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RESPONSE

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

Editorial

CHALLENGE OF MAINTAINING THE MOMENTUM

The first quarter of 2023 has been eventful and promising for India, setting the stage for further progress on its *Amrit Kaal* journey. Despite facing numerous challenges, the nation's growing confidence in its ability to tackle them and achieve its 2047 goal is remarkable. Now is the time for India to play its part as an important player on the global stage more proactively.

Is it the early glimpse of the India Moment or is it already there? To an extent, that moment has arrived as the world recognises India's presence in almost every area – from economy to geopolitics to military to space. Self-confident and self-reliant India will have to synergise all its efforts to ensure the enduring success of its forward movement on the global stage. Will India be able to sustain the momentum in the long run? It would be interesting to watch.

To achieve enduring success, India needs to focus on research and development (R&D), which can help it become an economic powerhouse through value-added exports and technological advancement. It's time to bring more finesse to India's innovative instinct, as it can be a game changer. The country's R&D efforts should leverage its abundant human resources and well-balanced labour-capital matrix.

The key reforms and Make in India initiatives have revitalised the defence sector, with a tenfold increase in exports of military hardware in the competitive global defence market in FY 2022-23, reaching an all-time high of Rs 16,000 crore. Similarly, India's progress in the space sector is commendable, but issues related to possible flaws in the design, quality control, production or certification of the Advanced Light Helicopter (ALH) program require prompt solutions to avoid negatively impacting the domestic and export potential of ALH. The reputation, safety, and longevity of the Light Utility Helicopter, the Light Combat Helicopter, and the Indian Multirole Helicopter are at stake.

International politics, regardless of the winner of the Russia-Ukraine war, will see further deepening of the global conflict as western primacy now confronts existential challenges thrown by Russia and China. India needs to tread cautiously, leveraging its G20 presidency to broker peace and end the proxy war, and insulate itself from the vulnerable situation of being at the frontline in a US-China clash. India's neutral stance will have to pass the test of time to ensure that its neutrality is not viewed as a crime.

Choosing the right partners has become trickier for India with a narrowing margin of error despite its strategic autonomy, non-alignment, and multi-alignment posturing. It's time for India to correct past strategic mistakes and reverse the overwhelming dependence on Russia for arms by expediting the Aatmanirbharta drive with calculated risks, while harnessing its available talents, skills, and indigenous technology. Going solo with Project 75 (I) submarine project and backing LCA Tejas' future development to provide IAF the desired squadron strength could be a worthy attempt.

Presenting the April-June 2023 edition, team *Raksha Anirveda* appeals to its esteemed readers to share their feedback. We hope the edition meets your expectations. I would also like to inform you that a special web feature, *Indian Armed Forces Modernisation: Technology. Innovation. Digitisation. Adaptability,* is scheduled for publishing between May 31 and June 5. Please visit www.raksha-anirveda.com to benefit from the first-hand, valuable information and insight. Happy Reading!

Jai Hind!!

Ajit Kumar Thakur
Editor & Business Director

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MANAGING FAULT LINES

Since independence, India's military leadership has faced formidable challenges in dealing with the country's religious diversity and colonial heritage. Avoiding the seepage of communal disharmony into the military's cultural fabric requires a multi-dimensional approach that prioritises education, information tools, and the preservation of institutional values

By **LT GEN (DR) PRAKASH MENON**

India takes pride in its ancient civilisation and believes it will continue to provide the cultural fabric with which the Indian State will weave its unity that would, in turn, provide the ultimate strength to ensure the welfare of its citizens. The Indian Constitution reflects this value system and serves as a guide for the country's continuity and permanence. Changes in modern India's socio-political fabric are expected to be confined within the Constitutional framework. The military institution is the guardian of the Constitution and operates under the Supreme Commander- the President of India.

Defence Minister Rajnath Singh

MANAGING RELIGIOUS DIVERSITY

Ancient India gave birth to two religions that continue to be major religions of Asia - Hinduism and Buddhism. While Hinduism continues to remain the religion of the majority in India, Buddhism is comparatively thin in the land of its birth but has many adherents, especially in the rest of Asia. Hinduism has a justifiable claim to being one of the earliest religions and has coexisted for long with other religions like Buddhism, Islam, Christianity, Sikhism, Jainism, and Judaism.

India's religious diversity harbours a communal fault line that requires constant attention from political and religious leaders. The lines are visible in phenomena such as deepening religious animosity, exploitation of religion for political purposes, spread of religious fundamentalism, stereotyping of other religions based on myths and fallacies, and entrenched positions within one religion that are characterised by intolerance and provide no room for give and take.

These lines impact communal harmony to variable degrees in variegated geographies at most levels of Indian society from where the military institution draws its human capital in terms of its leadership and soldiery. The seepage of communal disharmony into the military's cultural fabric is likely and perhaps inevitable, hiding below the surface and rearing its head during a national communal crisis that calls for an impartial military intervention.

MANAGING CULTURAL CHANGES

The first step to deal with this matter is for the apex level military leadership to accept the possibility that institutional values considered sacrosanct could be eroded by seepage from civil society. Bucking the larger trend in civil society will be a major challenge that must be confronted by education and information tools that provide reminders of Constitutional loyalty in the context of the contestation between religions.

So, managing the impact of cultural changes on the Indian military in the context of India@75 requires a multi-dimensional approach that prioritises education, information tools, and the preservation of institutional values. The military must remain vigilant and impartial, adhering to its Constitutional role as the guardian of the country's unity and stability.

The military leadership may choose to ignore the communal polarisation caused by political winds, but it would amount to a dereliction of their constitutional duty, according to the author. However, it is an act that would not have individual attribution, despite its potential to cost the nation dearly. Only a high level of military professionalism could resist the temptation to turn a blind eye to a highly sensitive issue that may not find favour with the government in power. The government has recently indicated to the military that it is time to shed some of its colonial legacies, which runs concurrently with the national communal currents and is the second element of cultural change that the military institution has to manage.

Dealing with communal tensions and shedding colonial legacies are connected through civil-military relations. Post-independence civil-military relations in India were assumed to be closer to Huntington's Objective Civilian Control Model, which involves balancing civilian control of the military and allowing their professional autonomy. This is in contrast to Subjective Control, which places legal and institutional restrictions on the military's autonomy.

When dealing with communal trends that must be kept at bay, the military needs to assert its professional autonomy. Still, while dealing with the political push to jettison colonial legacies in the military, the Subjective Control model seems predominant. Therefore, the two models need to be concurrently in play. However, there may be a shift towards Subjective Control, making it difficult to deal with communal issues while making it easier to scrub the military's colonial legacies.

The shift to Subjective Control is visible in the political leadership exercising its powers in the selection of senior military leadership. Earlier, seniority was the reigning principle. Still, that seems to have changed, as witnessed in the change of rules for selecting the Chief of Defence Staff (CDS). The shift, when viewed through the Huntington Model, indicates a move towards Subjective Control. It is also possible that both models of control can co-exist, and the dominant style would depend on the context. While dealing with the communal context, Objective Control should be preferred, and Subjective Control might facilitate the required changes that involve jettisoning some colonial legacies.

SCRUBBING COLONIAL LEGACIES

The problem with colonial legacies is that some have connections to the primary source of military effectiveness – its fighting spirit. Fighting spirit is founded on the willingness to sacrifice for an entity and cause with which the soldiers must identify. While the spirit of nationalism provides the overarching spiritual framework that envelops and embraces the military institution, the identity that provides the spirit that is lived, felt, and experienced is the unit and subunit represented by battalion, company, platoon, and section. Therefore, preserving and strengthening the regimental spirit of the Indian Army should not be sacrificed in the name of eradicating colonial legacies.

The question that arises is whether some combat and combat support arms of the Army, such as the Infantry, Armoured Corps, Engineers, and Artillery,

While the spirit of nationalism provides the overarching spiritual framework that envelops and embraces the military institution, the identity that provides the spirit that is lived, felt, and experienced is the unit and subunit represented by battalion, company, platoon, and section

STRAIGHT DRIVE

The selection of Agniveers on all India merit may make the change to all India class composition inevitable, though the issue of whether to change the names of regiments is not central to military effectiveness

which are still more or less organised on regional, caste, and religious bases, should continue in their present form, and whether moves to change their composition and name could adversely affect their military effectiveness. In practice, it would entail converting the Rajput, Sikh, Maratha, Mahar, Gorkha, Assam, inter alia, into entities of All India Class Composition. The logic of composing units on a regional, class, or religious basis is a British legacy, and it has outlived its purpose. For example, if the Sikhs had to be used against the Gorkhas, it would be problematic. There was also the notion of the martial classes that underpinned the grouping and recruitment.

The logic that fighting capabilities are enhanced by narrow ethnic and other groupings has been disproved.

The Infantry Regiment – The Brigade of the Guards – was created in 1949 by the late Field Marshal Cariappa as an experimental vehicle. Its units have demonstrated excellent performance in both war and peace. However, the weight of legacy has prevented any move to shift all regiments to the All India Class, despite attempts to do so after the mutiny of Sikh units during Operation Blue Star. The selection of Agniveers on all India merit may make the change to all India class composition inevitable, though the issue of whether to change the names of regiments is not central to military effectiveness.

Uniforms and ceremonials, including cultural symbols and music, also pose challenges. Uniforms should prioritise comfort, simplicity, smartness, ease of maintenance, and suitability for weather and affordability. Symbols and emblems may have historical significance that links serving soldiers to the bravery and sacrifices of their forefathers, so changing or replacing them to suit contemporary political trends may be unjustifiable. Music, however, should blend the past and present and transcend boundaries.

Ceremonial parades involving multiple entities should harmonise uniform changes for the armed forces with other uniformed forces. Otherwise, the colonial legacy will stand out among police forces that have inherited colonial uniforms and selectively imitated the Army. The continued use of camouflage by police agencies despite protests by the Army exemplifies this issue.

The major change that must be managed for military effectiveness is the shift of all Army units to the All India class.

In conclusion, India at 75 shows signs of evolving a hybrid Civil-Military relations model that balances Objective and Subjective Control. Flexibility of control is essential, and the style of Civil Control should vary according to contexts and always aim to improve military effectiveness. However, managing communal trends will be more challenging than scrubbing colonial legacies and may require Objective Control, which may not be easily forthcoming and remains a significant challenge for military leadership in managing its cultural sphere.

– The writer is Director, Strategic Studies Programme, Takshashila Institution; former military adviser, National Security Council Secretariat. He tweets @prakashmenon51. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

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ANALYSIS

Today India stands at an historical intersection, where it is able to get its voice heard globally, whilst taking pragmatic decisions for the regional stability along with adding heft to its voice due to its economic performance

INDIA'S RISE AS GEOPOLITICAL BEACON

Prime Minister Narendra Modi

By **ASAD MIRZA**

Over the last ten years, India has emerged as a major player on the global scenario and the regional politics. Though earlier during the Cold War, India was considered to be the most moderate voice of the Non-Aligned World, but after the disintegration of the former USSR and the world turning into a unipolar world, India has been able to retain its stature as the spokesman for the developing and under-developed world and the heft has been added to this due to its economic performance, when most of the major economies are not performing well.

Recently, speaking at a Conclave organised by a leading news channel PM Modi succinctly summarised India's ambitions and plans. He said that this is India's moment and the time period before India in this decade of 21st century is unprecedented. Further stressing that if a country has to move forward, it should always have dynamism and the power to make bold decisions, he underlined the fact whatever India is achieving today, it is due to the power of our democracy, the power of our institutions. His words: We must strengthen the India Moment with 'Sabka Prayas' and empower the journey of a developed India in the *Azadi Ka Amrit Mahotsav*, amply demonstrates the resolve of the Indian leadership to take bold decisions to move the country forward at the global stage.

Whilst reviewing the Indian ambitions for becoming a relevant regional key player and also a global voice, we have to keep in mind that it has to achieve this in the midst of a geopolitical repositioning navigating its place in the evolving regional and global order, to emerge as an architect of new initiatives.

Today India stands at the intersection of traditional geopolitical challenges and emerging regional and global trends. India has to keep an eye on protracted border tensions, dynamics of

the neighbourhood and manage its equation with China besides managing the fallout of the US-China rivalry.

In the context of shifting alliances, New Delhi is also set to shape the future of the Indo-Pacific region in security and economic spheres. As it aspires and seeks to strengthen its position as a regional trade hub and stay open for international commerce, it has to carefully consider myriad domestic interests and pressures, also. But its importance for the region has become evident in the manner the US co-opted it in the regional alliance QUAD.

Australian Prime Minister Anthony Albanese (far left), US President Joe Biden, Prime Minister Narendra Modi and Japanese Prime Minister Fumio Kishida during the QUAD Leaders summit in Tokyo

India has commendably emerged as the voice of the Global South particularly in the post-pandemic era. It has withdrawn from the Regional Comprehensive Economic Partnership (RCEP), in order to pursue a policy of strategic trade. Instead of being obsessed by rivalry with neighbouring Pakistan, it is more focussed on maintaining India-China relations in the backdrop of managing the emerging regional and global challenges.

For India, the geopolitical tensions in the region are likely to continue along with land-border and maritime sovereignty issues. Intensifying technological rivalries and geopolitical competition around connectivity will complement these.

In foreign affairs, the shift from India's former policy of non-alignment to pursue and establish strategic relations with the United States, Europe and Indo-Pacific countries have been enhanced. This in turn opens avenues for it to pursue possibilities of emerging multilateral and plurilateral partnerships.

The debates on India's strategic options and policy choices put the spotlight on a wide array of issues in the diplomacy, defence & security, socio-economic, health and climate domains. Continued social and economic reforms can help enable India to build a competitive, equitable, sustainable, future-oriented economy with sound investment in knowledge creation and capacity building in both technical and human resources.

On the diplomatic front the key to an integrated approach to widen India's foreign policy forays will benefit from a continued cooperative, pragmatic, and targeted approach. This could be achieved by emerging as a champion of regional connectivity initiatives, increased participation in issue-based coalitions strengthening cooperation with strategic partners to keep the balance and being a proactive force on the global and regional foras, like it has done recently at the G20.

Foreign Minister S Jaishankar on the occasion of completing 100 days of the Modi government's second term, had reiterated that "the first circle of priority" remains the neighbourhood and highlighted two elements of the 'Neighbourhood First' policy - frequent high-level political exchanges and "non-reciprocal policy" towards its smaller neighbours. Beyond these stated elements, the neighbourhood approach is guided by pragmatism as Delhi rearranges the geopolitics of its neighbourhood.

India's prioritisation of engagement with neighbours has coincided with growing US-China strategic competition in its backyard, traditionally considered its sphere of influence. That Delhi is letting the US to keep the pressure on China in its periphery to leverage the situation to further its strategic interests is but only a part of India's current approach towards its neighbourhood.

Delhi's desire to shape political changes and foreign policy choices of its smaller neighbours using hard power - military intervention and economic blockade - has not always achieved

India has been able to retain its stature as the spokesman for the developing and under-developed world and the heft has been added to this due to its economic performance

ANALYSIS

Prime Minister Narendra Modi at the G20 summit in Rome-2021

On the occasion of completing 100 days of the Modi government's second term, Foreign Minister S Jaishankar had reiterated that "the first circle of priority" for India remains its neighbourhood

the desired goals. In 2015, India's "unofficial" economic blockade of Nepal pushed Kathmandu closer to China. Furthermore, as a negative spinoff such actions have often fuelled 'anti-India' sentiments in the countries in its periphery, like Nepal and Maldives.

Sino-India geostrategic competition has long been a dominant element in India's relations with its smaller neighbours. For some time now, Delhi has been warily watching China's growing economic and military footprints in its periphery as Beijing emerges as the top trading partner and a major investor in most of its smaller neighbours. The line dividing Delhi's desire for its smaller neighbours to be sensitive to its security concerns and being accused of interfering in their foreign policy has further blurred as all its smaller neighbours, except Bhutan, have joined China's Belt and Road Initiative.

Engaging China to counter-balance India remains a key foreign policy feature of India's smaller neighbours. Delhi might have problematised the traditional mindset by maintaining a low profile in the emerging US-China rivalry. As smaller neighbours increasingly attempt to balance their ties between America and China, the India-China strategic competition for influence in these countries has taken the backseat for now.

India has positioned itself as supporting the growing aspirations of its smaller neighbours. As Delhi adopts a "multi-aligned" policy vis-à-vis major powers, it also appears to be signalling to its smaller neighbours that it is not against their policy of engaging more players to maximise benefits. India is aware that it is a key player in that matrix. This pre-empts the tendency of the smaller neighbours accusing it of preventing them from engaging with other major powers, a stance that is often viewed through the lens of a big power limiting smaller nations in exercising their independent foreign policy.

India is slated to become a magnetic new centre. And its stewardship of the G20 this year offers a big opportunity for it to imprint its agenda in an emerging multipolar world.

–The writer is a political commentator based in New Delhi. He can be contacted on www.asadmirza.in. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

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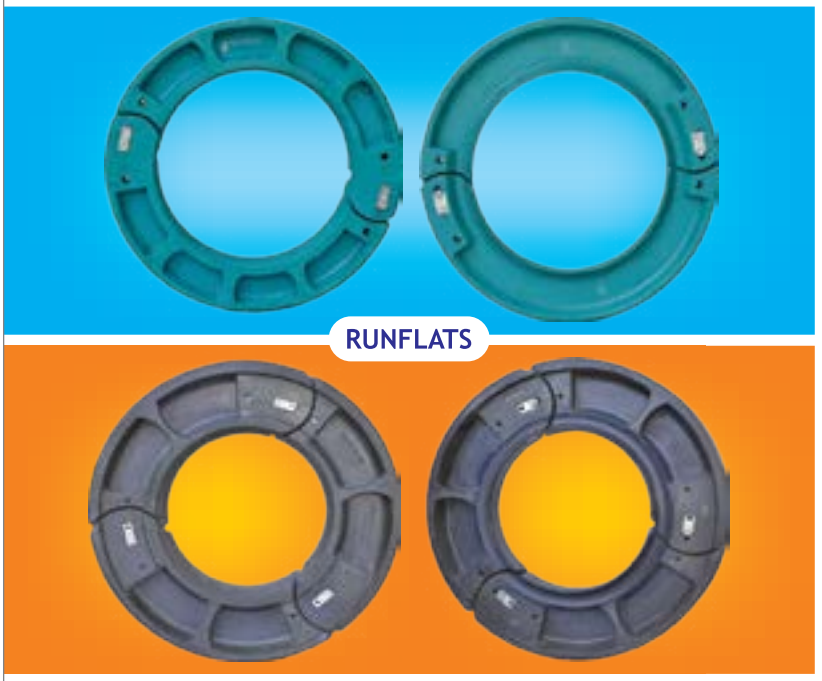

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OPINION

INDO-FRENCH DEFENCE COOPERATION: CHANGING DYNAMICS

There is an urgent need is to take prudent steps to strengthen Indo-French cooperation within the broad EU framework. India's G20 presidency will come in handy in crafting a joint strategy to contain the dragon from using the Indo-Pacific to spread Chinese influence and money power globally at the expense of stability of the current international political order

By **PRANAY K. SHOME**

The India-French alliance is undoubtedly one of the strongest connections that exists in the oriental-occidental contact ever since the end of the Second World War. The Indo-French cooperation has been one partnership which has steadily grown in support from pillar to pillar ever since the emergence of India as an independent nation-state in 1947. France was one of the few western countries which provided India with armed support during the 1971 and 1999 conflicts with Pakistan and interestingly congratulated India during the 1974 and 1998 nuclear tests.

Defence Minister of France with Prime Minister Narendra Modi

The G20 presidency of India has enabled India to evolve the Indo-French ties to the next level from the level of strategic partnership. The ties now encompass not just in the domain of trade and commerce but also in the fields of defence, geostrategy, culture and people to people ties. One prominent sign of French influence in Indian culture and policy circles is the influence that the French New Wave cinema has exerted in the making of Indian art cinema. French academics also dominate the intellectual circles of the country's premier educational and social institutions.

However, one area which has been in the spotlight for quite some time is the defence aspect of this strategic partnership. Without delving much into history, it is necessary to understand that France has been undoubtedly one of the most reliable states when it comes to the deliverance of reliable and potent arms. The acquisition of 36 Rafale fighter jets and the further order of additional fighter jets is a testimony to the importance of developing the defence ties between the two nations further.

An important aspect of this defence tie is the Project 75I - the Indo-French deal to supply six Scorpene diesel submarines to form the backbone of India's undersea naval arsenal. The advantage of these submarines is that they make less sound, are more energy efficient and interestingly emit less carbon emissions than the conventional submarines.

Some additional areas where India and France can explore to expand their defence partnership is in the area of drone technology and artificial intelligence. Drones have changed

the nature of electronic and battlefield warfare as is seen in the increasing use of Iranian made drones by Russia against the Ukrainian forces. Cooperation on drone manufacturing should emphasise not only on the reconnaissance purposes but also for combat purposes, like the American predator and reaper drones and the armed Heron drones used by the Israeli Defence Forces. While India has already acquired the swarm drones whose devastation capabilities were seen in a simulatory mode in the Call of Duty Modern Warfare series of games (2019 and 2022), India is yet to develop the hunter killer capability drones of the American models.

Artificial intelligence is the next big thing in the realm of defence partnership between India and France. The government which has made it a point to boost technological defence exports can actually focus on encouraging the private sector and public sector to enter into partnerships with French firms to encourage the already vibrant start-up ecosystem of India. The scope in this area is enormous. The killer robots and super soldier programs which appear to be the harbinger of tech disruption in the field of defence will be run by artificial intelligence. Artificial intelligence in the future can also run pilotless jets, armoured vehicles thereby making the armed forces of both countries leaner and tech savvy. There is also a distinct possibility of both the countries' guarding their internal and external arenas of security solely based on the technological dimension in the near future.

The Performance Linked Incentive (PLI) scheme which the government of India has unveiled in 2021 is reaping dividends with the private sector in the defence field slowly flourishing. This could be very well extended to French firms who intend to contribute to the Make in India story and promote the autarky spirit of India.

EUROPEAN UNION DIMENSION

The evolving prospects and scope of Indo-French defence cooperation can't be seen to be exclusive of the broader India-European Union relationship context. European Union is the second biggest destination for Indian exports after USA; products ranging from chemicals to petroleum products to Indian spices make its way to the EU. It is therefore quite easy to fathom the importance of this relationship. The defence ties between India and EU in the form of the latter as a grouping is not encouraging.

Leopard 2A7 main battle tanks

Artificial intelligence is the next big thing in the realm of defence partnership between India and France. The government which has made it a point to boost technological defence exports can actually focus on encouraging the private sector and public sector to enter into partnerships with French firms to encourage the already vibrant start-up ecosystem of India

Only France is the major partner of India within the EU. There is tremendous scope for enhancement to Indo-EU defence ties. One such area is the fighter jet program; the Indian Air Force is in dire need of jets and the Eurofighter typhoon can become a viable alternative to the Rafale. However, with India keen on indigenising the programme, the focus can be on joint development of a 5th generation fighter jet. India can ask for Germany's help in buying the deadly Leopard 2A7 main battle tanks.

A new and innovative area of cooperation is the doctrinal help the EU's main work horses can give in helping India formulate an inclusive and holistic national security doctrine. While a doctrine may not help much in the field of actual war, yet it plays a defining role in shaping the nature of India's security outlook and the objectives of the Indian armed forces and the role that India can play in response to the new and emerging threats in the field of defence and security.

A major aspect of India-EU security cooperation is non-traditional security especially human security. Climate security is an essential aspect of

OPINION

India and the EU should not be complacent in underestimating the power and potential of China; they might exercise caution which is necessarily the best strategy in this context. India's G20 presidency will come in handy in crafting a joint strategy to address the Chinese elephant in the room

non-traditional security. India-EU framework for cooperation on implementing the proceeds of the Paris Accord targets and the resultant initiative to set carbon neutral targets (for India 2070, for EU 2050) can prove to be a gamechanger in the crusade against climate change.

INDIA'S POSITIONING IN THE INDO-PACIFIC REGION

The Indo-French within the broader framework of India-EU cooperation is especially significant in the contextual position of India's and EU's position in the Indo-Pacific region. The Indo-Pacific is the current buzzword in the world of geopolitics. India is a major player in this geopolitical and geoeconomic construct owing to India's position in the strategic Indian Ocean arc so any EU strategy to have a strong foothold in the Indo-Pacific will remain incomplete without taking India onboard.

The principal adversary in the strategic region is China and not Russia because Russia is the main adversary of West in the Eurasia; Russian presence in the Indo-Pacific is poor to say the least. However, it is not the case with China; the dragon sees the Indo-Pacific as a crucial part of its maritime silk route strategy designed to spread Chinese influence and money power globally at the expense of stability of the current international political order.

This is where India and France can come together; joint military drills, reconnaissance operations, naval exercises, and war time exercises involving the armed forces of India and the countries of the EU will help in sending a potential deterrent message to China that brazenness in such a critical geoeconomic region won't be tolerated.

A key aspect of India-France and EU's broad Indo-Pacific strategy can be to conduct denial of sea operations and a naval blockade in consonance with international maritime law should circumstances deteriorate to the point of open conflict. However, India and the EU should not be complacent in underestimating the power and potential of China; they might exercise caution which is necessarily the best strategy in this context.

India's G20 presidency will come in handy in crafting a joint strategy to address the Chinese elephant in the room and take steps to contain the dragon.

CONCLUSION

India's G20 presidency is critical for bringing peace and tolerance to a fractured world. In this context, Indo-French cooperation is an important pillar of support for India's national as well as international interests. Therefore it is expected that the mandarins of Indian foreign policy take prudent steps to strengthen India-France cooperation within the broad EU framework.

– The writer is currently working as a Research Associate at Defence Research and Studies (dras.in) and is a columnist. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

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DEFENCE COOPERATION

Prime Minister Narendra Modi with Salman bin Abdulaziz Al Saud, King of Saudi Arabia

TEAMING UP WITH THE GULF

India and the countries in the Gulf region are coming closer in defence and security arena. The growing warmth has also opened up opportunities for collaboration in defence trade, sales and joint manufacturing by roping in domestic private defence industry

By **MD. MUDDASSIR QUAMAR**

The Gulf region forms India's 'extended neighbourhood' in the west and is significant for its energy security, counterterrorism, safety and welfare of Indian expatriates in the Gulf Cooperation Council (GCC) States, and for maritime security in the Arabian Sea and Western Indian Ocean. Besides, there are geopolitical and strategic factors in South Asia, especially due to the turmoil and instability in AfPak region, which makes the Gulf and Middle East significant for India. Another important factor is foreign trade, investments, business and commerce wherein the Gulf is the top business partner of India. Accordingly, the Gulf has come to acquire a special place in India's evolving international relations and foreign policy over the past decades.

HISTORICAL TIES

In the security and defence domains, India has longstanding relations with the Gulf region going back to the late 1990s and early 2000s wherein New Delhi gingerly sought cooperation focusing on maritime security in the Arabian Sea, prevention of organised crime, smuggling and terror financing, and also combating home-grown terror. Oman was the first regional country with which India developed collaboration in maritime domain and started joint naval exercise in 1993. India also gradually signed extradition treaties with the UAE (1999), Bahrain, Kuwait and Oman (2004) and Saudi Arabia (2008). Joint military exercises and port calls of Indian naval ships increased in the 2000s.

In the aftermath of the 26 November 2008 (26/11) Mumbai attacks, India expedited the process of improving security and counterterrorism cooperation with the

regional countries. Meanwhile, memorandums of understanding (MoUs) on bilateral defence and security were signed with the Gulf States. Gradually, the cooperation expanded from discussions, exchange of ideas, port calls and occasional joint exercises to greater military-to-military engagements, regular bilateral exercises, intelligence sharing, combating terror financing and extradition of Indian fugitives.

GROWING DEFENCE TIES SINCE 2014

Under Prime Minister Narendra Modi, the security and defence sphere witnessed a greater emphasis. That it was backed by increased political visits and continued economic relations helped in giving an impetus to defence and security ties. Since 2014, India has focused on three regional countries – Oman, Saudi Arabia and the United Arab Emirates – so far as defence and security cooperation are concerned.

While building on the established ties, New Delhi and Muscat, Riyadh and Abu Dhabi have not only expedited the process of security and defence engagements but have also expanded into newer areas. For example, India and UAE and Saudi Arabia have been collaborating and discussing cooperation in space exploration.

In March 2023, the CEO of Saudi Space Commission Mohammed bin Saud al-Tamimi led a Saudi delegation to India and held talks with Chairman of the Indian Space Research Organisation (ISRO). Tamimi also met officials at NewSpace India Limited (NSIL), a commercial arm of ISRO, and visited the U R Rao Satellite Centre in Bengaluru.

There are also efforts towards greater military-to-military ties and joint exercises, research and training. With Oman too there is an emphasis on converting the maritime and military-to-military ties to more tangible aspects. Many Saudi officers have enrolled in courses offered in National Defence College, College of Defence Management and Defence Services Staff College. In defence manufacturing domain too there has been some progress.

SPURT IN M2M ENGAGEMENTS

In recent months, there is a spurt in engagements with India participating in several joint exercises in the region. There has been frequent exchange of visits with each country. Chief of Naval Staff Admiral Karambir Singh visited Oman to hold discussions and enhance bilateral cooperation in September 2021. In December 2020, General Manoj Mukund Naravane became the first Indian Chief of Army Staff General (CoAS) to visit Saudi Arabia. With the UAE, the defence and security relations have been more robust. General Naravane's visit to the UAE in December 2020 led to talks on critical security and defence issues and explored the possibilities of tie-ups in a wide range of areas. In addition to the joint air force exercise, the Desert Flag, the two countries held the joint naval drill Zayed Talwar in August 2021 off the coast of Abu Dhabi.

REGULAR JOINT EXERCISES

Between 26 February and 16 March, Indian Navy participated in the International Maritime Exercise – Cutlass Express 2023 off the coast of Bahrain. This is the first time that the Indian Navy is participating in the multinational joint exercise IMEX organised by the Combined Maritime Forces (CMF) in the Arabian Gulf anchored by the US Naval Forces Central Command and US Navy Fifth Fleet in Bahrain. In 2022, Indian Navy participated in the IMEX as an observer. The Indian decision to join the CMF is an indication of

UAE delegation in meeting with Deputy Chief of Integrated Defence Staff, India

Under Prime Minister Narendra Modi, the security and defence sphere witnessed a greater emphasis. That it was backed by increased political visits and continued economic relations helped in giving an impetus to defence and security ties. Since 2014, India has focused on three regional countries – Oman, Saudi Arabia and the United Arab Emirates – so far as defence and security cooperation are concerned

DEFENCE COOPERATION

Indian Air Force's Sukhoi fighter jet

Indian navy and air force have participated in the annual defence and naval exhibitions – IDEX and Naval Defence Exhibition (NAVDEX) – held in Abu Dhabi. Officials from UAE, Saudi Arabia and Oman have also participated in Aero India and Def Expo organised in India annually showcasing India's prowess in defence technology and manufacturing

India's growing concern about maritime security in the Arabian Gulf.

In February 2023, INS Vela – a Kalvari Class Scorpene Submarine – visited port Salalah in Oman for testing operational readiness. As noted, India and Oman have a long standing maritime security cooperation which has been renewed from time-to-time including in May 2021. Accordingly, the Indian and Omani navies conduct the joint naval exercise Naseem al-Bahr and Oman has also granted Indian Navy docking facilities at the Duqm Port.

Besides, the Indian Air Force participated in joint air exercise Desert Flag VIII with its Emirati counterpart in March 2023. In February, Indian Air Force visited a Royal Saudi Air Base for the first time and the planning for the second Al-Mohed Al-Hind – India-Saudi joint naval exercise in May 2023 is underway.The fourth joint exercise between Indian and Omani armies—AlNagah IV—took place in Bikaner in August 2022. The sixth India-Oman joint air force exercise—Eastern Bridge-VI—was held in Jodhpur in February 2022. The 13th edition of Naseem Al-Bahr, the joint India-Oman naval exercise, took place off the coast of Oman in November 2022.

STRENGTHENING COOPERATION IN DEFENCE TRADE

A key area where there is a greater emphasis in terms of bilateral collaborations is defence trade, sales and joint manufacturing. The commitment to aatmanirbharta (self-reliance) in defence acquisition has led to the need to give a push to domestic private defence industry; this has emerged as a possible avenue for cooperation with Oman, Saudi Arabia, and UAE as well as with other Middle Eastern countries including Egypt. There is also a greater emphasis on self-reliance even in discussions with Israel which is a major supplier of defence and military equipment to India.

In 2022, when the UAE firm Caracal lost out on a mega deal to deliver close quarter battle carbines to Indian army due to emphasis on acquiring from Indian manufacturer, it tied up with an Indian company as part of 'Make in India' programme. Besides, Indian and regional defence and military officials have also been visiting the respective defence exhibitions as part of the ongoing efforts to enhance cooperation in defence trade and manufacturing. Saudi Arabia's Power for Defence Technology Company (PDTC) signed an agreement with Bharat Electronics Limited (BEL) for collaboration in defence and aerospace technologies with the aim of introducing cutting-edge aerospace technologies and solutions in Saudi Arabia.

Indian navy and air force have also participated in the annual defence and naval exhibitions – International Defence Exhibition (IDEX) and Naval Defence Exhibition (NAVDEX) – held in Abu Dhabi. Officials from UAE, Saudi Arabia and Oman have also participated in Aero India and Def Expo organised in India annually showcasing India's prowess in defence technology and manufacturing. India and UAE have also been working towards greater cooperation in defence manufacturing and several rounds of talks and discussions have also taken place in this respect among officials and private enterprises based in the respective countries.

CONCLUSION

India's relations with the Gulf region have evolved gradually and acquired pace since 2014. The increased threats from international terrorism to internal security of the countries and to maritime security in the Persian Gulf, the Arabian Sea and Red Sea have been one of the major catalysts for India and the Gulf States to strengthen defence and security relations. Threats from non-state actors in the Middle East and instability in the AfPak too have contributed to improvements in defence ties. Additionally, there is now a greater emphasis on military-to-military ties to help in trust building and developing greater understanding on important issues as well as on operational areas. Given an emphasis on reducing external dependence for military acquisition in India as well as in the Gulf countries, there is now a serious effort to develop domestic defence industries and this has also opened up opportunities for collaboration in trade and manufacturing. The future of defence collaboration between India and Gulf countries, especially Oman, Saudi Arabia and the UAE, is brighter today than it was ever before.

–The writer teaches Middle East Studies at Jawaharlal Nehru University, New Delhi. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

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IN CONVERSATION

FORGING SELF-RELIANCE IN DEFENCE

Bharat Forge is contributing significantly to augmenting India's manufacturing capabilities in the defence and aerospace sector. Neelesh Tungar, Chief Operating Officer, Defence and Aerospace, and Guru Biswal, Chief Executive Officer, Aerospace Business Division of Bharat Forge, spoke to Raksha Anirveda, on a wide range of issues. Excerpts...

Bharat Forge, the flagship company of Kalyani Group, is a credible name in the defence manufacturing and innovation industry. It has established itself as a renowned manufacturer and supplier of forged and precision-machined critical components and sub-assemblies that are widely used in high-performance engines, aerospace applications, and defence systems.

Since venturing into the defence and aerospace sector in the early 1990s, Bharat Forge has been continuously playing a vital role in enhancing India's defence manufacturing capabilities, making the nation more self-reliant in defence production and technology. The company's commitment to quality, innovation, persistence, and long-term planning has positioned it as a significant contributor to India's "Aatmanirbharta in Defence" initiative. Bharat Forge has endeavoured to overcome innovation bottlenecks in the country and develop high-level technology by creating defence products, thereby helping India secure a significant place in the global market.

Bharat Forge has emerged as a leading supplier of various components, including airframe, structural and engine parts for the aviation sector. The company is well-known for its manufacturing capabilities of aircraft compressors, turbines, and fan blades in India.

In a recent interaction with *Raksha Anirveda*, Neelesh Tungar, Chief Operating Officer, Defence and Aerospace, and Guru Biswal, Chief Executive Officer, Aerospace Business Division of Bharat Forge, shared valuable insights into the company's progress in the defence sector. They discussed how the government's policy is helping Bharat Forge leverage indigenous technology to its optimum potential.

When asked about Bharat Forge's experience at Aero India 2023, Neelesh Tungar responded, "It was quite hectic given the fact that the large number of delegations had come to the Aero Show. It was a very engaging show. The inaugural was impressive and the meetings with delegations very useful."

Speaking on the Make in India program, he added, "Make in India has finally arrived. The government has taken a number of steps in this direction and it has been successful. We have seen the difference in the way people have approached us. Earlier, we used to approach people who wanted to do business. We have shown our strength in terms of technology. We have a strategic partnership in the country and that is a major change. The changes that we have seen in the last couple of years since the Aatmanirbhar Bharat policy, have been very encouraging."

Joining in the conversation, Guru Biswal,

Bharat Forge and Paramount Group Officials after signing the MoU

CEO- Aerospace Business Division said, "Aerospace has been one of the major areas of our business. It takes more time and needs plenty of resilience. India has always had the expertise but somewhere we were not able to go beyond the military sector. Now, we as a company have gone beyond the military market and are also in the commercial sector. We supply critical Indian components in fully finished condition to giants such as Rolls Royce and Honeywell."

Questioned about the future of Bharat forge in the aerospace sector, they promptly responded, "We have small indigenous engines. We don't want to compete with larger players but only want to complement them. Our intention is that wherever we see weakness in the industry, we would like to focus on that so that we can complement the efforts of the bigger companies and the Government of India in the present ecosystem."

"Make in India has finally arrived. We have seen the difference in the way people have approached us. In the last few years, we have shown our strength in terms of technology. The changes that we have seen in the last couple of years since the Aatmanirbhar Bharat policy, have been very encouraging."

Neelesh Tungar, Chief Operating Officer, Defence and Aerospace, Bharat Forge

Neelesh Tungar observed, "Previously, people came to India for our labour, but now they come for technology and the demographic dividend that the country provides." Guru Biswal added, "We as a company want to create capabilities and I think that is the strength of our company. We create capabilities not for a specific but for multiple purposes. We are creating a system so that wherever there is a deficiency, it can be rectified."

Bharat Forge's Aero India 2023 participation concluded on a promising note as it signed memorandums of understanding (MoUs) with Paramount Group for the development and production of Composite Rotor Blades, Mission Systems, and Stores Management Systems for Medium Lift Helicopters, Hindustan Aeronautics Limited and Saarloha Advanced Materials for the development and production of aerospace grade steel alloys and Roll-Royce for the supply of aero engine components.

With its unwavering dedication to engineering excellence and innovation, Bharat Forge is confidently making strides as a prominent player with a strong foothold in the global defence and aerospace market.

"Aerospace has been one of the major areas of our business. As a company have gone beyond the military market and are also in the commercial sector. We supply critical Indian components in fully finished condition to giants such as Rolls Royce and Honeywell."

Guru Biswal, Chief Executive Officer, Aerospace Business Division, Bharat Forge

INSIGHT

INDIA-CHINA RELATIONS: TOUGH ROAD AHEAD

Recent aggressive Chinese moves, constrains India on how to manage its strategic interests whilst maintaining cordial trade and business ties, with China

By **VINAY KUMAR**

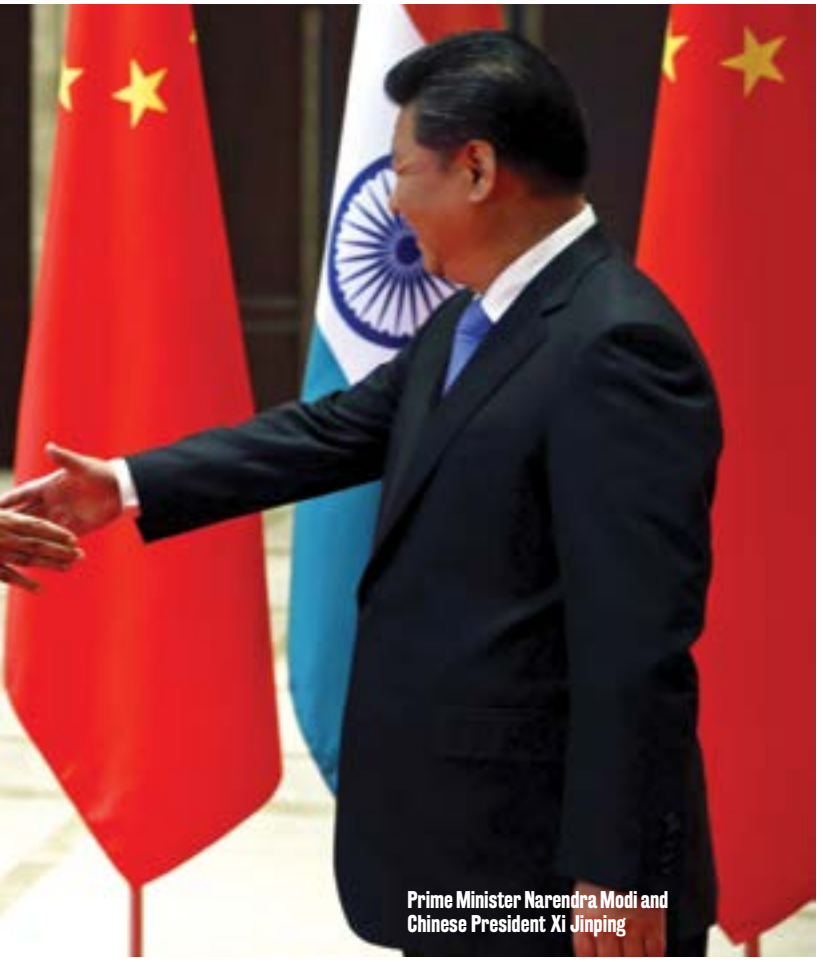
India-China relations remained in focus last month, as a number of important events manifested the geo-political scenario that unfolded in quick succession. Display of solidarity and support could not be missed during Chinese President Xi Jinping's visit to Moscow to meet his Russian counterpart Vladimir Putin in the backdrop of the on going Ukraine war, Japanese Prime Minister Fumio Kishida's visit to New Delhi indicated the emphasis on Indo-Pacific and the Quad that lays stress on strategic cooperation between Australia, India, Japan and the United States, and the truce between Iran and Saudi Arabia caught everyone by surprise as they agreed to re-establish diplomatic ties and the mediation was accomplished by China.

If President Xi's meeting with his Russian counterpart Putin showed that China is strongly supporting Russia over Ukraine, it puts India in a bind which has carried on with its nuanced stance and puts the onus on New Delhi to be clever in expanding its strategic outreach as it faces standoff on the border with China.

President Xi's meeting with his Russian counterpart Putin showed that China is strongly supporting Russia over Ukraine

Over the past nearly three years since a clash at Galwan in Ladakh in June 2020 led to the deaths of 20 Indian and four Chinese soldiers, India and China have seen border tranquillity falling prey to tensions and skirmishes. In December 2022 a clash took place at Yangtse, northeast of Tawang in Arunachal Pradesh. Both sides are witnessing a painfully slow movement in easing their border tensions along the disputed 4,000-kilometre border. The earlier agreements of 1993, 1996, 2005 and 2013 between the two neighbours have literally been thrown to the winds as China prevents Indian soldiers from carrying out patrol duties along the border.

Since 2020 clash, several rounds of talks have been held between the two sides and disengagement has occurred at four points in



Prime Minister Narendra Modi and Chinese President Xi Jinping

India will have to analyse the recent aggressive Chinese actions in order to counter its deceptive and false narrative to stoke trouble in newer areas in newer forms

Ladakh, but two sore points still remain unsettled. Normalcy in bilateral relations seems far away even as ministers and high-ranking officials of the two countries have had regular meetings. External Affairs Minister Dr S. Jaishankar has pointed out that there could be no normality in India-China relations until the situation in eastern Ladakh was resolved.

The latest move of China 'renaming' of areas in Arunachal Pradesh points to its machinations and marks a new low in its ties with India. Rightly so, India has summarily rejected China's bid to lay claim over areas in Arunachal Pradesh. China's attempt shows affront and scant regard for India's territorial sovereignty. The Ministry of External Affairs said in a statement that 'invented names' will not alter the reality that Arunachal Pradesh is an integral part of India. The move by China came even as India was playing host to the visiting Bhutanese King Jigme Khesar Namgyel Wangchuck who held meetings in New Delhi with President Draupadi Murmu and Prime Minister Narendra Modi. Security and border issues, including theprogress on boundary talks between China and Bhutan, particularly above the tri-junction point of Doklam, where a flare up had occurred four years ago came up for discussions in these meetings.

Policy analysts have pointed out that despite high-level meetings between the two sides to pave the way for establishing peace on the Line of Actual Control, it is becoming clear that Beijing intends to maintain the status quo of an uneasy calm in the border areas. India will have to go deeper into analysing the move by China and its aggressive actions in order to counter its deceptive and false narrative to stoke trouble in newer areas in newer forms.

On many occasions in the recent past, China has made clear its strong dislike and disproval of Quad and Indo-Pacific strategic initiatives. Is it because China wants to deliver its message hard and clear that it disapproves India's close strategic ties with the US? It wants to drive home the message that as a neighbour, Beijing would be more accessible to it in resolving problems and therefore this aggression along the LAC is a way to hammer its point.

For India, dealing with China remains a complicated web on account of a number of issues. India lags behind not only in military terms but also economically. In 2022, China's GDP was nearly $18 trillion as compared to India's $3.5 trillion. China's Defence budget was nearly $230 billion, which is more than three times that of India's.

India will have to figure out ways of what to do with its trade and business ties with China while finding ways to protect its strategic interests. It looks like a tough and long road ahead.

–The writer is a senior journalist and media consultant. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

ANALYSIS

CHINA'S FIGURES OF FALLACY

China's ambiguity on defence spending is deliberate because the actual expenditure is many times higher than the figures presented before the world. The Chinese media gives a spin to the entire episode to showcase China as a powerful, responsible, progressive and highly respectable country. But the Chinese claims don't stand the scrutiny

By **RAVI SRIVASTAVA**

Painful Justification: China recently announced a draft defence budget for the year 2023 during the annual session of the National People's Congress (NPC) held in the first week of March. In China's case, NPC is supposedly the highest constitutional body with administrative, executive, and law-enacting powers and also to address major state issues. This year, China's defence budget is slated to cross 1.55 trillion yuan ($224 billion). It will see an increase of 7.2% from the previous allocation. In pure value terms, China continues to be the world's second-largest defence spender after the US. The problem with China's figures is its complete lack of transparency. Unlike a general norm, China doesn't want to tell how much it plans to spend on procurements of weapon systems, on defence infrastructure, outlays for three services or on revenue commitments.

This ambiguity is noted as purposeful by international observers. As all things Chinese have questionable creditability, their figures too suffer the same. In 2021, International Institute for Strategic Studies (IISS) estimates suggested the Chinese Defence budget to be $285 billion while Stockholm International Peace Research Institute (SIPRI) pegged it at $293.4 billion as against Chinese official figures of $209.2 billion in their annual report, a massive variation of more than 27%. In a 2002 US DoD report, it was noted that Chinese

defence spending is almost four times the official figures released. Data available from 2013 onwards show a pattern of deliberate undervaluation by at least one-third. So where does China intend such huge money to be used for? China has taken immense pain to justify it is not in any horizontal arms race. Reports carried by CCP's mouthpiece The People's Daily in a March editorial attempted to clarify the defence outlay for military modernisation, optimised COVID-19 policies and defence diplomacy. It roughly translates into China's contributions to UN Peacekeeping, multilateral and bilateral military exercises and Chinese military grants to its client states like Pakistan.

COURTESY: WWW.FT.COM

However, Chinese claims don't stand the scrutiny as its Ministry of National Defence lists just one bilateral and one multilateral military exercise undertaken by its forces last year. The fact is its expenditures accounted under multilateral military exercises are its own unilateral military operation underway in the South & East China Sea. Money is being funnelled in bullying neighbours over contested boundaries, spending millions on live firing - the one seen during Nancy Pelosi's visit to Taiwan, to counter US presence in their backyard and bribe their way to buy military alliances from corrupt regimes of the likes of Solomon Islands and Honduras, whose leaders overnight find China giving a better deal. None of it really leaves one convinced about how China attributes its military commitments. China can surely choose to burn dollars, but its kiddish attempt to cover it up only reflects how the whims of Xi continue to drain China of billions.

A PRECURSOR

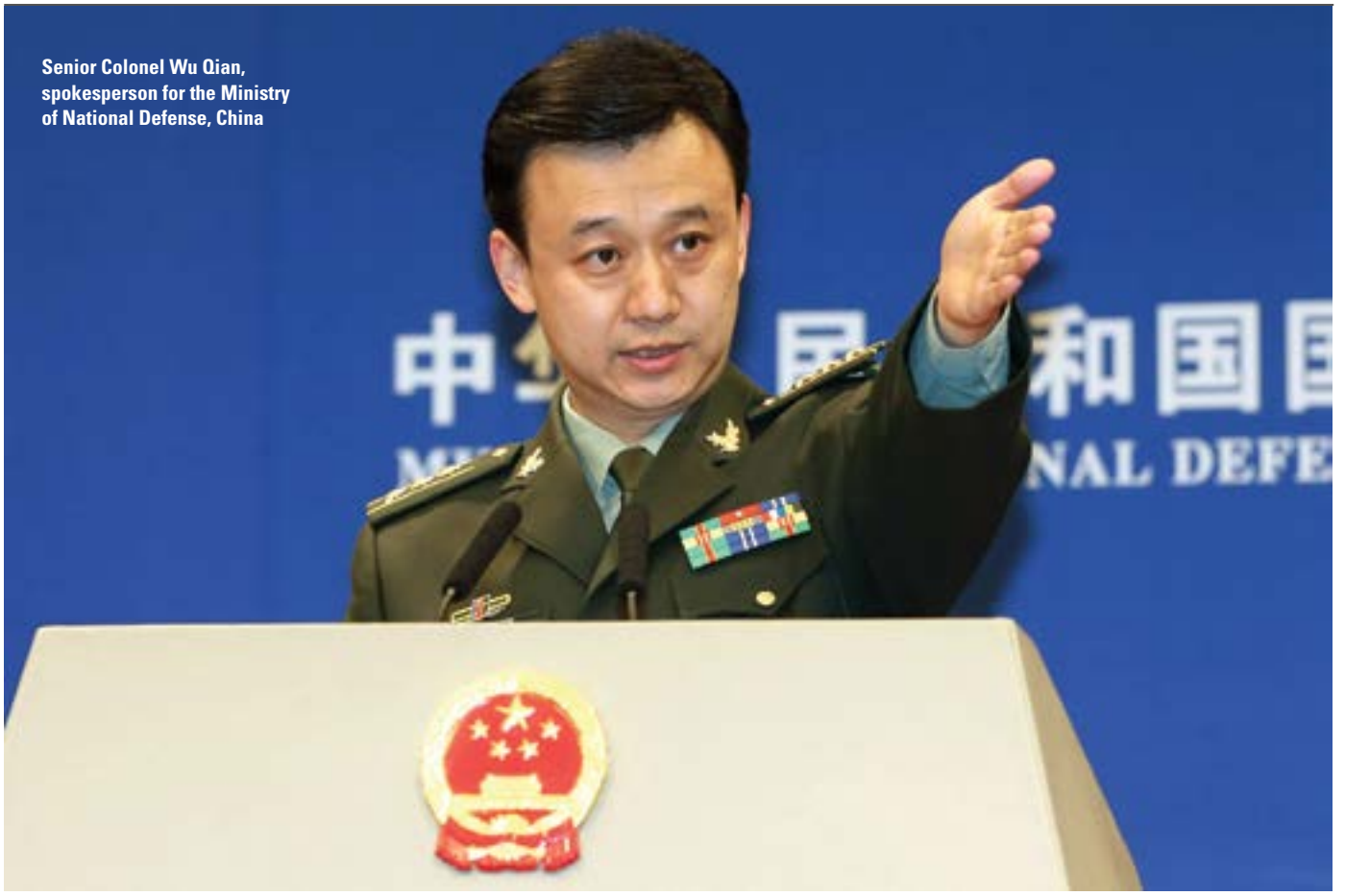
Surely there's much more than what China would want everyone to believe. The draft defence budget was not so much of a talking point as much the manner in which all of this was built as a precursor to a much grander scheme of events. The public announcement was swiftly followed up with multiple media briefings by President Xi's trusted aids, targeted more for local consumption. Take the explanation of the proposed defence budget offered by outgoing Premier Li Keqiang, Wang Chao spokesperson for the 14th NPC and Wu Qian spokesperson of PLA to their state media, all of them, without an exception narrated exactly the same story. Unsurprisingly, there wasn't any contrarian viewpoint from China as President Xi's reincarnation was just a few days away. They very well knew that the defence budget was bound to draw global attention, creating a perfect stage for showcasing China as a powerful, responsible, progressive and highly respectable country in the current world order under Xi. The carefully curated spin was to showcase Xi as an indispensable man for China now and forever. The Chinese media collectively gave a euphoric twist to the developments, it ecstatically highlighted how Xi brings experience, continuity and success when there are major global security challenges and it's the people's choice to see him continue. What can't be missed is their painful attempt to brush over each of Xi's black spots. What President Xi has given China is huge arrogance, the Covid catastrophe, economic calamity and artificial conflicts. If all these are in the interest of the people then the Chinese must have moved to another planet! Because if that's not true, then it only refers to a bunch of crass lies most common in an anarchic society where the ruler for sure can do no wrong.

FACTS & INTENTS

President Xi's unprecedented continuation has been trumpeted as if this would get China guaranteed global domination and a certain Taiwan. Only confirming to CCP's agenda for ensuring the announcement of Xi's continuation must be backed up with a rosy spectre showcasing how China is with him happily backing and celebrating the moment! Though Chinese people would know better how much they could have altered their fate. As far rest of the world is concerned, they weren't even

China is the world's second-largest defence spender after the US. The problem with China's figures is its complete lack of transparency. It doesn't want to tell how much it plans to spend on procurements of weapon systems and on defence infrastructure

ANALYSIS



Senior Colonel Wu Qian, spokesperson for the Ministry of National Defense, China

China's can't-care-less approach and its desire of getting nothing less than everything will soon see it treated like a pariah. CCP believes it can gloss over Xi's disastrous handling of affairs and it only needs to manage the narrative; it is indeed failing on both together

bothered by this charade and just no one was really losing sleep over decisions being announced in the Great Hall of People. What matters in the global account are facts & intents and on both these counts world has gone extremely disillusioned with China, and is almost on verge of losing patience. It's like an unruly child growing into wayward adulthood. China's can't-care-less approach and its desire of getting nothing less than everything will soon see it treated like a pariah without a grudge. CCP believes it can gloss over Xi's disastrous handling of affairs and it only needs to manage the narrative; it is indeed failing on both together.

Considering the past as the precedence, President Xi's third term would continue with confrontation, suppression and coercive diplomacy. Unfortunately for CCP mandarins global leadership has also gone through this learning curve. People who matter are increasingly transparent and rather forthright with their responses and likely future course they are prepared to take. CCP can surely opt for confrontation, what they cannot control is the options others would choose for themselves. This China can take as their national learning – They are well within their rights to feel smart, but they would go wrong the moment they take their adversary as dumb!

India has responded with a four-pronged strategy - it continues to push on infrastructure build-up, multilateral security arrangements, capability augmentation and indigenisation of critical technologies. In a recent brainstorming on 14th March headed by the nation's security architects, the buzzword was Whole of Nation's Approach. India looks set to accept current deployments along the China border as the new normal. It would most likely continue to keep its eyes wide open on China and will not shy away from swift responses. India has amply highlighted the responsibility for good relations is always mutual. President Xi gets full credit for taking his country downhill from an imposing identity to a questionable character in his previous two terms and if the pattern continues, as is largely expected, he will lead China into further chaos and isolation!

–The writer has varied experience in security paradigm and is a keen follower of international geopolitics. He is also the author of popular blog site (geostrat.in) on geo-strategic affairs. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

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INSIGHT

PERILS IN THE SKY

The code of regulations enumerated for the UAS may not completely eliminate the threat over Indian skies with malicious intent. However, the establishment of a testing and certification facility with structured norms for the design, production, and maintenance of UAS and its components can be a credible deterrent

By **BRIGADIER P S RAMESH**

In August 2018, two commercially available explosive-laden drones detonated near Venezuelan President Nicolas Maduro while he was delivering an outdoor speech to hundreds of soldiers. The first drone hovered over the gathering and detonated in the air. Immediately after the first explosion, the president's security crew physically protected him, preventing any damage. In a densely populated nation like India, the catastrophic consequences of such an attack on a packed cricket stadium, a political gathering, or a religious congregation is beyond imagination.

Unmanned Aircraft Systems (UAS) manifest three major threats for India. First, untested, d uncertified and unidentified UAS designs pose a high risk of accident and are therefore a serious flight safety hazard. Second, the lack of a rigorous process for testing, certifying, and identifying criteria for UAS in development or production facilitates easy access to terror elements and poses immense dangers for a densely populated country like India. Third, the deployment of UAS with malicious software or hardware in border areas has serious consequences for national security.

UAS, also known as drones or UAVs, have been primarily used by militaries around the world for several years. Over the last few years, there has been a significant surge in interest in the civil usage of UAS all over the world, and India has been no exception to the emerging trend. Therefore, UAS are poised to become an

Drone attack on Venezuelan President

integral part of the airspace, hitherto occupied solely by manned aircraft. Access to UAS should ideally have been limited to people and organisations who can be trusted to use them responsibly. However, as technology has become more accessible and people's knowledge of UAS has grown, these systems have inevitably attracted the interest of terrorist organisations and anti-social elements.

The Japanese cult Aum Shinrikyo was the first to introduce the idea of using drones for terror attacks in 1994. Investigations by the Japanese police revealed that the cult planned to use a small helicopter UAV to spray poisonous sarin gas. Since the helicopter crashed during the testing process, the terrorist group could not employ drones for the terror attack. However, it provided early insights into the innovative use of UAVs for destructive purposes. Brenton Tarrant used multiple shotguns and rifles to attack two mosques in Christchurch, New Zealand, in 2019, killing 51 people and injuring 40. Prior to the attack, Tarrant used a drone to conduct reconnaissance on the Masjid an-Nur Mosque. Hence, UAS can be used both in armed and surveillance roles by anti-social elements.

Date	Event	Application
Aug 2017	An amateur photographer landed a DJI Phantom drone on the aircraft carrier Queen Elizabeth, took photographs, and flew away undetected. The act was repeated a week later, highlighting the vulnerability of a 3-billion-pound warship against a USD 2000 drone.	Surveillance
Jan 2018	Attack on Russian military bases using GPS aided rudimentary drones. The highly sophisticated EW systems took control of six drones and landed them in a safe zone. However, three drones exploded on landing. Another seven drones were destroyed by Pantsir S1 SHORAD. Had it not been for the highly advanced and effective AD system, the low-cost elementary drones could have caused substantial damage.	Armed attack
Dec 2018	Commercially available drones used by unidentified operators disrupted Gatwick airport operations for two days. More than 1000 flights were affected, and over 1,40,000 passengers had to undergo hardships. Although these drones created only a nuisance, they exposed the vulnerability of the airport. Hence, an orchestrated terror attack with catastrophic consequences cannot be ruled out.	Surveillance
Sep 2019	For two days in a row, six small drones hovered for an hour over the Arizona nuclear power plant. This could have been a spying operation. The drones could have also been used for radiological sabotage, with horrible consequences beyond imagination.	Surveillance
Sep 2019	Around twenty low-cost Kamikaze drones went past the air defence systems and carried out precision strikes on a Saudi Aramco oil facility. The distance between the point of launch and the target was around 1000 km. The damage to fourteen tanks and three processing trains halted 5.7 million barrels of production per day. This resulted in 20 per cent spike in Brent crude price, affecting global economy.	Armed attack
Jan 2022	A drone attack claimed by Yemen's Houthi rebels triggered a fuel tank blast at a storage facility in Abu Dhabi that killed three and injured many. The Houthis have developed advanced versions of their UAVs that are capable of long-range strikes with vastly improved precision. Following the attack, the UAE government banned the use of drones by private entities for one month. Unless there is a credible defence, such attacks in the future cannot be ruled out.	Armed attack
Feb 2022	Saudi air defence systems deployed at Jizan airport reportedly intercepted and destroyed a suspected Houthi-launched weaponised drone. More than a dozen personnel sustained injuries, and transport and business operations were disrupted. Repeated attacks using crude weaponised drones by illiterate rebels are becoming a trend.	Armed attack
Mar 2022	Yemen's Houthi rebels attacked at least six Aramco sites across Saudi Arabia. Although the scale of the attack was higher, no major casualties were reported, but there was a temporary reduction in oil production.	Armed attack
Sep 2022	A rogue drone caused havoc at Husky Stadium during a game between the University of Washington and Stanford. A few days later, the game between the Seattle Seahawks and the Atlanta Falcons was reportedly halted and delayed after a drone was spotted. Sporting events, a congregation for many people, often with little to no security, can thus be potentially a soft target,	Surveillance

INSIGHT

Access to UAS should ideally have been limited to people and organisations who can be trusted to use them responsibly. However, as technology has become more accessible and people's knowledge of UAS has grown, these systems have inevitably attracted the interest of terrorist organisations and anti-social elements

Progress in technology has enabled anyone with little or no experience in aerial flying to operate an UAS. Eagerness of manufacturers, particularly from China, to gain greater market share has facilitated easy access to low-cost drones. Over the years, there has been several use, and attempted use, of UAS by terrorists and insurgent groups across the world for reconnaissance and surveillance, messaging, IED delivery, delivery of biological and chemical agents, and as a weapons platform. The utility, attractiveness, coupled with ease of access, of UAS for terrorist use are demonstrated by their use in violent acts by various terror groups like Al-Qaida, Revolutionary Armed Forces of Colombia, Fatah, Hizbollah, Lashkar e-Taiba, and Hamas. Table 1 (previous page) lists some of the major security threat incidents in recent times.

In June 2021, suspected Pakistan-based terrorists employed UAS to drop improvised explosive devices (IEDs) at an air force base in Jammu. It was perhaps the first drone attack on any defence establishment in India, adding a new threat dimension to India's security. Of late, there have been repeated attempts from Pakistan to smuggle weapons and drugs. As per media reports, the BSF intercepted 22 drones attempting to smuggle weapons and drugs across the border in 2022. Going by the current trend, by the end of 2023, BSF will have foiled a higher number of such attempts.

Indian regulations prohibit the import of foreign UAS drones in completely built up, semi-knocked down, completely knocked down form, except those required for defence, security, or R&D purposes with permission from the Directorate General of Foreign Trade (DGFT). However, the import of UAS components is permitted, and that too without elaborate permission requirements. Broadly, Indian UAS can be bracketed into four categories (see table 2).

Indian UAS industry is at a relatively nascent stage. Hence, it is compelled to rely on imports for the majority of components. As in the case of other industries, India lags in making sophisticated electronic components. Chinese UAS manufacturers enjoy a significant price advantage over foreign competitors due to generous subsidies to their high-tech sector. For the cash-strapped Indian UAS industry, Chinese components thus present an attractive proposition, both in terms of price and performance. Hence, there are many UAS in Category B and Category C. Category D UAS, designed and made in China and branded as Indian, are illegal and hazardous, and there may be few companies in this category.

Category	Design	Components
Category A	India	India, Europe, US
Category B	India	India, Europe, US, China, China proxies
Category C	India	India, China, or China proxies
Category D	China	China or China proxies

India's new UAS policy is liberal and is based on the premise of trust, self-certification, and non-intrusive monitoring. The new policy provides a much-needed incentive for the Indian UAS industry. However, there are loopholes in the policy that can be exploited for nefarious purposes. With two hostile neighbours interested in disrupting India's internal security, the use of UAS with malicious intent cannot be overlooked. UAS software and firmware not certified by reputable agencies raise serious security concerns. Bugs in electronic hardware are difficult to detect, both in terms of technology and intent. Citing a national security threat, the American Security Drone Act of 2023 prohibits the purchase of commercial off-the-shelf UAS that are manufactured or assembled in China or by any entities "subject to the influence or control" of China. Deploying UAS with Chinese-origin components along India's northern borders can have catastrophic consequences. Hence, it is important for India to have a complete ban on UAS and its components originating from China, which may also be sold through proxies in Hong Kong, Taiwan, or any other country "subject to influence or control" by China. Licence of companies presenting UAS under Category D (China-made, India-labelled) should be revoked to curb unethical and illegal practises. Providing disproportionate tax advantage to Indian made products and components will promote Aatmanirbharta and check such unethical and illegal practises.

Airworthiness certification encompasses the soundness of the design, the dependability of the manufacturing process, flying operations norms, and training modalities. While flying norms and training are reasonably well-structured in India, the same cannot be said for UAS design and production. The design, manufacture, testing, and certification of UAS in the EU and USA are governed by a code of regulations.

The Indian government's 2021 edition of military technical airworthiness requirements

documents covers the role of Centre for Military Airworthiness and Certification (CEMILAC) in a wide range of UAS development activities, including initial design, continued airworthiness, production support, and system certification. Considering the Indian security scenario, these regulations should have been implemented at the earliest and extended to civil UAS as well. However, these regulations have yet to be implemented in a streamlined manner, even for military UAS. To support a thriving Indian UAS industry, the government of India had mooted the proposal for setting up an integrated test facility for UAS in 2021. The integrated UAS testing facility had plans to include land, a hangar, an airstrip, a UAS traffic management system, radar, static (indoor) and dynamic (outdoor) testing facilities, as well as ancillary infrastructure such as an office building and utilities. But the proposal has so far remained on paper.

The potential use of drones in a terrorist incident or attack against critical infrastructure or soft targets should be cause for concern. This threat is expected to grow and evolve as UAS become more affordable. With counter-UAS (CUAS) technology in a relatively nascent state, the threat becomes even more ominous. While there are stringent security apparatuses in place for entry into crowded spaces like sports stadiums, airports, and similar places, the open skies do not have similar security systems in place. It can no longer be assumed that the skies above are free of pilotless aircraft that could cause harm in the future. Taking the necessary precautions now can help mitigate that risk.

Chinese-origin products pose an inherent security risk, particularly for the Indian military. Therefore, it is imperative that each component used in the UAS be tested and certified in a structured manner, following stringent regulations. A manned aircraft is physically piloted by a human in the cockpit. In the case of UAS, the airborne aircraft is piloted from a cockpit on the ground through an invisible medium. Hence, it is important to understand and acknowledge that UAS are 'aircraft systems' and must be treated as such. Tested and certified UAS allotted with a unique identification number serve three major purposes. (a) Prevent deployment of UAS with Chinese origin components in border areas; (b) restrict free access to UAS to terrorists or anti-social elements; and (c) avert untoward incidents by ensuring only validated and safe UAS designs are permitted to fly.

The code of regulations enumerated by CEMILAC for the UAS may not completely eliminate the threat from UAS employed over Indian skies with hostile intent. However, the establishment of a testing and certification facility with structured norms for the design, production, and maintenance of UAS and its components can be a credible deterrent. Conversely, in the absence of a testing and certification infrastructure, Indian skies appear to be a ticking timebomb.

– The writer, amongst the pioneers of UAS in India, has spent the last 20 years developing a niche specialisation in the technology. He is currently pursuing his PhD in UAS. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

The Indian government's 2021 edition of military technical airworthiness requirements documents covers the role of Centre for Military Airworthiness and Certification (CEMILAC) in a wide range of UAS development activities, including initial design, continued airworthiness, production support, and system certification

ABSOLUTE POWER

PACK ATTACK: SWARM DRONES ARE SET TO TRANSFORM WARFARE

With advances in artificial intelligence and miniaturization, masses of drones are able to work in sync and independently of human control. India has got off to an early start by acquiring these weapons that will provide the armed forces a lethal edge on the battlefield

By **RAKESH KRISHNAN SIMHA**

The Indian Army has taken a major step in the area of drone warfare by acquiring its first batch of swarming Unmanned Aerial Vehicles (UAVs). The Autonomous Surveillance and Armed Drone Swarm (A-SADS), as the Army calls it, comprises groups of autonomous drones which engage with each other using radio signals to plan and conduct attack or reconnaissance missions using advanced Artificial Intelligence algorithms with minimal or zero human interference.

Built by NewSpace Research & Technologies, A-SADS has a maximum take-off weight of between five and 30 kg, has an operational radius of 50 km, an endurance of up to three hours, and a service ceiling of 20,000 ft. The Bengaluru-based startup completed the delivery of the swarm of 100 UAVs comprising two types of UAVs – the Beluga hexacopter (with six rotors) and Nimbus Mk-III quadcopter (with four rotors) – on March 2, 2023. According to company founder Sameer Joshi, "The UAVs have applications for kinetic attack, intelligence, surveillance and reconnaissance (ISR), and as communications relays."

MACHINES WORKING AS A TEAM

So how does a swarm work and why is it such a big deal? A swarm is the simultaneous utilisation of multiple drones which communicate with each other and inform their operator of battlefield developments. They can hunt or spy in unison, making them potentially the military's first strike weapon of choice. For instance, India can position swarms at the periphery of key Pakistani

military bases; over terrorist training camps outside Lahore; and near infiltration points in Kashmir, thereby getting a bird's eye view of the battlespace. "Reconnaissance missions for these operations are currently physically conducted by small teams of soldiers acting as scouts. This not only increases the risk of casualties but also can jeopardise the entire operation," an Indian Army officer told the Times of India.

The swarm can surround a target while providing video feeds from multiple angles and piece them together to create a comprehensive picture that provides excellent situational awareness for Indian troops on the ground. If the drones are weaponised they can be targeted to take out key military commanders and terrorists, decapitating the enemy before he gets an opportunity to strike. Kamikaze drones can be smashed into enemy armour, command HQ and troop concentrations. In the short duration wars that India is likely to face in the subcontinent and the Himalayas, early intelligence and quick action can provide a huge advantage.

A 2018 report titled 'Swarm Weapons: Demonstrating a Swarm Intelligent Algorithm for Parallel Attack' by the US Department of Defense's Defense Technical Information Center explains that even basic swarming makes drones far more effective than working in an uncoordinated mass. Swarming would make attack drones at least 50 per cent more lethal while decreasing the losses they took from defensive fire by 50 per cent, and this is just the start.

Swarms will enable unique synergies. Analyst Zak Kallenborn of the Unconventional Weapons & Technology Division at University of Maryland's National Consortium for the Study of Terrorism & Responses to Terrorism says unarmed drones may collect information from the field to inform armed drones on where best to strike. Drones armed with guns, bombs and missiles would allow the drone swarm to use a combination of weapons to carry out an attack. This flexibility would allow each type of target on the ground – vehicle, bunker or personnel – to be engaged in the most efficient way.

WEAPONISING DRONES

In February 2022, the US Department of Defense launched the Autonomous Multi-Domain Adaptive Swarms-of-Swarms (AMASS) project to develop autonomous drone swarms that can be launched from sea, air and land to overwhelm enemy air defences. AMASS aims to develop the capability to launch and command thousands of autonomous drones, working together to destroy an enemy's defences including air defences, artillery pieces, missile launchers and intelligence, surveillance and reconnaissance (ISR) platforms.

Simulations done by the RAND Corporation showed that drone swarms linked by a laser "mesh" data-sharing network were decisive in ensuring a US victory in defending Taiwan against a Chinese invasion. The US drone swarms formed a decoy screen for manned aircraft such as the F-22 and F-35, extending the latter's sensor ranges through data-sharing and enabling them to maintain electronic silence upon approaching their targets.

Swarms drones are already making their impact in real wars. In the Ukraine War, Russia has demonstrated the effectiveness of drone swarms in a large-scale conventional war. By acquiring the cheap Shahed drone from Iran and configuring it to strike in swarm mode, the Russians have turned a crude drone into a game-changing precision weapon that has severely threatened Western air defence systems deployed to Ukraine.

INDIA FRONT

On Army Day in January 2021, the Indian Army offered a live demonstration of a swarm of 75 drones destroying a variety of targets in explosive kamikaze attacks for the first time. The swarm deployed three types of UAV - a quadcopter for sensing, a hexacopter mothership and the small quadcopters carrying explosives. In the demonstration, the scout drones probed the

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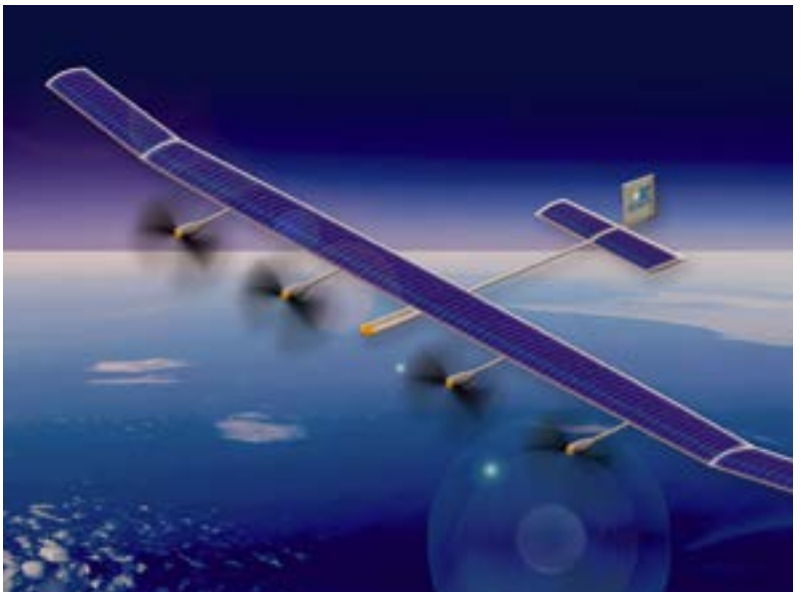

ABSOLUTE POWER

To encourage the indigenous ecosystem, India has largely prohibited the import of drones. The import of drone components is exempted for domestic drone manufacturers to incentivise and boost investments

targets, and the mothership drones then vectored the explosive-laden kamikaze units which carried out the attacks.

In February 2023, the Indian Army sent a request for proposals to local defence firms that it was looking to procure 850 domestically-built nano drones to bolster its intelligence and surveillance capabilities. While being primarily deployed to support special missions along the country's border with China, they would also be deployed for counter-terrorism and out-of-area contingency operations throughout India. And indicating that this was an urgent requirement, the proposal stated the selected vendor must deliver all 850 drones within a year of the contract signing.

According to P.K. Mahla of the Delhi-based Manohar Parrikar Institute for Defence Studies & Analyses, "A new phase of drone warfare has come, involving several actors and the usage of UAVs has progressed beyond counter-terrorism and counter-insurgency operations to full-scale conventional battles. Moreover, as technology advances and is linked to artificial intelligence, a new third era of drone warfare is on the horizon."

Mahla adds that armed drones are becoming a vital component of modern warfare, and governments are more inclined towards investing time and money to acquire or manufacture them. The military technology of the 21st century has been epitomised by drones, since they don't put pilots or ground troops in danger of being killed or kidnapped.

NEW TACTICS IN THE SWARM AGE

For India, drone warfare offers a tantalising alternative to putting its soldiers in the firing line. There are four key areas where swarm drones can be deployed for achieving dominance in the battlespace.

COUNTER-TERRORISM

Initially, this is where swarms are likely to be used first. Groups of low cost drones - in particular the miniature ones that appear like birds or insects - can be positioned on round the clock patrol at major infiltration points along the LoC in Kashmir and the Bangladesh border.

Ryan Bridley and Scott Pastor of the US-based National Intelligence University write in the Small Wars Journal that a swarm can monitor a wide area, scoop up data and quickly transmit it for analysis. This was demonstrated by the Israel Defense Forces' (IDF) conflict against Hamas in May 2021. "During the conflict, Hamas shot thousands of mortars and rockets from the Gaza Strip, while ensuring their launch locations remained largely hidden underground or in civilian establishments. The IDF responded by deploying drone swarms to observe suspected launch sites. Through their observation, the drones detected from where and when Hamas was firing, enabling the IDF to conduct strikes against those positions."

AREA DEFENCE

Area defence is defined as a defensive task that concentrates on denying the enemy access to designated terrain for a specific time. Major Sean M. Williams of the US-based School of Advanced Military Studies explains: "In this case, the swarm's search area would coincide with the unit's defence area. As threats enter the defence area, the swarm would detect threats then relay imagery and position to a human for confirmation then attack. The swarm can act in a layered defence with the swarm out further providing an outer perimeter defence. The advantage of swarm area defence is that the swarm's adaptive area reconnaissance capability combined with pulsing allows the swarm to adapt and overcome both enemy breaches and frontal attacks."

MILITARY INTELLIGENCE

In war, the primary intelligence is provided by spy satellites, high-altitude long-endurance (HALE) drones and human assets in enemy territory. However, all or many of these intelligence providers may be taken out by the adversary in a preemptive first strike. Swarm drones can not only complement the traditional methods of intelligence collection but also serve as a versatile backup. They can surge into a contested environment, seeking out both threats and targets in a search area.

PARALLEL WARFARE

Parallel warfare is the application of combat power simultaneously at the strategic, operational, and tactical levels of war to effect paralysis on the enemy's ability to function. This involves attacking multiple primary targets - the political leadership, military HQ, critical infrastructure, radars, airfields and fielded forces - simultaneously or in parallel. It can reduce the time and manpower invested in a conflict. Swarm weapons can achieve operational paralysis by simultaneously attacking the enemy's vulnerable redundancies.

A 2016 study by the Advanced Robotic Systems Engineering Laboratory of California's Naval Postgraduate School looked into a key aspect of swarms - long-range communications and survivability beyond enemy lines. Because parallel warfare would require these weapons to operate beyond the enemy frontline forces, beyond line of sight communications with the swarm would be critical. Finally, an often overlooked issue with swarm weapons is the logistical requirements of supporting swarm weapons. The Laboratory's research efforts showed that although expendable, swarm weapons have the potential to also be survivable.

INDIGENOUS PRODUCTION

To encourage the indigenous ecosystem, India has largely prohibited the import of drones. The import of drone components is exempted for domestic drone manufacturers to incentivise and boost investments. In November 2022, the Indian Army issued a requirement for 363 drones for non-combat, multi-domain operational missions which can operate at high-altitude mountainous terrain across India. In the open tender, the Army clearly outlines that the drone system must have 60% indigenous material. A drone system is basically a drone with a ground control station and other essential sub-systems for imaging and processing.

Due to its historical strengths in innovation, information technology, cost effective engineering, and high local demand, India has the ability to become a worldwide drone hub by 2030. Moreover, Indian start-ups are anticipated to contribute significantly to the indigenisation of drones.

"Numerous Indian start-ups, such as Botlab Dynamics and Alpha Design, are creating innovative native solutions powered by cutting-edge technology like edge computing and artificial intelligence. India has also developed approaches

to detect these aerial systems using various technologies such as radar, video/electro-optical (EO) and audio acoustics," says Mahla.

CONCLUSION

Swarm weapons no longer exist in the area of computer special effects. They are now being inducted into militaries around the world; they are set to make a huge impact in warfighting; and the current generation of soldiers is certainly coming up with new ways of deploying them in battle. The only questions are how soon will swarms change our concept of war, and will they replace humans on the frontlines?

– The writer is a globally cited defence analyst. His work has been published by leading think tanks, and quoted extensively in books on diplomacy, counter terrorism, warfare and economic development. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

COVER STORY

SWARM DRONES: REVOLUT

India has inducted the world's first operational high-density swarming UAV system with Indian Army taking the lead in validating the swarming UAV concepts and inducting a high density swarm drone system for operations with its armoured and mechanised forces. The Indian Army's ability to use different types of UAVs for different missions in the same swarm gives the country a global lead in cutting-edge technology that is at par with its peers across the world

By **AJIT K THAKUR**

Over time, as militaries have incorporated greater communications, training, and organisation, they have been able to fight in an increasingly sophisticated manner, leveraging more advanced doctrinal forms, with each evolution superior to the previous. Today, militaries predominantly conduct and manoeuvre warfare. Here, swarming would be the next evolution in warfare, with swarms exhibiting the decentralised nature of melee combat, along with the mobility of manoeuvre warfare. Advances in drone swarming, the next evolution of robotic warfare are mostly classified, though governments have given glimpses of their progress over the years.

Swarm drones have varied levels of autonomy and artificial intelligence. The autonomy extends its reach into well-defended battlespaces, operating with greater range and persistence than manned systems. Artificial intelligence ensures dangerous and suicidal missions, thus allowing for more daring concepts of operation (CONOPs). Both provide greater success in the face of increased threat levels and rapid penetration of contested airspace.

IONISING THE WARFARE

SWARMING UAV SYSTEM

In a major boost to India's disruptive military technology development quest, the Indian Army has started taking delivery of its first heterogeneous swarm UAV system for use on the battlefield. The swarming system was ordered under the fast-track emergency procurement (EP) route and was designed and developed by NewSpace Research & Technologies, an Indian start-up company based out of Bengaluru. This delivery for the Indian Army may possibly be the world's first operational high-density swarming If so, then India has probably taken a global lead with the induction of a cutting-edge 'Made in India' technology that is at par, if not ahead of its peers across the world. This immensely boosts the government's Aatmanirbharta in Defence effort to indigenise critical and disruptive military technologies.

DE-MYSTIFYING SWARM DRONE TAXONOMY

A swarming UAV system consists of a group of UAVs that cooperate with each other using advanced autonomy, computing, communication, and AI protocols to execute various mission objectives with minimal human intervention. Unlike the UAVs in a drone light show which do formation flying, the UAVs exhibit self-organising behaviour, collision avoidance between the UAVs, and obstacle avoidance with terrain. In a true swarm, there is no true leader and follower, with all members in a swarm having their own 'mind' able to undertake collective decision-making, adaptive formation flying, and self-healing within the swarm. The benefit of such a swarm is that if one drone drops out or a few crash, the group can rearrange or self-heal itself to continue undertaking the mission till the last UAV in the air.

The military implication of swarming is in generating 'mass' and 'saturation' effects over the battlefield in real-time. Massed attacks are very difficult to stop using conventional defences and can overwhelm the defenders to a great extent. This has only been highlighted in the high-density drone attacks on Russian forces in Ukraine and on the Saudi oilfields. Swarm UAVs offer a highly asymmetric value of return, and very significantly, drones working together and aiming for target saturation through numbers not only have a greater chance to achieve mission success but also impose a high-cost penalty on the air defence elements.

Swarm drone technology is actively being developed in several countries including the United States, United Kingdom, Turkey, Russia, Israel, and China. The recent swarming experiments conducted by the Royal Air Force's 216 Test & Evaluation Squadron and Rapid Capabilities office demonstrate that drone swarms can overwhelm enemy defences and could be deployed in a war scenario. While new technologies like AI and edge

While new technologies like AI and edge computing will drive the development of drone swarms, the key element is the swarming software, which is difficult to develop, and only a few nations have been able to demonstrate missions exhibiting de-centralised swarming algorithms, with India being one of them

COVER STORY

The Indian Army is embracing niche and disruptive technologies that will provide an edge for the forces in meeting security challenges in the years ahead, especially against powerful adversaries like China, who has publicly tested advanced swarm UAVs along with other potent class of hardware in the past

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The Indian Army has been leading the way in swarm drone experimentation for the past few years, understanding the advantages of mass drone attacks for offensive and defensive missions against technologically advanced adversaries like China. In a unique demonstration in January 2021, the Indian Army conducted a flight display of 75 drones in a swarm in New Delhi. The heterogeneous swarm consisted of different types of UAVs carrying out multiple missions concurrently, which had not been seen before in any equivalent effort across the world.

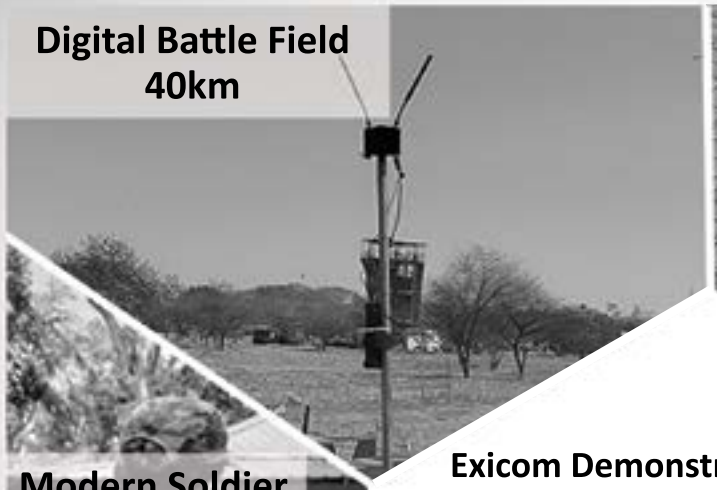
After the demonstration, swarm drone expert David Hambling commented in his Forbes article, "The 75-drone swarm shows the current state of the art, but India's goal is a 1,000-drone swarm. Swarms of small drones have the potential to overwhelm air defences, and their low cost means they can be deployed in far greater numbers than existing systems. While massed drones in spectacular light shows are all controlled centrally, in a true swarm each of the drones flies itself, following a simple set of rules to maintain formation and avoid collisions with algorithms derived from flocking birds. A 1,000-drone swarm could hit a vast number of targets. Research Affiliate Zak Kallenborn at the Unconventional Weapons and Technology Division, National Consortium for the Study of Terrorism and Responses to Terrorism (START) noted the "heterogeneous nature" of the swarm with different classes of UAVs, which differs from the emphasis on large, homogeneous swarms in national security discourse in the United States.

The Indian Army's ability to use different types of UAVs for different missions in the same swarm as a heterogeneous solution is not lost on swarm UAV experts worldwide. The Indian Army will leverage this capability of heterogeneous, de-centralised swarming developed by NewSpace in their underway induction. The Director General of Armoured Corps (DG AC) has been given the critical responsibility of inducting and operationalizing the underway delivery of swarm drones in the mechanised forces. The Ministry of Defence's Defence Acquisition Council (DAC) has allocated an additional Rs 700 crore budget to DG AC for "autonomous surveillance and armed drone swarms" to neutralise targets in-depth.

While the efficacy of swarm UAVs in the battlefield will be proven in the future, it is clear that the Indian Army is embracing niche and disruptive technologies that will provide an edge for the forces in meeting security challenges in the years ahead, especially against powerful adversaries like China, who has publicly tested advanced swarm UAVs along with other potent class of hardware in the past.

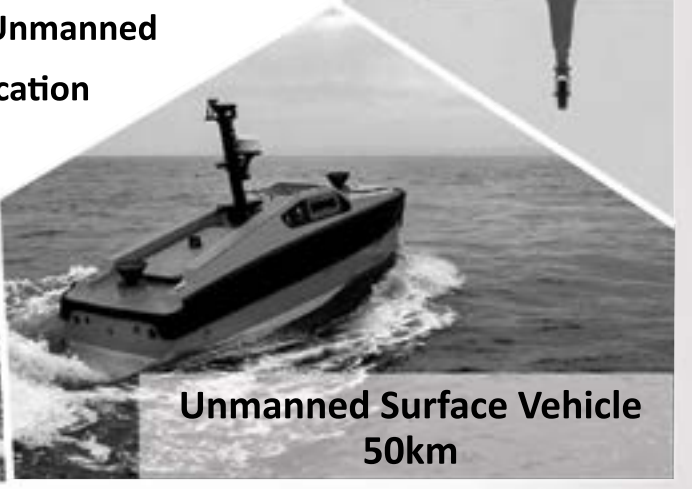
EXICOM

EXCELLENCE IN COMMUNICATION



Exicom Demonstrated it's Digital Battle Field Solution using it's Interoperable

IP Mesh Radios for Manned/Unmanned Application



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MAKE IN INDIA

GUEST COLUMN

AMIT COWSHISH

CHASING A DAUNTING TARGET

Increasing the armed forces' capacity to buy and evolving appropriate strategies to meet several challenges confronting India's self-reliance in defence production are the way forward to catapult India into the big league of defence exporters on a lasting basis

India has emerged yet again as the largest importer of arms, concurrently sliding back in exports. It exposes the vacuity of the official hype over rising levels of local manufacturing and the spurt in defence exports to more than 75 countries across the globe.

According to the report entitled Trends in International Arms Transfers, 2022, published in March 2023 by Sweden's Stockholm International Peace Research Institute (SIPRI), India accounted for 11 per cent of the global imports between 2018-22, down from its 12 per cent share in the preceding four-year block of 2013-17.

Parallelly, in an embarrassing blow to the claims of soaring defence exports from India, it does not figure anymore among the 25 largest exporters – a league it had broken into in 2015-19 with 0.2 per cent share of the global export market, which is also the highest share India managed to garner before being edged out of the league.

In 2020, the Ministry of Defence (MoD) had set the twin targets of ramping up local defence manufacturing to Rs 1,75,000 crore, and exports to Rs 35,000 crore, by the year 2024-25. These targets continue to be projected as the cornerstone of the country's quest for self-reliance in defence production, despite achieving these targets becoming tougher by the year.

Replying to a question in the Rajya Sabha on February 13, Minister of State for Defence Ajay Bhatt disclosed that the value of production by the private and public sector defence units had increased from Rs 78,820 crore in 2017-18 to Rs 94,846 crore in 2021-22. This amounts to a compound annual growth rate (CAGR) of merely 4.74 per cent.

For sure, the economic disruption caused by the Covid-19 pandemic slowed down manufacturing during this period, especially in 2019-20 when it slumped to Rs 79,071 crore, but the fact is that local production will have to grow at CAGR of approximately 16.5 per cent between 2022-23 and 2024-25 to reach the target of Rs 1,75,000 crore.

In a broad sense, MoD's strategy to achieve the aforesaid targets is built around several policy initiatives taken in the past 8-9 years and major revisions of the procurement procedures in 2016 and 2020. While all these steps were intended to promote Make in India, which also lies at the heart of Aatmanirbharta, or self-reliance, in defence, two developments stand out.

First, the policy adopted in 2016 made it mandatory to accord the highest priority to procurement of defence equipment designed and developed by the Indian companies, and the second priority to equipment manufactured locally with transfer of technology from the foreign original equipment manufacturers (OEMs). Outright import of equipment was to be the last resort.

Second, to encourage local manufacturing by the Indian industry, four 'positive indigenisation lists' have also been notified by the MoD since August 2020 to progressively ban import of 411 items which range from chaff rockets to military aircraft. The fifth list is believed to be under preparation. These lists provide a preview of the armed forces' future requirements to the Indian industry in a bid to encourage local manufacturing of the banned-for-import items.

Some other important initiatives include relaxation in the foreign direct investment norms, which currently allow investment up to 74 per cent through the automatic route and beyond that with the government nod, setting

India does not figure anymore among the 25 largest exporters – a league it had broken into in 2015-19 with 0.2% share of the global export market, which is also the highest share India managed to garner before being edged out of the league

aside 25 per cent of the R&D budget for the private sector, and earmarking a substantial portion of the capital budget – 75 per cent for the financial year 2023-24- for procurement from the local industry.

It would be legitimate to ask why, despite all these measures, local manufacturing hasn't gathered momentum. To be fair, some of the measures, like the embargo on imports, are too recent to start showing results but whether they can collectively propel local defence manufacturing to Rs 1,75,000 crore mark by 2024-25 is the moot point.

One of the many problems plaguing defence manufacturing has been the enduring inadequacy of capital outlay, which limits MoD's capacity to buy and, in turn, the industry's ability to ramp up production. Prima facie, this problem has been overcome in the budget for 2023-24, but a closer look at the fine print suggests otherwise.

According to a March 2023 report of the Standing Committee on Defence, for the year 2023-24, the Indian Army (IA) and Indian Navy (IN) have been allocated whatever they had demanded for capital expenditure, and the gap between the Indian Air Force's (IAF's) projection and budgetary allocation is a mere Rs 539.77 crore. This is creditable but it cannot be concluded that this seemingly satisfactory allocation will result in substantially higher procurement by the MoD.

For one thing, the amount demanded by the IA and IAF for 2023-24 was the lowest since 2018-19, and the IAF's demand was the lowest since 2021-22. This implies that the armed forces do not have substantially higher allocation at their disposal in 2023-24 for signing new contracts. And for another, as in the past, a large proportion of the allocated budget will undoubtedly be spent on making contractual payments against previously concluded contracts, further impacting the ability to award new contracts.

Local manufacturing can gather pace only in proportion to the increase in the armed forces' capacity to buy which remains very modest despite their budgetary requirements being met in full. In the circumstances, policy measures such as earmarking 75 per cent of the capital budget for procurement from the local industry or putting an embargo on import can contribute little to achieving the production target set for 2024-25.

Reaching the export target of Rs 35,000 crore seems to be an equally uphill, albeit not an impossible, task. Recent media reports indicate that the value of exports in 2022-23 was Rs 15,900 crore. This is more three times the exports worth a mere Rs 4,682 crore in 2017-18, but the increase has not been steady.

As a matter of fact, after a sudden jump from Rs 4,682 crore in 2017-18 to Rs 10,746 the next year, exports came down to Rs 9,116 crore and Rs 8,435 in the following two years, before jumping again to Rs 12,815 crore in 2021-22. This fluctuation, undoubtedly caused in part by the Covid-19 pandemic, makes it uncertain that the exports will jump to Rs 35,000 mark by the next year end on their own steam.

Policy measures such as earmarking 75% of the capital budget for procurement from the local industry or putting an embargo on import can contribute little to achieving the production target set for 2024-25 without increase in the armed forces' capacity to buy

There are other factors too. One, the global defence export market is dominated by just a handful of countries. Almost three fourths of the export is monopolised by the United States (40 per cent), Russia (16 per cent), France (11 per cent), and China (5.2 per cent). Most of the remaining trade is dominated by another 20 countries with their individual shares ranging from 0.2 per cent to 4.2 per cent.

India will have to break into this tightly controlled market, which is not going to be easy, not least because India does not have a wide range of major military equipment to offer. Moreover, except for the US whose exports are staggered across several countries, the other major exporters have two or three countries each which account for a major proportion of their exports. According to the latest SIPRI report, 63.2 per cent of Russia's exports in 2017-21 were to India (31 per cent), China (23 per cent) and Egypt (9.2 per cent). Likewise, India (30 per cent), Qatar (17 per cent) and Egypt (8 per cent) account for 55 per cent of France's export, while Pakistan alone accounts for 54 per cent of China's total export.

On the other hand, India had Myanmar as its biggest customer during 2017-21 with a share of 50 per cent, followed by Sri Lanka (25 per cent) and Armenia (11 per cent). Though the percentages seem formidable, these countries have limited resources and transient demand to catapult India into the big league of exporters on a lasting basis. India will need one or two major customers to sustain its exports.

All said and done, it may not be impossible to achieve the production and export targets set out for 2024-25 even in the face of several challenges, but the policy makers and strategists in the MoD have the work cut out for themselves to deal with these challenges and evolve appropriate strategies to deliver on the pledge.

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

SPACE

LEAPFROGGING INTO THE FUTURE

ISRO needs to quickly demonstrate to the global customers that the SSLV is fully capable of carrying a payload of 500 kg and putting it safely at an altitude of 500km. The organisation is also required to ensure the operaltionalisation of the proposed second spaceport at Kulasekharapatnam in Tamil Nadu, besides launching heavy satellites into geostationary orbits. This would also help them to establish capability to carry more than 10,000 kgs to LEO

By **DR AJEY LELE**

Indian Space Research Organisation (ISRO) had put in place a project in 2018 to develop a Small Satellite Launch Vehicle (SSLV) to cater to the requirement for launching 500 kg satellites to Low Earth Orbits (LEO). On Feb 10, 2023, ISRO successfully launched three small satellites powered by its SSLV-D2 launch vehicle from Satish Dhawan Space Centre at Sriharikota. Unfortunately, earlier on Aug 07, 2022, the first developmental flight of the SSLV (SSLV-D1) had failed. However, within six months, ISRO was able to identify and rectify the fault and ensure the first success for their new launch vehicle.

ISRO is a globally recognised space agency for its quality of work and successfully managing difficult space missions for a fraction of cost in comparison with other global space players. One limitation of ISRO has been that, it has not invested much towards developing different categories of launch vehicles. They have been mostly satisfied with tweaking the existing vehicles based on the mission requirements. Hence, one can see different configurations (no change in basic design) of their launch vehicles like Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV). The first flight of GSLV (Mk-2) had happened on Apr 18, 2001 and now after a gap of more than two decades, ISRO has tested a new launch vehicle. At the backdrop of this, it could be of interest to trace back the history of ISRO's launch vehicle programme.

The launch of the first sounding rocket from a small village called Thumba (in the state of Kerala) on Nov 21, 1963, could be said to have marked

the beginning of the Indian Space Programme. India begun with launching of indigenously built (initial assistance was from the US and France) sounding rockets around 1965. This programme was consolidated under the Rohini Sounding Rocket (RSR) Programme after a decade. It gave India's scientific community experience towards grasping solid propellant technology. On April 19, 1975, India launched its first satellite called Aryabhata. However, at that time India was not ready with its own launch vehicle and hence the satellite was put in space by the Soviet Union's Kosmos-3M rocket from Kapustin Yar.

The first launch vehicle developed by ISRO was SLV-3, a four-stage vehicle using all solid propellants and had a capability of placing 40 kg payload into the LEO. It had the technologically challenging and very important subsystem called the heat-shield, required to protect satellite from the aerodynamic heating. Also, for this rocket other important mechanisms like analogue autopilot, on-board event programmer, inertial altitude measurement system and telemetry, tracking and tele-command avionics were developed. The first SLV-3 launch attempt on Aug 10, 1979 had failed. However, the subsequent analysis indicated that various sub-systems of SLV-3 had functioned correctly and there were only some minor glitches responsible for the vehicle to fail. Subsequently, on July 18, 1980 a successful launch of SLV-3 took place and Rohini satellite was placed in a correct orbit. With this India became the sixth member of an exclusive club of space-faring nations.

SLV-3 was a first step by ISRO towards developing rocket launcher technology, one of the most difficult aspects of rocket technology to master. There was a realisation that having a capability of putting 40 kg payload in LEO has not much of future and there is a need to improve on the success of SLV-3. Hence, the Augmented Satellite Launch Vehicle (ASLV) Programme was designed to increase the payload capacity to 150 kg, almost thrice that of SLV-3, for LEO. Four developmental flights were undertaken under the ASLV programme. The first two developmental flights which took place, respectively on March 24, 1987 and July 13, 1988, failed. The third developmental flight, ASLV-D3 held on May 20, 1992 and the fourth on May 4, 1994, turned successful. This programme was not extended further since it was designed for a limited mandate mainly for validating various critical technologies.

The turning point came in the history of India's space programme with the arrival of PSLV, the third generation launch vehicle and the first Indian launch vehicle to be equipped with liquid stages. First mission on Sep 20, 1993 was not a success. The first success was tested during October 1994 and since then PSLV has established itself as a reliable and versatile workhorse launch vehicle of India. As of July 1, 2022 the PSLV has made 55 launches, with 52 successes, two outright failures and one partial failure. This is a four-stage rocket, with two solid and two liquid stages and has a success rate of around 95 per cent. Over the years ISRO has developed five different models of this vehicle and this vehicle, which has been mainly designed for the purposes of putting satellites weighing two tonnnes in LEO, has even been used for Moon (Chandrayaan-1) and Mars missions.

GSLV is the fourth launch vehicle developed by ISRO and is a vehicle which took maximum period for its development. The need for putting a satellite in the geostationary orbit for the purposes of communication was identified much before this vehicle became a reality. There was much emphasis put by Bhabha-Sarabhai duo during 1960s about the need for the capability to put communications satellites into the geostationary orbit. But only by April 18, 2001, ISRO was able to launch the geosynchronous satellite from the Indian soil. This vehicle can put a payload 2,250 kgto geosynchronous transfer orbit or geostationary transfer orbit (GTO) and 6,000 kg to LEO. This is a three-stage vehicle with solid, liquid and the cryogenic stages. There is a long history of India's cryogenic programme; transfer of this technology from Russia to India did not happen during 1991, owing to the pressure from the United States (US) and ISRO took many years to develop this technology indigenously.

ISRO's GSLV Mk-3 programme is about putting 4,000 kg in GTO and 8,000 kg in LEO. The first successful orbital launch of GSLV Mk-3 took place on Jun 05, 2017. This vehicle has been developed primarily for putting communication and weather satellites into geostationary orbit. This vehicle was also used for India's second mission to Moon called Chandrayaan-2. When this vehicle gets used for launching satellites in LEO, it is called as the Launch

SSLV is designed for carrying a payload of 500kg (or 300 kg to Sun synchronous orbit) in 500km planar orbit. The key features of SSLV are low cost, low turn-around time, flexibility towards housing multiple satellites and requirement of minimal launch infrastructure

SPACE

SSLV has a major commercial angle associated with it and ISRO is expected to transfer the vehicle development technology to the private sector for conducting these launches in the future

Vehicle Mk-3 (LVM-3). ISRO undertook a successful commercial launch of this vehicle by launching 36 One Web satellites into LEO on Oct 22, 2022.

This entire development process of ISRO's launch vehicle programme demonstrates that ISRO has good capabilities for launching satellites into LEO. The LMV-3 launch carried the payload of 5,796 kg to LEO, while the maximum weight carried during the GSLV Mk-3 mission was 3,850 kg (Chandrayaan-2). Modern day communications satellites normally carry a payload of six to eight tonnnes. Hence, there is a requirement for ISRO to leapfrog in the area of launching heavy satellites into geostationary orbits. This would also help them to establish capability to carry more than 10,000 kgs to LEO. ISRO is required to develop semi-cryogenic to carry more weight into the space. It needs to be noted that there is a good commercial market available for launching heavy satellites. However, it would take some more years for ISRO to fully operationalise its heavy satellite (say eight/ten-tonne category) launch programme. Possibly, hence ISRO has decided to grab the 'low hanging fruit' first. All this offers a perspective for ISRO's SSLV programme.

ISRO is expecting great future for its SSLV programme from commercial point of view. At present, there is a major global market for small satellite launches. Till recently, ISRO was using the additional weight carrying capability (when available and feasible) of PLSV rockets for commercial purposes. Over the years PSLV has allowed ISRO to launch various mini/micro/nano satellites. Now with SSLV (also with LMV-3) in place, ISRO can plan for exclusive commercial launches. Already, this vehicle has started attracting global customers. SSLV is designed for carrying a payload of 500kg (or 300 kg to Sun synchronous orbit) in 500km planar orbit. The key features of SSLV are low cost, low turn-around time, flexibility towards housing multiple satellites and requirement of minimal launch infrastructure.

At this stage, ISRO requires to push for the full operationalisation of SSLV. The first two developmental flights (one was a success) carried less than 200 kg payload. The SSLV-D1 mission had carried two satellites namely EOS 02 and AzaadiSAT. This mission had a total weight of (135 kg+ 8 kg) around 143 kg. The SSLV-D2 has successfully placed three satellites in the space namely: EOS-07, Janus-1 and AzaadiSAT-2. The total weight carried was (156.3 kg+10.2 kg+ 8.7 kg) 175.2 kg. It is likely that two more missions with this vehicle would happen during 2023. What is important for ISRO is to quickly demonstrate to the global customers that the SSLV is fully capable of carrying a payload of 500 kg and putting it safely at an altitude of 500km. ISRO is also required to ensure that the proposed second spaceport at Kulasekharapatnam in south Tamil Nadu becomes operational quickly. In future all SSLV mission are expected to happen from this launch pad.

SSLV has a major commercial angle associated with it and ISRO is expected to transfer the vehicle development technology to the private sector for conducting these launches in the future. SSLV is also a good news for the Indian armed forces, since it has got significant strategic utility too. This vehicle could be used to launch military satellites too and is expected to realise the military requirement of 'launch on demand'. Let us hope that SSLV also emerges as a reliable workhorse (or a pony!) for India's private space industry and the armed forces.

*– The writer is a Consultant with MP-IDSA, New Delhi. The views expressed are of the writer and do not necessarily reflect the views of **Raksha Anirveda***

IN CONVERSATION

WE ARE SANGUINE AND COMMITTED TO THE NATIONAL VISION OF 'AATMANIRBHARTA' IN DEFENCE

HENSOLDT is a leading provider of high-tech defence and security solutions including radar, optronics and electronic warfare products. For decades, HENSOLDT has been supporting the Indian Armed Forces through different entitites and Indian partners. In a freewheeling conversation with Raksha Anirveda, the Managing Director of HENSOLDT Private Limited, India - Andleeb Shadman discussed at length the current role and plans of HENSOLDT in India. Excerpts....

RA: Kindly provide insights into the key business areas of HENSOLDT and its footprint in India?

Andleeb: HENSOLDT is a leading company in the global defence industry with its HQ at Taufkirchen near Munich. The company develops complete sensor solutions for defence and security applications. As a technology leader, HENSOLDT drives the development of defence electronics and optronics and is continuously expanding its portfolio based on innovative approaches to data management, robotics and cyber security. With more than 6,400 employees, HENSOLDT achieved a turnover of 1.5 billion euros in 2021. Though the name HENSOLDT is new, the company has a rich heritage that dates back several decades. Over the years, Hensoldt has evolved through various mergers and acquisitions, bringing together a diverse range of expertise and capabilities.

HENSOLDT has almost two decades long history of supporting "Make in India". We have been collaborating with the Indian MoD, DPSUs and MSMEs to provide state of the art indigenous sensors for Indian platforms.

RA: How HENSOLDT is contributing to the growth of the industry in India aligned to its current focus?

Andleeb: We believe that the Indian armed force has been undergoing rapid technological transformation to meet the ever expanding need of battle field superiority. We are sanguine and committed to the national vision of 'Aatmanirbharta' in Indian Defence sector. Our business plans are built on Transfer of Technology, Local Production and Joint development based industrial collaborations.

We have gone much beyond tradional Built-to-Print (BtP) manufacturing and have offered unique & pioneering industrial collaboration model for specific products to Indian DPSUs and MSME such as

a. Transfering the design and manufacturing to India including IPRs
b. Co-development of the Products with several Indian IPRs for Indian and world market
c. Indigenous manufacturing content upto 60%

RA: What products are being offered to the Indian market by HENSOLDT?

Andleeb: We are currently maturing our industrial partnership network to offer the following indigeneous products to Indian Customers:

1. Obstacle Aviodence Systems consisting of LiDAR Sensor and Pilot assistance system for Degraded Visual Envoronment conditions
2. Self Protection Systems for Helicopters and Fixed wings consisting of MIsslie Warning System, Laser Warning System and Fully Diital Radar Warning Receiver with Artifical Intelligence inside.
3. ISR Sensors suite for MALE and Fixed Wing Mission Aircrafts consist of Mission Management Systems, Multifunction ISR/SAR Radar, ESM/ELINT system (0.5 – 40GHz), Electo-optics Systems and Datalinks (Both LoS and Multipoint). The Integrated Airborne Sensor suite is highly customizable with respect to desired CONOPS to meet various mission needs.
4. Integrated EW System for Plains, Deserts and Mountains Light Vehicle
5. 'Periscope & OMS (Optronics Mast System)' for submarines
6. Counter UAV system
7. Infantory Combat Vehicle Protection and Situational Awarensss

RA: What innovative technologies and products HENSOLDT has developed in recent years?

Andleeb: As a high-tech company with a global brand, innovation is intrinsic to HENSOLDT's DNA. Accordingly, the company has invested significantly in research and development in recent years and supports in-house innovation. Through the development of ground-breaking key technology, HENSOLDT helps to protect soldiers, security personnel and critical infrastructure. HENSOLDT's main areas of activity include intelligence and reconnaissance sensors, solutions for controlling the electromagnetic spectrum and mission avionics systems. The company combines various mission-critical sensor technologies to create package solutions that allow detection Capabilities to be substantially improved through sensor and data fusion. In this way, HENSOLDT helps to avert threats to armed forces and society. The company drives their development in its competence centres at its main sites in Germany, France, the UK and South Africa. With its proven expertise, HENSOLDT plays a substantial role in multinational future-oriented projects, such as the Future Combat Air System (FCAS), Main Ground Combat System (MGCS) and Maritime Airborne Warfare System (MAWS). HENSOLDT is also very successful at turning innovative ideas into market-ready products, such as the Xpeller counter-UAV system and the Twinvis passive radar.

RA: Tell us about HENSOLDT's collaboration and partnerships approach worldwide and in India.

Andleeb: Collaboration and partnerships are a key aspect of HENSOLDT's business strategy. The company works closely with customers, suppliers, and other organizations in the aerospace and defence sector to develop integrated solutions that meet the needs of the market. To re-iterate, HENSOLDT is fully committed to the vision of 'Make in India' and at present we are working closely with various DPSUs and Private Indian companies through collaboration and knowledge sharing.

RA: How the future of the aerospace and defence industry will evolve in the next 5-10 years? Your views and how HENSOLDT is positioning itself to take advantage of these changes?

Andleeb: The future of the aerospace and defence industry is likely to be shaped by a number of trends, including the increasing use of unmanned systems, innovative ways of spectrum dominance, increased network centricity and the growth of the commercial space industry. HENSOLDT is well-positioned to take advantage of these changes by continuing to invest in research and development, building strong partnerships, and delivering innovative solutions to its customers.

HENSOLDT has almost two decades long history of supporting "Make in India". We have been collaborating with the Indian MoD, DPSUs and MSMEs to provide state of the art indigenous sensors for Indian platforms

ANALYSIS

PROTECTING THE INDO-PACIFIC

India's upcoming deep water port in Andaman and Nicobar Islands can synchronise with a maritime defence strategy to meet China's challenge, which is increasing in the Indian Ocean Region (IOR) with Pakistan's acquiescence. A focused development-cum-defence strategy plan for the A&N Islands will also greatly enhance the country's geopolitical leverage

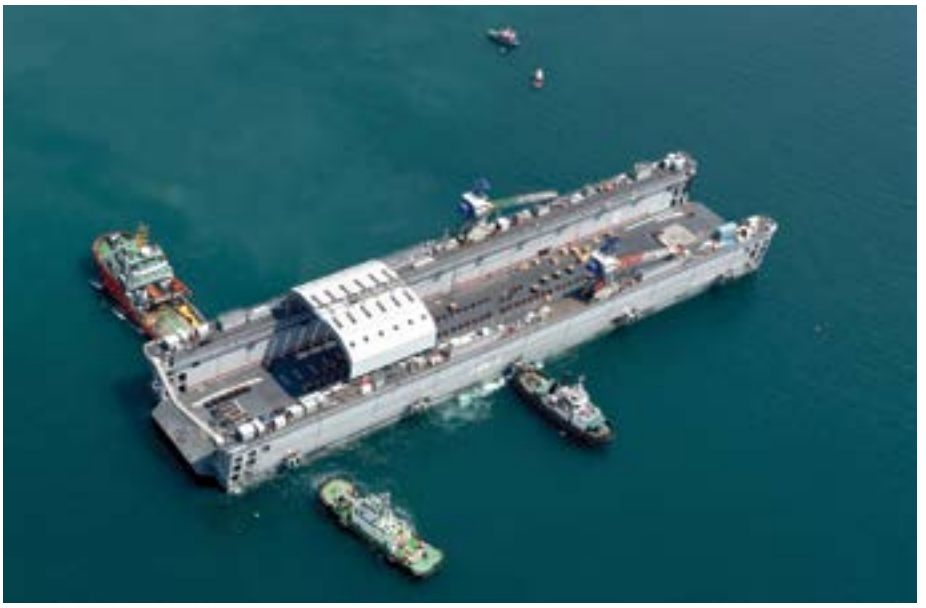
By **CMDE RANJIT B RAI**

The Indo-Pacific has emerged as the fulcrum for geopolitical rivalries, and though the US remains a formidable power, its relative attributes as a super power are declining. By analysing the effects of the Russo-Ukraine war, China is seizing the opportunity to expand its influence, particularly around India's periphery in Pakistan, Bangladesh, Sri Lanka, Bhutan and Nepal. In this backdrop, India is moving with a resolve to become stronger with a resilient economy and a strong military. With increasing imports and exports, more than ninety per cent of all Indian cargo is carried by shipping, for which India needs deep water ports. A deep water port is defined as a fixed or floating artificial structure, or a group of structures, located on the coast or within a state's seaward territorial boundaries (12 nautical miles) and used as a large port or terminal for the transportation, storage, and further handling of oil or natural gas to or from any state in large quantities.

The saying goes, 'Deeper Ports Give Rise to Deeper Pockets', and a few more metres of water in a port means large ships called Very Large Crude Carriers (VLCCs) and Very Large Container Ships (VLCs) which can berth in the state's ports, bringing in and exporting millions of dollars' worth of additional cargo. The logic is, carrying more goods in one trip means fewer total trips to ship the same amount of goods economically on the principle of economy of scale. As of December 2018, there were around 200 VLCC and VLC class ships and only around 60 ports worldwide with drafts of around 20 metres with large berths that can accommodate them. India is not one of them. Mumbai port has a draft of around 10 metres only and needs dredging and Visakhapatnam, India's deepest port has 16.5 metres, but the length of the berths and manoeuvring space is limited.

India has always needed a deep water port with large berths. With deep water, Colombo, Fujairah, Port Klang, and Singapore have become the transhipment hubs for Indian cargoes and containers that are exported and brought in by feeder's vessels; it has filled the coffers of Sri Lanka, UAE, Malaysia and Singapore. According to Ministry of Shipping data, nearly 75% of India's transhipment cargo is handled at ports outside India. No steps were taken to fulfil the urgent need because India's coast lacked deep water as India's mainland coast is continental. Only the Andaman's has deep water. Building a large Greenfield port is capital-intensive, and FDI is prohibited in the A&N region. The pennies have now dropped under the stewardship of Prime Minister Narendra Modi, and India will have a deep water hub in Great Nicobar. The project is being implemented by the Andaman and Nicobar Islands Integrated Development Corporation (ANIDCO), and includes a transhipment port, an airport, a power plant, and a Greenfield township.

The build-up of the Andaman and Nicobar Islands began with the basic digital needs in August 2020 when the Prime Minister launched and dedicated to the nation the submarine Optical Fibre Cable (OFC) connecting Andaman & Nicobar Islands to the mainland. The connectivity has



boosted the opportunities in the Andaman & Nicobar Islands by promoting ease of business, e-commerce, swifter banking, telemedicine, and education and simplifying maritime logistics and the quality of life and tourism. The 2,300 km submarine cable was completed before the set target date to service the many scattered islands from Chennai to Port Blair as the hub, Port Blair to Little Andaman, Swaraj Dweep (Havelock), Long Island, Rangat, Little Andaman, Kamorta, Car Nicobar and Great Nicobar. It has also strengthened the security of the islands.

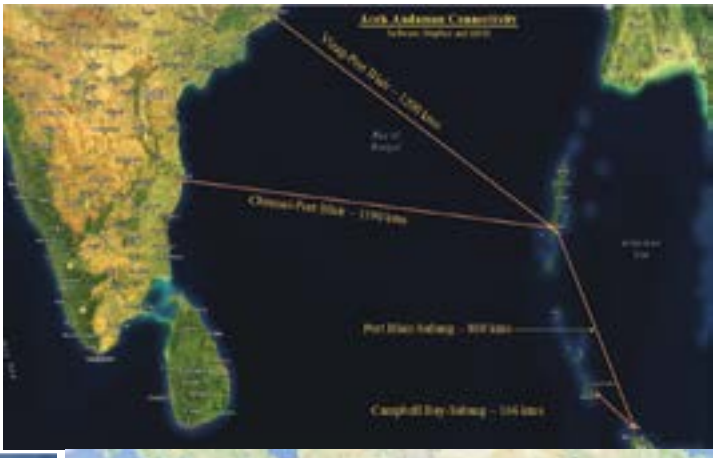
In January 2023, Government announced that the Galathea Bay of the Great Nicobar Island is the proposed site for India's transhipment hub for VLCCs and VLCs with a depth of around 18 to 20 m to handle large ships. The bay's floor is rocky and may not need dredging. The mega International Container Transhipment Port (ICTP) has called for bids to develop and construct the Rs 41,000 crore harbour and the additional trans-shipment port in Great Nicobar. PM Modi said this would enable big ships to berth and increase India's share in maritime trade and employment opportunities. India's economy with fisheries, aquaculture and sea-weed farming on the island is set to accelerate in commensurate with the modern infrastructure being developed in Andaman and Nicobar, not only with new facilities but also as a prominent place on the world's tourist map with cruise ships. Plans for a special economic zone (SEZ), fuel tanks, and a refinery could follow to make Galathea Bay a bunkering port and wean away bunkering revenue from Singapore. India has a large refinery capacity and is exporting refined petro-products. Article 243 of the Constitution mandates protection of the indigenous population of the Andaman's, which is currently diminishing from a high of approximately 700. The Government has assured displacement of tribes people will not be allowed to make room for the Great Nicobar project.

INDIA'S MARITIME SECURITY WILL ALSO GET A LEG UP

The A&N Islands provide India with a commanding presence in the Bay of Bengal to further the PM's 'Act East' policy with access to Southeast Asia and ASEAN. The Nicobar group of islands are strategically close to the northern entrance to the Malacca Straits and India is assisting Malaysia in upgrading the port of Sabang in Aceh as a deep water port, 200 km from Great Nicobar and shipping has to transit the area. The Andaman's with secure islands are ideal for missile batteries, and the coves can be used to berth warships with pens for submarines. The Navy has a naval air station INS Baaz near Cambell Bay, the Indira Point Lighthouse is the southernmost point of India and the Indian Air Force has an airbase at Car Nicobar. The Air Force and Army can expand their components in the Joint Andaman and Nicobar Command with planes and an amphibious division, up from a brigade. The Navy conducts an amphibious Exercise called AMPHEX annually. All Chiefs of Naval Staff have opined

India's economy with fisheries, aquaculture and sea-weed farming on the island is set to accelerate in commensurate with the modern infrastructure being developed in Andaman and Nicobar, not only with new facilities but also as a prominent place on the world's tourist map with cruise ships

ANALYSIS



The Nicobar group of islands are strategically close to the northern entrance to the Malacca Straits and India is assisting Malaysia in upgrading the port of Sabang in Aceh as a deep water port, 200 km from Great Nicobar and shipping has to transit the area

that the Andaman's development can co-exist with a maritime defence strategy for India to meet China's maritime military challenge, which is increasing in the Indian Ocean Region (IOR) with Pakistan's acquiescence to the Gwadar port that China constructed, and the China-Pakistan Economic Corridor (CPEC). PLA (Navy) has a base with a jetty it has built at Djibouti; it is getting ready to receive aircraft carriers.

The Indian Navy regularly exercises in the East with major navies, and invites the four Quadrilateral (QUAD) and friendly navies to a bi-annual Exercise Milan at Port Blair to foster maritime friendships. Post Covid-19 a de-coupling from China has led to enthusiasm by the QUAD of India, USA, Japan and Australia to act like a four-power defence arrangement, not an alliance per se, like the Five Power Defence Arrangement (FPDA), which worked for Singapore, Malaysia, UK, Australia and New Zealand in the East in the Cold War. Like the FPDA, the QUAD can share hard Intelligence and exercise inter-operability through exercises like Malabar and share a vision not to be bullied by China in the South China Sea and jointly enforce free and open navigation.

A focused development cum defence strategy plan for the A&N Islands will also greatly enhance the country's geopolitical leverage by opening up the islands with operational turnarounds (OTA) to friendly navies of the US, Japan, Australia, and France, which is a riparian Indian Ocean state and UK and ASEAN among others, to promote greater naval cooperation and generate economy. A&N is a Union Territory, and PMO or Niti Ayog can directly monitor the progress. A&N's development will enhance the country's geopolitical leverage, and the Indian Navy looks forward to it. The US withdrawal as a 'cheerleader'' and driver of globalisation has been the most critical change in the last 20 years as an aggressive China has risen. The world looks to India as a fulcrum in the Indo-Pacific. The Indian Navy has a lead role to play.

–The writer is former DNO and DNI and writes and broadcasts on military affairs, and is Curator of New Delhi's only Maritime Museum at C-443 Defence Colony. His latest book -The Indian Navy@75.ISBN 9-789381-72336 is available on Amazon. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

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18th - 21st January 2024
Begumpet Airport, Hyderabad, India

In pursuance of the Hon'ble Prime Minister's vision to fulfil the common man's aspirations of flying and the grand success of the previous edition, Ministry of Civil Aviation (MoCA), Government of India, Airport Authority of India (AAI) and Federation of Indian Chambers of Commerce and Industry (FICCI) are organizing the next edition of **'WINGS INDIA 2024'**, a flagship event on Civil Aviation sector in this part of the world. The event is scheduled from 18th to 21st, January 2024, at Begumpet Airport, Hyderabad, India.

Wings India 2024 will be the most comprehensive event on the Civil Aviation Industry calendar that includes the Inaugural Ceremony, Global Ministerial Conference, Global CEOs' Forum, B2B / B2G Meetings and Awards Ceremony, Cultural Evening & Business Networking Dinner. Also, the event includes Exhibition, Chalets, Demonstration flights, Static Display, Media Conferences, One-to-One Business Meetings and many more.

Event Format

- EXHIBITION
- CONFERENCE
- CHALETS
- CEOs FORUM
- STATIC DISPLAY
- MEDIA CONFERENCES
- AWARDS

Exhibitors Profile

AIRCRAFT & HELICOPTER MANUFACTURERS	AIRCRAFT INTERIORS	AIRCRAFT MACHINERY & EQUIPMENT COMPANIES
AIRLINES, AIRLINE SERVICES & CARGO	MRO	SPACE & DRONES INDUSTRY
AIRPORT INFRASTRUCTURE	AIRCRAFT ENGINE MANUFACTURERS	SKILL DEVELOPMENT

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BUSINESS INITIATIVE

CAMCOPTER® S-100: A MATURE, PROVEN VTOL SOLUTION FOR INDIAN ARMED FORCES

As the only tactical VTOL UAS in its class with extensive operational experience, the CAMCOPTER® S-100 is in use with a number of Navies and Armies. S-100's mature and proven capability makes it most suitable to meet Indian Armed Forces' varied requirements

By **EDITORIAL DESK**

After monitoring the Indian market for many years and witnessing the extensive growth in its UAS requirements – both military and commercial, Schiebel made its foray in 2020 into India with eyes all set to tap a significant share in billion opportunities that the Indian market offers. It partnered with a well-established manufacturer with a strategy to meet the 'Made in India' mandate. This partnership will manufacture the CAMCOPTER® S-100 along with its payloads under the Buy (India) category with up to 60% indigenisation content.

The endeavour would be to create the necessary skills for integration and testing in India such that a robust eco-system is created which can sustain the platform for 15 years and above based on the technology obsolescence. With the opening of its local office (Schiebel India) and setting up production facility with VEM Technologies, Schiebel has ensured that future customer needs are met effectively and efficiently with focus on long-term business in the Indian subcontinent.

Schiebel's business strategy in India is to support and grow with the Indian industry by creating jobs and developing technology while offering the best Vertical Takeoff and Landing (VTOL) UAS available in the global market. As part of its growth strategy in India, Schiebel has continuously been on the lookout for expanding

CAMCOPTER® S-300

- Maximum payload capacity of around 250 kg along with maximum endurance of about 20 hours with a light payload. The CAMCOPTER® S-300 a larger version of the S-100 has given a new twist to the UAV competition in the naval domain and filled a big gap in the heavy-lift-capable unmanned air system (UAS) market.
- CAMCOPTER® S-300 UAS is 4.8 meters long, 1.9 meter high, 0.9 meter wide and can fly at a maximum speed of 120 knots (cruising speed 55 knots). The S-300 is able to carry up to 340 kg (fuel including) and its maximum take-off weight can reach 660 kg.
- The S-300 can also fly up to 24 hours (4 hours with 250 kg) with a 50 kg payload — three times more than what the S-100 can carry. This is essentially what is different between S-300 and S-100.
- A triple-blade folding rotor system allows the storage of S-300 UAV in a standard 20-foot container in the ground control station (GCS).
- In the long run, due to its payload-carrying capacity and endurance, the S-300 is expected to make a big difference as an unmanned asset for high-altitude regions and change the current geopolitical situation.

and strengthening its network.

Schiebel has exhibited at Aero India 2021, DefExpo 2022 and recently, it showcased the full scale model of CAMCOPTER® S-100 at Aero India 2023 and generated a lot of interest among potential military customers. Schiebel's participation in these exhibitions provided it with a holistic picture of the unmanned landscape in India and how it is set to grow in the next decade and be part of India's growth story.

Currently, Schiebel India is in negotiations with Indian Navy for its Naval Ship-borne Unmanned Aerial System (NSUAS) Fast Track Programme that will deliver Intelligence, Surveillance and Reconnaissance (ISR) capability at sea. There is also the emerging need for Manned Unmanned Teaming (MUM-T) – combining for example the capabilities of the manned MH-60Rs with the unmanned S-100.

In addition, the company is looking forward to work with the Indian Coastguard for ISR and search and rescue roles, and the Army primarily for load lifting- as well as Indian companies who are looking to utilise UAS in the oil and gas sector.

Operating globally now, Schiebel focuses on the development, design and production of the CAMCOPTER® S-100 Unmanned Air System (UAS) and its reputation as a reliable producer of the high-tech military, commercial and humanitarian products, backed by exceptional after-sales service and support is well established.

According to Schiebel India CEO - Jajati Mohanty, the unique requirements of the Indian

"The S-100 provides the best option to the Indian Navy, where the weather is unpredictable and an autonomous VTOL UAS is the ideal solution to meet the tactical ISR requirements. The range and endurance of the CAMCOPTER® S-100 provides a dedicated "eye in the sky" for meeting the needs of the Army, Navy, Air Force and the Coast Guard"

-Jajati Mohanty – CEO, Schiebel India

BUSINESS INITIATIVE

CAMCOPTER® S-100

- S-100 with several hundred thousand flight hours under its belt is the only established and operationally proven UAV of its class with Anti-Submarine Warfare (ASW), and Intelligence, Surveillance and Reconnaissance (ISR) capabilities.
- S-100 a Vertical Takeoff and Landing (VTOL) is capable of transmitting high-definition payload imagery to the control station in real-time and does not require a prepared area or support equipment for launch and recovery.
- The UAS can operate anytime in day or night, under adverse weather conditions, even beyond the line-of-sight up to 200 km (108 nm) over land and sea. It can carry a 34-kg payload for up to 10 hours using AVGas or JP-5 heavy fuel.
- The S-100 can successfully operate in environments where GPS is not available, with missions planned and controlled using a simple point-and-click user interface. Its carbon fibre and titanium fuselage provide capacity for a wide range of payload/endurance combinations up to a service ceiling of 5,500 m / 18,000 ft. The high-tech unmanned helicopter is backed by Schiebel's excellent customer support and training services.
- S-100 ideally suited to automatically detect and identify even small objects during integrated intelligence, surveillance, reconnaissance (ISR) operations and Search and Rescue (SAR) missions at sea in different weather conditions.
- S -100 200 kg class VTOL UAS is the perfect solution for small ships. The Schiebel VTOL has flown over 100,000 hours and is currently being operated from more than 30 different naval platforms on five continents.

Soon after successfully showcasing CAMCOPTER® S-100's impressive capabilities in NATO's REPMUS (Robotic Experimentation and Prototyping using Maritime Uncrewed Systems) exercise in Portugal sponsored by the Royal UK Navy, Schiebel recently won the UK Ministry of Defence contract "Peregrine" along with Thales. Under the contract, Schiebel will deliver the unrivalled CAMCOPTER® S-100 UAS, fitted with a powerful naval surveillance sensor suite, to provide a comprehensive maritime capability protecting Royal Navy ships on operational tasks. Schiebel and system integrator Thales, will provide the operationally proven S-100 with a range of high precision Intelligence, Surveillance and Reconnaissance (ISR) sensors and systems.

The CAMCOPTER® S-100's rapid launch ability, superior mission endurance and high quality sensors combine to find, track and identify targets providing additional protection for the ship and its crew. High-definition imagery and radar data downloaded to the system operator and transmitted in real-time into the ship's Combat Management System (CMS), provides the crew with invaluable time to prepare and enact operational decisions.

Armed Forces are defined by the types of terrain and the kind of weather, which the military has to face at high seas and its borders. The S-100 provides the best option to the Indian Navy, where the weather is unpredictable and an autonomous VTOL UAS is the ideal solution to meet the tactical ISR requirements. The range and endurance of the CAMCOPTER® S-100 provides a dedicated "eye in the sky" for meeting the needs of the Army, Navy, Air Force and the Coast Guard. In addition, the Manned Unmanned-Teaming (MUM-T) opens a plethora of usage options for both the tactical ISR as well as Search and Rescue.

Elaborating further, Mohanty says that Schiebel operates across the globe and has been active in Asia for a number of years with a strong customer base. The company has strengthened its focus on the Indian market and with the CAMCOPTER® S-100, a mature and proven Vertical Take-off and Landing (VTOL) solution, we believe we have a very strong offering for the Indian Navy that meets all their requirements.

The S-100 is a multi-role, multi-domain UAS, which caters to the specialised needs of navies, armies and air forces alike. The payload-agnostic unmanned aircraft allows customers to add a robust and value for money "eye in the sky" to their existing capabilities, allowing for the provision of Intelligence, Surveillance and Intelligence (ISR), search and rescue, environmental protection, vessel detection, cargo delivery and more.

Today as a market leader in rotary UAS, Schiebel has gained extensive experience around the world over the last 20 years and delivered several hundred UAVs to customers globally. Understanding the needs of its customer on priority basis, Schiebel has been investing 20 per cent of its annual revenue into Research and Development. The CAMCOPTER® S-100 is continuously being developed using state-of-the-art materials and technology taking into account the customers experiences and their feedback.

The CAMCOPTER® S-100 has achieved several hundred thousand flight hours in all climatic conditions and is currently being operated by 14 navies worldwide and used in demanding conditions in more than forty classes of ships, patrol vessels and helicopter carriers. Having built an international reputation for producing high-tech military, commercial and humanitarian products over the years, the company publicly presented CAMCOPTER® S-300 – a bigger version of S-100 for the first time at Euronaval in Paris, in October 2022.

GREECE STANDING ON THE SPOTLIGHT OF GEOPOLITICAL DEVELOPMENTS – 350 EXHIBITORS FROM 27 COUNTRIES WILL ATTEND DEFEA 2023

Athens. The upgraded role of Greece in the geopolitical forefront of the Eastern Mediterranean and the Balkans, as well as the "rebirth" of the Hellenic defence industry, will be a main focal of the international defence and security exhibition DEFEA – Defence Exhibition Athens 2023, which will take place from May 9 to May 11, in Athens Metropolitan Expo. The participation of numerous diplomatic missions and 350 leading defence companies from 27 countries confirm that Greece is a point of reference for the region of Southeast Europe and the Eastern Mediterranean.

Armenia, Austria, France, Germany, the United Arab Emirates, the United States of America, India, Israel, Italy, China, Cyprus, the Netherlands, Portugal, Slovakia and the Czech Republic will participate with national stands, as well as the European Commission with the Directorate-General for Defence Industry and Space. Independent entries include Belgium, Switzerland, Poland, Spain and Sweden. Hellenic Ministry of National Defence and Hellenic National Defence General Staff will participate with their own stands.

At the forefront, geopolitical, economic and technological developments from the United States to China and from Russia to Iran, as well as the role of NATO, Europe and Greece in the constantly evolving landscape of security threats and challenges, will be a main focal and talking point among political, academic and military participants of DEFEA. Within the framework of DEFEA, many national delegations, defence ministers and deputy ministers and Chiefs of Staff are expected to visit Greece. The participation of high-ranking political and military officials coincides with the official launch of Greece's campaign for election as a non-permanent member of the United Nations Security Council for 2025-26 period, which aims to expand Greece's geopolitical footprint on the international stage.

The fact that Greece is organising one of the most important international defence and security exhibitions, at a time of tectonic changes that reshape the future, confirms Greece's role a pillar of security and stability as well as a regional power. Emphasising on Hellenic defence industry, the framework of DEFEA was the subject of a detailed presentation to Defence Attaches and the diplomatic officials of foreign countries in a meeting held by the Hellenic Ministry of National Defence, while a working meeting took place with the executives of the exhibition organizers, ROTA SA. Deputy Minister of National Defence, Nikolaos Hardalias conveyed the message that the country needs a robust defence industry that will serve as a catalyst for achieving strategic autonomy. Extroversion is still a main goal for Greek companies which are exploring new markets and participating in defence exhibitions worldwide.

Last week, a working meeting led by the Deputy Minister of National Defence Nikolaos Hardalias with executives of the exhibition organisation company ROTA SA took place at the Ministry of National Defence. The meeting was attended by the Chairman of the Board, ROTA SA Georgios Tsausoglou, the CEO Alexis Lagoudakis and the Director of the "DEFEA 2023" Exhibition Vassilios Barkas, the Directors of the Executive Office Eleni Bobou and of the Military Office Captain Georgios Zouros HN, as well as competent Staff of the Office of the Deputy Minister of National Defence.

In the meeting organisational actions and action planning were discussed regarding the holding of the second DEFEA. The Ministry of National Defence and the Hellenic National Defense General Staff (HNDGS) will have their own stands. In 2021, the organisation of the first DEFEA was particularly successful, with the participation of 315 exhibitors from 22 countries and the presence of 45 official national delegations, at a particularly high political and military level. This year the expectations are even higher. With the cooperation of the Association of Hellenic Manufacturers of Defence Material (SEKPY), which represents over 150 certified Greek companies active in the field of Defence, and the valuable patronage and assistance of the Ministry of Defence, DEFEA will once again present an exhibition worthy of the history of defence exhibitions of the country and the importance of its geopolitical position. Strengthening the Hellenic defence industry is a strategic goal of Hellenic government as Greece is investing in upgrading its defence capabilities. With exhibitors coming from more than 27 countries and delegation from at least 55 countries, DEFEA is a hub for cooperation among the hundreds of representatives of the Greek and international defence community and the leaders of the global industry.

BY INVITATION

CIVIL-DEFENCE CONVERGENCE STRENGTHENING INDIA'S DEFENCE

To strengthen our defence forces and complement the Make-in-India campaign with Maintain-in-India strategy – the civil-defence convergence could lead to a win-win scenario for India

By **D ANAND BHASKAR**

Unlike developed markets, the aviation sector's Maintenance, Repair and Overhaul (MRO) industry in India, has evolved in silos – military and civil. Given that the security of our nation took precedence during the country's formative independent years, most aviation platforms inducted in the country were primarily secured off the shelf, for defence purposes, via organizations such as Hindustan Aeronautics Ltd (HAL), that were tasked with ensuring the nation's safety security by having a presence across the entire aviation value chain - from development or transfer-of-technology (ToT) for diverse platforms, to their local assembly or production and even their aftermarket requirements. This was supported by the creation of a proprietary and pan-India network of Maintenance Depots (called Base Repair Depots or BRDs) to undertake heavy maintenance of military assets. Together, HAL and the BRDs have been the historical 'national backbone' of India's military aviation's engineering & maintenance ecosystem.

The above mentioned robust, primarily defence-driven maintenance infrastructure however, contrasts sharply with the country's maintenance capabilities for civil aviation that grew rather slowly. Only in the 1990s, as Indian civil aviation began to gather momentum (driven by commercial airlines), an associated indigenous MRO ecosystem began to take shape.

Today, the country's Civil Aviation has become a signature of the nation's growth ambition against the backdrop of an anticipated addition of over 2000+ aircraft by the next decade, making India the world's 3rd largest civil aviation market - behind the USA and China. This fleet enhancement possesses the potential to deliver extensive benefits for Civil MROs, making India, an aviation as well as a MRO Hub.

Unfortunately, the insulated or siloed development of India's Civil and Military ecosystems with their corresponding policies, regulations, engineering & maintenance infrastructure, and manpower, has created a 'Berlin Wall' where despite the presence of extensive civil MRO capabilities, there is little or almost no sharing of expertise, learning's, technology, or even manpower between civil and defence enterprises, despite increasing synergies between aviation platforms.

For a nation like ours, this causes needless duplication of infrastructure, capabilities as well as time – luxuries that we as a nation can ill afford, to do justice to the Hon'ble PM's clarion call for Atmanirbharta. Moreover, such isolated development is in stark contrast and completely contrary to the way the global MRO industry has developed - where engineering and MRO services are equally equipped and permitted to collectively address both civil and military requirements.

INDIGENIZATION FOR NATIONAL DEFENCE – A MUST!

Given the current geo-political scenario including our relations with our close neighbours – we cannot de-

prioritise our defence readiness. In fact, our security requirements will only expand and evolve with time, putting further pressure on our budget and, on the exchequer.

Notwithstanding the above, deliveries of planned and indigenous modernisation programmes have repeatedly fallen short of expectations. This has had far-reaching implications making India increasingly dependent on aviation and aerospace capabilities bought in from the West at exorbitant costs, creating a complicated and multi-generation mix of technologies and platforms that has meant a continuous dependence on Western suppliers for dedicated aftermarket support.

With emerging aviation platforms and technologies being increasingly complex, intelligent and prohibitively costly, indigenous MROs become duty-bound to find and create ways to explore synergies to create strong aftermarket capabilities for the country's benefit, stretching every dollar (or rupee) of investment including extension-of-life measures for the current platforms, regardless of whether they are transport-led (AN32/ Chetak/ Cheetah) or mission-critical ones such as P-8Is,

"Committed to the nation and to aviation for over 70 years, Air Works began indigenous civil-defence convergence more than a decade ago for undertaking maintenance of Boeing Business Jets (Heads of State programme) in partnership with the OEM and the IAF. In another development, Air Works also completed Phase 32 checks for Indian Navy's P-8I ASW aircraft indigenously – a country first. As India's biggest independent MRO and an Embraer defence ASF for the region, Air Works is already maintaining ERJs on behalf of the IAF and the BSF, in India, helping expand capabilities, reduce TAT as well as forex"

D Anand Bhaskar, Managing Director & CEO

MiGs, Mirages or Sukhois. As is the case, significant synergies in design for certain platforms already exist for their use in civil and military operations. This includes platforms such as BBJ (Boeing Business Jets), ASW platforms such as P-8I (based on B737), Dornier 228, ERJ-135/145 (Legacy 650) and A320s being currently adapted for AWACs use etc. Interestingly, training capacities, spares and components required in civil and defence sectors are also quite similar.

CIVIL-DEFENCE CONVERGENCE

Taking cognisance of global MRO developments, India's needs and having witnessed the role and capabilities of Civil MROs in driving the Indian aviation and the economy during the pandemic, the GoI announced its plan to promote Civil-Defence

BY INVITATION

The insulated or siloed development of India's Civil and Military ecosystems with their corresponding policies, regulations, engineering and maintenance infrastructure, and manpower, has created a dichotomy

convergence in 2020. The move was meant to break the Berlin Wall or siloed mindset of the sector and foster enhanced coordination and speed in terms of development, by getting the industry to eventually begin both thinking as well as operating on a global, integrated footing, driven by the singular vision of self-reliance.

With life cycle cost of any platform being 2-3 times of the development cost, defence MRO offers a burgeoning market. Integrating Civil MROs to partner and share the growing load of the Defence aftermarket ecosystem brings in several advantages for the nation, some of which include:

1. Boosts transparency and partnership (on the lines of public-private partnership in aviation and other sectors)
2. Creates new or strengthens indigenous defence engineering and maintenance capabilities via larger participation.
3. Promote and strengthens cross-industry cooperation and collaboration for synergies, leading to efficiencies.
4. De-risks defence preparedness in an event where the sole maintenance provider, say HAL, isn't able to deliver.
5. Creates economies of scale and generate large-scale employment, stimulating economic development.
6. Spurs competition, leading to better and efficient delivery of defence services, for better quality output at an optimised cost.
7. Expands the market and facilitates optimum resource utilisation, avoiding needless duplication, wastage and maximising infrastructure utilisation.
8. Assists customers (defence as well as airlines) to save costs (fuel and logistics), conserving precious foreign exchange.
9. Reduces industry's skill shortage by opening-up a currently inaccessible talent pool (defence manpower)
10. Export of MRO services to other countries in the region - having similar defence platforms

Committed to the nation and to aviation for over 70 years, Air Works began indigenous civil-defence convergence more than a decade ago for undertaking maintenance of Boeing Business Jets (Heads of State programme) in partnership with the OEM and the IAF. In another development, Air Works also completed Phase 32 checks for Indian Navy's P-8I ASW aircraft indigenously – a country first. As India's biggest independent MRO and an Embraer defence ASF for the region, Air Works is already maintaining ERJs on behalf of the IAF and the BSF, in India, helping expand capabilities, reduce TAT as well as forex.

Challenges however remain, especially in areas of training and availability of skilled manpower, a liberal taxation regime for inventory management and logistics, as well as a simplified, indigenous regulatory framework (DGAQA and DGCA). Especially in terms of manpower, it may be prudent to note that a leading US MRO has nearly 20% ex-servicemen as its employees – a far cry from what Indian MROs can or are allowed to. While a beginning is indeed being made with civil-defence convergence, we must ask ourselves, if it will be a missed opportunity for us?

With the country invested in developing, manufacturing and deploying emerging platforms, Civil MROs such as Air Works and others, are ideal to strengthen the hands of the Indian defence forces and help the country maintain its strategic deterrence. They are equipped to provide a wide variety of maintenance support across airframes and components, speeding up turnaround and offering more competitive solutions to our defence forces, complementing Make-in-India with Maintain-in-India – and creating an integrated sector for civil as well as defence platforms, heralding a win-win for the country.

–The writer is Managing Director & CEO, Air Works Group. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

GODREJ AEROSPACE CONTRIBUTES TO ISRO'S HEAVIEST ROCKET LVM3

Mumbai. Godrej Aerospace, a business unit of Godrej & Boyce, the flagship company of the Godrej Group, has contributed to the LVM3 (Launch Vehicle Mark III), ISRO's heaviest launcher till date. For this mission, the L110 engine for the core stage and the CE20 engine thrust chamber for the upper stage have been made by Godrej Aerospace. With a steadfast dedication to indigenous manufacturing for India's space endeavours, Godrej Aerospace has contributed to all PSLV and GSLV launches in the country and has delivered over 175 engines and other critical equipment till date. With the government's new policy initiatives to empower 'Aatmanirbhar Bharat', new opportunities for partnerships in domestic programs have been created for private players in the Indian Space industry. Godrej Aerospace has invested Rs 250 crores to build a new facility at Khalapur in Maharashtra to propel India's technological prowess in the Space domain on a global stage. Godrej Aerospace's long-standing partnership with ISRO has paved the way for the development of advanced launch vehicle subsystems, liquid propulsion engines for PSLV and GSLV rockets, satellite thrusters, and antenna systems. Godrej Aerospace has a state-of-the-art manufacturing facility in Mumbai that is equipped to produce a wide range of indigenous aerospace components and systems. The advanced facility has been instrumental in these efforts and has been involved in India's ambitious deep space exploration missions such as Chandrayaan-1, Chandrayaan-2, and Mangalyaan, and GSLV Mk III – the heaviest satellite launched from India. Recently, the business was awarded the contract to produce eight modules of the DRDO's turbojet engine. The company's expertise in precision engineering and high-quality manufacturing has earned it a reputation as a trusted partner for the Indian space program and other aerospace initiatives. As India's space program continues to grow and expand, Godrej Aerospace remains committed to supporting ISRO's efforts with its advanced aerospace components and systems. With its track record of excellence and commitment to innovation, Godrej Aerospace is well-positioned to play a key role in shaping the future of India's space sector.

REALITY CHECK

EXPLOSIVE REMNANTS OF WAR: THE SILENT KILLERS

Explosive Remnants of War are invisible and deadly monsters that lurk below the ground, in abandoned buildings, or other unexpected places - waiting for an opportunity to maim and kill unsuspecting individuals – mostly civilians long after conflicts have ended. The enormous and infinite danger they pose to human lives cannot be expressed in words

By **NEERAJ MAHAJAN**

Every year April 4 is observed as the International Day for Mine Awareness as declared by the UN General Assembly on December 8, 2005. The idea behind this is to spread awareness about mines and explosive remnants of war which pose a serious threat to the safety, health and lives of the civilian population.

Explosive Remnants of War (ERW) are explosive devices buried under the ground -- landmines, cluster munitions, Unexploded Ordnance (UXO), and other abandoned or discarded explosive devices that pose a threat to human lives - even after the conflict or war is over. ERW pose a substantial danger to civilians and the environment, as they can be triggered accidentally and cause death, injury, or damage to property.

Every hour, people – mostly civilians in so-called peacetime accidentally step on a landmine and die or lose their limbs.

This is because nearly 24 years after the Mine Ban Treaty signed in 1999 to ban the use of landmines – various countries all over the world continue to stockpile, produce, and export antipersonnel mines. Even – nearly 164 countries that signed the global treaty still have more than 50 million antipersonnel mines stockpiles according to the Landmine Monitor report.

The good news is that at least 158 of the countries that signed the treaty, do not stockpile landmines. But the bad news is that countries like Russia (26.5 million), Pakistan (6 million), China (5 million) and India (4-5 million) are among the top three nations which hold the maximum number

of landmines in their stock. It is quite surprising that even countries which are signatories of the treaty still keep landmines in their arsenals. Finland is one such example and has more than 16,000 mines in its inventory.

Almost two decades back countries which signed the Mine Ban Treaty committed to never use landmines and also agreed to remove mines buried on their territory. Significantly the campaign to ban the use of landmines got off to a big start when Prince Harry, the Duke of Sussex and his late mother Princess Diana visited an Angolan minefield

in 1997 to galvanize global action. This is what ultimately led to the 1999 treaty.

"Somewhere in the world right now, a parent is making the grimmest of choices: to risk cultivating mine-contaminated land or to let their family starve. That is no choice at all. The sooner we are able to clear all the remaining landmines, the less chance there is of innocent lives being lost or changed forever," Prince Harry was reported to have said.

Since then reportedly about 128 square kilometres of land have been cleared, and 168,000 landmines have been destroyed. But 58 countries including Afghanistan, Bosnia and Herzegovina, Cambodia, Turkey and Yemen continue to have an unbelievably high density/ concentration of landmines per square kilometre.

Unexploded Ordnances (UXO)

Courtesy: UN Photo

Photo Courtesy: UNDP Yemen/2020

The year 2017 was the third year in succession to register an exceptionally high number of casualties due to antipersonnel, anti-vehicle and improvised devices. The Landmine Monitor recorded 7,239 casualties – 2,793 people were killed and 4,431 injured.

Afghanistan and Syria topped the list of countries which saw the maximum number of death and disability followed by Ukraine, Iraq, Pakistan, Nigeria, Myanmar, Libya and Yemen. The largest toll was taken by improvised mines (2,716) and the single biggest group of casualties were children (2,452). More than 122,000 mine casualties have been recorded since global tracking began in 1999. Most of these casualties in recent years include civilians (87%).

As of date - 11 countries including China, Cuba, India, Iran, Myanmar, North Korea, Pakistan, Russia, Singapore, South Korea and Vietnam have the capability to produce landmines. Almost 40 countries have stopped producing antipersonnel mines, including Egypt, Israel and Nepal which surprisingly were not a party to the global Mine Ban Treaty. Afghanistan, Colombia, Myanmar, Nigeria and Yemen happen to be among those countries where insurgents have been known to produce landmines.

But despite all precautionary measures, landmine accidents continue to happen. After an active operation is over, the army puts up barbed wire to prominently mark landmine fields. In addition to this, steps are taken to spread awareness among people in the proximate villages who live or work in nearby fields to take adequate precautions and avoid entering the marked areas.

In addition to this, demining operations are carried out to identify, remove or blast landmines over a period of a month. But still, someone somewhere makes a mistake and the unexploded mines get mixed up with firewood for preparing food, fodder to feed cattle or metal scrap presumed to be harmless. Ironically most often the mines dug inside the ground shift their position and explode or detonate even when the slightest pressure is applied to them.

Landmines and other explosive remnants of war are effective deterrents against the enemy, but they continue to kill own army personnel and

Every hour, people – mostly civilians in so-called peacetime accidentally step on a landmine and die or lose their limbs. This is because nearly 24 years after the Mine Ban Treaty signed in 1999 to ban the use of landmines – various countries all over the world continue to stockpile, produce, and export antipersonnel mines

REALITY CHECK

civilians even after the war is over. Ironically the advancing enemy knows how to avoid landmines, but innocent civilians and children don't.

As per the SOP (standard operating procedure) - all minefields are laid as per plan and records of all minefields are diligently maintained. Each mine is accounted for and taken out by the same set of troops after the operation is over. But this is something that looks good and happens only on paper. If this was the case – then there would be no casualties of army personnel due to landmine blast.

USE OF LANDMINES BY PAKISTAN IN THE KARGIL WAR

In 1999 during the Kargil War, Pakistan reportedly used landmines and other explosive devices - designed to cause severe injuries or death due to detonation in the presence or proximity of a person or vehicle. The idea behind the extensive use of mines as a defensive weapon by Pakistan was to protect territory and assets from the Indian armed forces. Pakistan is understood to have laid a variety of anti-personnel mines and anti-tank mines along the Line of Control (LoC) in the Kargil sector during the Kargil War.

According to the Landmine Monitor Report 2000, published by the ICBL, Pakistani troops and armed rebel groups used antipersonnel mines in Kargil. The Indian border security and army forces showed the Landmine Monitor researcher the label of the Pakistan Ordnance Factories on crates of antipersonnel mines captured from the armed groups. These landmines caused significant casualties and injuries to both Indian and Pakistani forces. As a result, many soldiers lost their limbs or lives.

Landmines and other explosive remnants of war are an effective deterrent against the enemy, but they continue to kill own army personnel and civilians even after the war is over. Ironically the advancing enemy knows how to avoid landmines, but innocent civilians and children don't

Several countries particularly USA, UK, Russia, and Japan publicly criticized Pakistan for using landmines against India in the Kargil war. Even the United Nations condemned the use of landmines which is considered to be a violation of international humanitarian law and can cause severe harm to civilian populations even after the conflict has ended.

The Kargil War is just one of the many occasions when Pakistan has used landmines against India. Besides the Kargil War, Pakistan is known to have planted landmines along the Line of Control (LoC), Siachen Glacier where Pakistani landmines have resulted in several casualties on both sides, as well as the Punjab border.

These incidents have caused numerous casualties among Indian troops as well as civilian populations living along the border and are a clear-cut violation of the Ottawa Convention, which prohibits the use of landmines. Both India and Pakistan are signatories to the Ottawa Convention also known as the Anti-Personnel Mine Ban Convention, which prohibits the use, production, and stockpiling of landmines. This was also a violation of Pakistan's domestic law and export control procedures.

INDIA'S LANDMINE POLICY

India is not a party to the 1997 Mine Ban Treaty, also known as the Ottawa Treaty which aims to eliminate anti-personnel landmines around the world. However, India is a signatory to the 1997 Ottawa Convention, which is the same treaty but with a different name.

The Ottawa Convention, officially known as the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines was signed in Ottawa, Canada in 1997. It aims to prohibit the use, stockpiling, production, and transfer of anti-personnel landmines.

Though India is not a party to the Mine Ban treaty, it has taken steps towards mine clearance and has contributed to international efforts to ban landmines. India has also renounced the use of APLs and has not produced any since 1997.

India has not exported or imported landmines since it signed the 1997 Ottawa Convention and is providing financial and technical assistance for the clearance of landmines and explosive remnants of war in Afghanistan, Sri Lanka, Cambodia, and other countries.

However, India has not signed the 2008 Convention on Cluster Munitions due to its impact on national security and military capabilities.

PAKISTAN'S LANDMINE POLICY

Pakistan is not a party to the Ottawa Convention. Pakistan's landmine policy is guided by the National Mine Action Strategy (NMAS), launched in 2015 with the goal of making Pakistan free from the impact of landmines and explosive remnants of war (ERW) by 2023. The NMAS outlines a comprehensive approach to addressing landmines and ERW, including through survey and clearance of contaminated areas, victim assistance, and risk education.

Despite these efforts, landmines and ERW continue to pose a significant threat to civilians in Pakistan, particularly in areas affected by conflict and displacement.

VIOLATION OF HUMANITARIAN AND INTERNATIONAL LAWS ON LANDMINES BY PAKISTAN

There have been allegations of Pakistan violating humanitarian and international laws on landmines. For example, it has been reported that Pakistan has used anti-personnel landmines in its conflict with India in the disputed region of Jammu and Kashmir, which is prohibited under the 1997 Ottawa Convention.

There have also been reports of Pakistan laying landmines along its border with Afghanistan, which has resulted in civilian casualties and hindered the delivery of humanitarian aid. The use of landmines in populated areas is prohibited under international humanitarian law, as it poses a significant risk to civilians.

In addition, there have been concerns about the proliferation of landmines in Pakistan, including the production and transfer of anti-personnel landmines. But Pakistan is not a party to the Ottawa Convention and hence is not bound to honour its provisions. This is all the more reason why the international community or the world's moral policemen should intervene and make Pakistan pay for its sins and adhere to international humanitarian and human rights laws, which include protecting civilians from the harmful effects of landmines and other explosive devices.

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As per the SOP (standard operating procedure) - all minefields are laid as per plan and records of all minefields are diligently maintained. Each mine is accounted for and taken out by the same set of troops after the operation is over. But this is something that looks good and happens only on paper

DEFENCE COOPERATION

Prime Minister Narendra Modi with South African President Cyril Ramaphosa

INDIA BOOSTING DEFENCE COOPERATION WITH AFRICA

India has launched an ambitious programme of strengthening Indo-African relations, especially in view of China placing significant strategic interest in the continent. India has made more than 20 visits to Africa at the levels of the President, Vice-President and Prime Minister in the last three years

By **SRI KRISHNA**

With China focussing on boosting relations with African nations, the world's second-largest continent after Asia has become crucial to China's foreign policy which is positioning itself as one of the biggest powers in the globe – politically and economically, India too kick-started its Africa policy with high-level visits by Indian leadership and putting a focus on boosting defence cooperation.

In the area of military relations, China has been placing significant strategic interest in countries around the Horn of Africa and the Gulf of Aden including Djibouti where it has opened its first military facility outside the country. To counter this, the Indian Navy also has been playing a crucial role in the Indian Ocean and helping African nations to tackle the problem of piracy which had at one time become rampant.

Keeping this increasing Chinese interest in Africa and the continent also coming on the radar

of China's ambitious Belt and Road Initiative (BRI) launched in 2013 by President Xi Jinping as part of China's ambitious growth, and not to be left behind, India too has launched an ambitious programme of strengthening Indo-African relations.

It is significant to recall that Africa has been crucial to China's foreign policy since the end of the Chinese civil war in 1947 and for every year since 1950 bar one, the foreign minister of the People's Republic of China (PRC) has first visited an African country. China's new foreign minister Qin Gang visited five African countries and the African Union in January 2023. Wang Yi, the former foreign minister, visited 48 African countries and President Xi Jinping as Prime Minister undertook 10 visits to Africa between 2014 and 2020.

In this context, the one major lacuna in the bilateral engagements between India and African nations has been a visible lack of exchange of high-level visits. There have been countries where there have been no visits ever for decades. This lacuna has been squarely addressed by the current government. In the last three years, there have been more than 20 visits at the levels of the President, Vice-President and Prime Minister. According to Secretary (ER) in the Ministry of External Affairs Tirumurti, India will complete visits at the levels of Ministers or above to all the 54 countries under New Delhi's Africa Outreach Initiative.

In line with the overall policy to step up relations with African nations, India has now also started focussing on boosting defence ties and as part of the military outreach to Africa, where China has made major strategic inroads, the Army held an Africa-India field training exercise and a chiefs' conclave in March in Pune.

10-DAY AFINDEX EXERCISE

According to senior Army officers, the 10-day AFINDEX exercise held from March 21 to 30, the second such exercise after 2019, saw the participation by nine countries (Ethiopia, Ghana, Kenya, Lesotho, Niger, Seychelles, Tanzania, Uganda and Zambia), while 11 countries (Congo, Egypt, Nigeria, Rwanda, Zimbabwe, Cameroon and Morocco) sent their observers.

The BRI saw a huge number of signature infrastructure projects built across Asia and Africa, funded by Chinese loans whose size, nature and origin were often opaque. Some African countries became badly exposed to Chinese lending during this period. Chinese investment peaked around 2016. Since then, Chinese loans to African governments declined significantly, falling from $28.4 billion in 2016 to $1.9 billion in 2020 – partly due to changing priorities in domestic Chinese politics, and partly due to the apparent difficulty African countries had repaying loans.

On the other hand, what the Indian model offered to African countries was a unique blend of the developmental package, technology transfers and skill, and infrastructure development which are in accordance with African needs and priorities and it is non-conditional, unlike China or some Western donors.

LANDMINE REMOVAL OPERATIONS

Some of the war-torn countries in Africa do face the problem of landmines and Unexploded Ordnance, often referred to as UXO. Joint exercises with India enabled these countries to gain detailed information on these problems and learn from the Indian experience in this field. India has been one of the biggest contributors of troops to the UN Peacekeeping Operations all over the world because of the level of training of the officers and soldiers.

The Foreign Training Node (FTN) of the Indian Army located at Aundh Military Station in Pune hosted a multinational military exercise

India will complete visits at the levels of ministers or above to all the 54 African countries under New Delhi's Africa Outreach Initiative, says the Secretary (ER) in the Ministry of External Affairs Tirumurti

DEFENCE COOPERATION

India offers a unique blend of development packages including technology transfer, skill, and infrastructure development in accordance with African needs and priorities and it is non-conditional

involving the Indian Army and armies of several African countries with a focus on Humanitarian Mine Assistance and United Nations Peacekeeping Operations. The inaugural edition of the Africa-India Field Training Exercise, AFINDEX, was held at the FTN in March 2019 and saw the participation of contingents from African nations Benin, Botswana, Egypt, Ghana, Kenya, Mauritius, Mozambique, Namibia, Niger, Nigeria, Senegal, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe while the Indian Army was represented by a contingent of Maratha Light Infantry.

Two coordination conferences of the stakeholder entities from the Indian Army and African countries have already taken place while the third is slated to take place soon. This was the first joint military exercise that the FTN held after the Covid-19 pandemic. The exercise sought to hone the skills of the participating defence forces in planning and conduct of Humanitarian Mine Assistance and Peace Keeping Operations under Chapter VII of the UN Peacekeeping Operations charter. The exercise focussed on the exchange of best practices between the participating nations, team building and tactical level operations in the conduct of UN-mandated tasks. The UN-mandated tasks include the establishment of new missions for UN peacekeeping forces, protection of civilians, nuances of standing combat deployment, convoy protection, patrolling aspects and aspects related to Humanitarian Mine Assistance. The Indian Army is considered one of the expert agencies in the world in mine removal operations.

INDIA-AFRICA CHIEFS CONCLAVE

In a first, army chiefs and representatives from 25 African countries took part in the conclave on the sidelines of AFINDEX, a joint exercise of India and African countries with the conclave's objective being defence partnership and defence industry outreach to Africa. With many African countries evincing interest in India's indigenous products, the conclave provided a platform for Indian companies. The exhibition of defence equipment enabled the guests to explore the opportunities. The exercise saw the participation of over 100 personnel.

As one high-ranking official said, "The first India-Africa Chiefs Conclave is a landmark event and will provide a fillip to the cooperation between the Indian Army and the armies of African Nations while simultaneously addressing the capacity enhancement requirements of African armies."

–The writer is a senior journalist and media consultant. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

FORESTALLING HIDDEN PERILS

A defence start-up Voliro has developed a drone that is capable of remote landmine detection as it keeps metal detector aligned to the ground surface

There are many different ways of detecting mines and explosives with none being easy or quick. Surely, sending a human out into a minefield with a metal detector is not the safest way of doing things. So, instead, people send anything else that they possibly can, from machines that can smash through minefields with brute force to well-trained rats that take a more passive approach by sniffing out explosive chemicals.

With most mines triggered by pressure or direct proximity, it may seem that a drone would be the ideal way to detect them non-explosively. However, unless you're only detecting over a perfectly flat surface (and perhaps not even then) your detector won't be positioned ideally most of the time, and you might miss something, which is not a viable option for mine detection.

But now a novel combination of a metal detector and a drone with 5 degrees of freedom is under development at the Autonomous Systems Lab at ETH Zurich. It may provide a viable solution to remote land-mine detection, by using careful sensing and localisation along with some twisting motors to keep the detector reliably close to the ground.

The really tricky part of this whole thing is making sure that the metal detector stays at the correct orientation relative to the ground surface so there's no dip in its effectiveness. With a conventional drone, this wouldn't work at all, because every time the drone moves in any direction up or down, it has to tilt, which is going to also tilt anything that's attached to it. Unless you want to mount your metal detector on some kind of (likely complicated and heavy) gimbal system, you need a drone that can manoeuvre its position without tilting. Happily, such a drone not only exists but is commercially available.

The drone used in this research is made by a company called Voliro, and it's a tricopter that uses rotating thruster nacelles that move independently of the body of the drone. It may not shock you to learn that Voliro (which has, in the past, made some really weird flying robots) is a startup with its roots in the Autonomous Systems Lab at ETH Zurich, the same place where the mine-detecting drone research is taking place.

So, now that you have a drone that's theoretically capable of making your metal detector work, you need to design the control system that makes it work in practice. The system needs to be able to pilot the drone across a 3D surface that it has never seen before and might include obstacles. Meanwhile, it must prioritise the alignment of the detector.

Testing with metallic (non-explosive) targets showed that this system does very well, even in areas with obstacles, overhead occlusion, and significant slope. Whether it's ultimately field-useful or not will require some further investigation, but because the platform itself is commercial, off-the-shelf hardware, there's a bit more room for optimism than there otherwise might be.

AATMANIRBHARTA QUEST

THE FUTURE OF WARFARE: INDIA'S INVESTMENT IN DIRECTED ENERGY WEAPONS AND THEIR POTENTIAL APPLICATIONS

India is amongst a select few countries in the world to have developed DEWs, despite several challenges including technological and financial constraints and regulatory hurdles

By **GIRISH LINGANNA**

Direct Energy Weapons (DEWs) are advanced weapon systems that use directed energy beams such as lasers and microwaves to destroy targets, including missiles, vehicles, and personnel. These weapons offer several advantages over traditional firepower, including accuracy, speed, and efficiency.

India has been investing in DEW technology and is one of the few countries in the world to have developed indigenous DEW systems.

INDIA'S INVESTMENT IN DEWS

India's investment in DEWs began in the late 1990s, with the establishment of several research institutes dedicated to laser and plasma technologies. In 2008, the Defence Research and Development Organisation (DRDO) launched the Directed Energy Weapons (DEW) program to develop high-power lasers, high-power microwaves and particle beam weapons.

Since then, India has made significant progress in developing DEW systems for both offensive and defensive purposes. India successfully tested its first DEW system, a high-power laser weapon in 2010. In 2017, DRDO announced the successful test firing of a High-Power Microwave (HPM) system.

POTENTIAL OF INDIA'S DEW TECHNOLOGY: FROM MISSILE DEFENSE TO DISASTER RESPONSE

India's DEW capabilities encompass both lasers and high-power microwaves. While laser weapons are primarily used for precision targeting of small targets, such as incoming missiles and drones, HPM systems can be used to disrupt electronic systems, including radars, communication systems and computers.

India's DEW technology has several potential applications in both military and civilian domains. In the military domain, DEWs offer several advantages. For example, laser weapons can be used to take down enemy drones, aircraft, and cruise missiles, thereby reducing the need for complex and expensive missile defence systems. High-power microwaves can be used to disable

enemy electronic systems without causing physical damage, which is particularly useful in situations where physical damage is not desirable., besides disabling UAVs in sensitive areas, such as airports and nuclear plants. Similarly, DEWs can be used to clear landmines without endangering people.

INDIA'S DEW PROGRAMME: OVERCOMING TECHNOLOGICAL, FINANCIAL, AND REGULATORY CHALLENGES

India faces several challenges in developing DEWs, including technological challenges, financial constraints and regulatory hurdles.

One of the primary challenges facing India's DEW programme is the technological challenge. Developing DEWs requires significant technical expertise and investment. For example, high-power lasers require advanced optics, high-energy density materials and complex targeting and tracking systems. Similarly, HPM systems require advanced microwave and power electronics technologies.

Another challenge is the financial constraint. Developing DEWs is an expensive proposition, and it requires sustained investment over an extended period. India's defence budget, though growing, is still a fraction of that of the United States and China.

Regulatory hurdles are another significant challenge. India has been traditionally cautious about the development of new weapons technology, and DEWs are no exception. DEW technology raises several ethical and legal concerns, such as the potential for collateral damage, the issue of indiscriminate targeting and the potential for misuse.

INDIA'S IMPRESSIVE DEW ARSENAL

As of today, India has developed several types of DEWs, including:

High-Energy Laser (HEL): India's DRDO has developed a high-energy laser weapon system that can track and destroy aerial targets, including incoming missiles and high-speed aircraft. This laser weapon system has a power output of 25 kilowatts and has an engagement range of up to 5 kilometers.

High-Power Microwave (HPM) weapon: DRDO has developed a prototype HPM weapon that can disable electronic equipments, including communication systems, radars, and computers, without causing any physical damage. This weapon uses microwave energy to disrupt the functioning of electronic equipments.

Chemical Oxygen-Iodine Laser (COIL): India has developed a COIL-based laser weapon system that can be used for air defence applications. This laser weapon system uses a chemical reaction between chlorine and hydrogen peroxide to produce the laser beam.

Laser Dazzler Weapon: DRDO has developed a laser dazzler weapon that can temporarily blind, disorient and confuse targets, including enemy combatants, drones and vehicles.

Fiber Laser Weapon: DRDO has developed a fiber laser weapon that can be used for anti-personnel and anti-materiel applications. This laser weapon system has a power output of up to 10 kilowatts and can be used for precision targeting of small targets.

In addition to these DEWs, India is also working on developing particle beam and high-power microwave systems for both offensive and defensive purposes.

India's progress in DEWs is impressive and has shown that it is capable of developing advanced military technologies. In 2010, DRDO successfully tested a high-energy laser against a missile target, marking a major milestone in the development of DEWs. Since then, India has continued to work on improving its DEW capabilities. In February 2021, DRDO successfully tested a solid-state laser system that was capable of shooting down drones. The laser system was mounted on a vehicle and was able to destroy multiple drones at a range of 1 km.

India has been investing in DEW technology and is one of the few countries in the world to have developed indigenous DEW systems

AATMANIRBHARTA QUEST

India has made significant progress in developing DEW systems for both offensive and defensive purposes; it tested its first DEW system in 2010

KALI PROJECT: A HIGH-POWER PULSED ELECTRON ACCELERATOR

The KALI (Kilo Ampere Linear Injector) project was initiated by the DRDO in 1985 with the goal of developing a high-power pulsed electron accelerator. The project aimed to create a device capable of generating a beam of electrons with a peak current of several kiloamps and pulse durations in the microsecond range. KALI was envisioned as a potential weapon system that could be used to neutralise enemy satellites, aircraft and missiles.

KALI consists of a linear accelerator that generates an intense beam of electrons that are injected into a magnetic field. This causes the electrons to move in a circular path, generating electromagnetic radiation in the form of microwaves. The microwaves can then be focused on a target to cause damage.

Over the years, DRDO has made significant progress in developing KALI. In 1993, the KALI-80 prototype was developed, which was capable of generating an output of 0.8 GW. The KALI-80 was later upgraded to KALI-200, which had an output of 0.2 TW (terawatts) and was used for a variety of experiments, including plasma generation, material processing and radiation effects studies.

KALI is a type of radio-frequency weapon that uses a high-power linear electron accelerator to generate and amplify powerful microwave pulses. The weapon system has a power output of up to 0.5 GW (gigawatts) and can be used to disable electronic systems, communication networks and radar systems of enemy targets.

DURGA II PROJECT: AN UPGRADED VERSION OF KALI

DURGA II (Device for Ultrafast Radiation from Gamma-ray Astrophysics) is an upgraded version of the KALI weapon system, and it is capable of producing more powerful microwave pulses. With a power output of up to 2 GW, DURGA II is considered one of the most powerful HPM weapons in the world. It is primarily designed to create a high-power microwave burst that can destroy incoming missiles, unmanned aerial vehicles (UAVs) and other airborne targets.

DURGA II uses a compact linear accelerator to generate intense electron beams, which are then focused on a tungsten target to produce intense gamma rays. The gamma rays are then converted into microwaves using a process called bremsstrahlung radiation. The resulting microwaves can be focused on a target to cause damage.

Both KALI and DURGA II are classified as DEWs (directed energy weapons) and are designed to operate in the electromagnetic spectrum. These weapons have been developed by India's DRDO and are part of India's ongoing efforts to develop advanced military technologies.

India's investment in DEW technology has been significant, with the country developing several advanced weapon systems that use directed energy beams, including lasers and microwaves, to destroy targets. DEWs offer several advantages over traditional firepower, including accuracy, speed, and efficiency, and their potential applications range from missile defense to disaster response. India's progress in DEWs has shown that it is capable of developing advanced military technologies; with the country having successfully tested several DEW systems over the years. However, India faces several challenges in developing DEWs, including technological, financial and regulatory hurdles, and the country will need sustained investment and expertise to continue to advance in this field.

*–The writer is a Defence and Aerospace Analyst.. The views expressed are of the writer and do not necessarily reflect the views of **Raksha Anirveda***

ADDITIONAL 100 K-9 SELF-PROPELLED HOWITZERS ORDERED BY INDIAN ARMY

New Delhi. The Indian Army has ordered additional 155 mm/52 calibre self-propelled howitzers (SPHs) known as K-9 Vajra-T designed by South Korea's Hanwha Aerospace, reported a leading media outlet.

The company has received an additional order of 100 K-9s from India, which is in process now, a Hanwha spokesperson was quoted by the media outlet. "[An order of] another 100 numbers [of K-9s] is being discussed and can be closed within 2023. We [Hanwha] are already in touch with our partner Larsen & Toubro (L&T) [regarding the order]," said Hanwha spokesperson. He further added, "These additional quantities under repeat order will include the K-9 upgraded with high-altitude area application as well as existing [technologies on] K-9s."

At present, the Indian Army has 100 in-service K-9 Vajra-Ts, which are the Indian-manufactured variant of the K-9 Thunder, with 50% of their components being manufactured in India. According to the media report, India's requirement for 100 NATO-compatible SPHs was issued in 1994, and by 2010, the tender had failed to arrive at a solution that met India's requirements. It was only in September 2015 that the K-9 was selected.

PM MODI HAILS CABINET NOD FOR PURCHASE OF 70 TRAINER AIRCRAFT, 3 TRAINING SHIPS

New Delhi: Prime Minister Narendra Modi said the Cabinet Committee on Security's approval to sign a contract for acquisition of three Cadet Training Ships (CTS) will cater to the training requirements of the Navy and strengthen it further. He said the decision of the Cabinet Committee on Security meeting which was chaired by him approved the procurement of 70 HTT-40 basic trainer aircraft for the IAF which would strengthen the ongoing efforts to make the defence sector self-reliant while also benefiting the vibrant MSME sector.

"The CCS under the chairmanship of PM Narendra Modi has accorded approval to sign a contract for acquisition of 3 Cadet Training Ship (CTS) at an overall cost of Rs. 3108.09 Crores under Buy-Indian (IDDM) Category," Defence Minister Rajnath Singh tweeted. In another tweet, Singh said, "The Cabinet Committee on Security (CCS) chaired by Prime Minister Shri Narendra Modi has approved procurement of 70 HTT-40 Basic Trainer Aircraft at the cost of Rs 6,828.36 crores. The aircraft will be supplied over a period of six years."

Tagging the tweet, Modi said, "This is an important CCS decision which will add strength to the ongoing efforts to make our defence sector self-reliant and will also benefit the vibrant MSME sector."

The HTT-40 aircraft is expected to meet the shortage of basic trainer aircraft of the IAF required for training newly inducted pilots. The HTT-40 is a turboprop aircraft designed to have good low-speed handling qualities and provide better training effectiveness. It has a fully aerobatic tandem seat turbo trainer with an air-conditioned cockpit, modern avionics, hot re-fuelling, running change over and zero-zero ejection seats.

The HTT-40 contains around 56 per cent indigenous content, which would increase to over 60 per cent through the indigenisation of major components and subsystems. The HAL would engage Indian private industry, including MSMEs, in its supply chain. Procurement is seen as the means of employment, which is expected to generate direct employment for nearly 1,500 personnel and indirect employment for up to 3,000 people spread over more than 100 MSMEs. The acquisition of the HTT-40 provides a fillip to the Indian Aerospace Defence ecosystem by boosting efforts towards 'Aatmanirbhar Bharat'.

MUSINGS FROM RUSSIA

GOODBYE OLD WORLD, PREPARE FOR A NEW NORMAL

The Russia-Ukraine war has not only shown the Russian strength but it may also be the harbinger of significant new global changes

By **VINAY SHUKLA**

In the wake of COVID-19 pandemic, the on-going Ukraine crisis has finally put an end to the post-Cold War world order based on the hegemony of five veto-wielding permanent members of the United Nations Security Council which emerged on ashes and ruins of the most devastating World War II in the human history.

Before the collapse of the Soviet Union, the bipolar world order had a semblance of stability and de-conflicting mechanisms in place, to diffuse acute crises. However, the US-led unipolar system in the globalised world led to erosion of the mechanism of checks and balances and equability of security of smaller nations perceived as a threat to the American interests (Libya, Iraq, Syria), followed by the turn of nuclear powers and UNSC permanent members Russia and China, who were declared adversaries.

To better understand the root cause of tectonic geo-political and geo-strategic shifts caused by the Ukraine conflict a brief peek at the past is necessary.

North Atlantic Treaty Organisation (NATO) led by the United States of America continued its eastward expansion to include not only former Soviet allies of defunct Warsaw Pact but also stepping into the territory of former Soviet Baltic republics of Estonia, Latvia and Lithuania in violation of the assurances given to the USSR. A weak Russia under president Boris Yeltsin had to meekly swallow the bitter pill, however, things changed under the regime of Vladimir Putin.

At the Bucharest Summit in April 2008, NATO welcomed Ukraine's and Georgia's Euro-Atlantic aspirations for its membership and agreed that these countries will become members of NATO. President Putin in his conversation with the US president George Bush warned that Ukraine's membership would be a "red line" for Moscow.

Encouraged by NATO declaration in August

2008, Georgia's pro-US government of president Mikheil Saakashvili launched an offensive to recapture the breakaway region of South Ossetia, which was repulsed by the Russian military. In the wake of the August war in South Caucasus, Moscow recognised the independence of South Ossetia and another breakaway region of Abkhazia, whose control by Georgia was lost after bloody conflicts during the process of the Soviet disintegration.

By this step, the Kremlin had signalled its readiness to use brutal military force to protect Russian interests in Ukraine. When in March 2014 in the course of popular protests known as Euromaidan, the US Embassy in Kiev virtually engineered the coup to oust the elected President Viktor Yanukovich, who had won the overwhelming vote in the Russian ethnic majority regions of Crimea, Donbass and Luhansk, causing widespread discontent. Knowing that the new dispensation in Kiev is planning to vacate the lease of the Russian Black Sea Fleet stationed in Crimea since 1783 and give its base to NATO, President Vladimir Putin through a hybrid war operation took over the physical control of the ethnic Russian majority peninsula and organised a referendum for reunion with mainland Russia.

Simultaneously, armed conflicts erupted in Donbas and Luhansk when Kiev tried to enforce its control with the use of military force. Both regions declared their independence as Donetsk People's Republic and Luhansk People's Republic. However, Moscow refused to recognise their independence and encouraged them to seek autonomy within the Ukrainian state through negotiations with Kiev, as per Minsk and Normandy formats. The US trained Ukrainian army continued the shelling of breakaway regions' cities and towns forcing thousands of local residents to seek refuge in neighbouring Russia. After the start of hostilities the former French President Francois Hollande and German Chancellor Angela Merkel - cosponsors of Normandy process conceded that Minsk and Normandy formats were nothing but to give the Ukrainian army more time to prepare for military operation against separatists and to liberate Crimea.

Russian intelligence had seen through West-guided Ukrainian plans to launch an offensive to liberate occupied territories. In the backdrop of war preparations President Zelinsky had banned the use of Russian language and shutdown popular news channels in the country.

In April 2021, the Kremlin had amassed troops on the Ukrainian border. Moscow probably understood that once NATO trained Ukrainian forces went into action, the world would see it as a legitimate action by the Kiev regime to liberate its occupied territories.

In December 2021, President Putin upped the ante by demanding from NATO to withdraw its military infrastructure from the territories of its new members, deployed in violation of promises it had made after the German reunification and declaration that Ukraine will not be admitted to the US-led alliance. It was still possible to avoid Russian invasion, however, NATO threatened the Kremlin with "sanctions from hell" and said that it was firm on its "open door" policy.

Then came the fateful day of February 24, 2022. Russian tanks poured into the neighbouring country under the Kremlin's Special Military Operation. Rest is in the public domain.

INDIA'S STAND ON UKRAINE CONFLICT VINDICATED

There has been a recent western media report that Japan is buying Russian crude above the price cap of USD 60 set by G-7 of the powerful economies, while New Delhi has been under pressure from the US and European Union and its individual member countries for lapping up Russian crude at discounted rates.

Just imagine, if the Prime Minister Narendra Modi's government had joined the Western sanctions against Russia, then we would have been left high and dry with accompanied unprecedented inflation in the developed Western economies.

India is a democratic country and its "deep state" works for the long-term strategic interests of the nation and the PMO effectively acts on its advice. India understands very well the root cause of Russian-Ukrainian conflict, which despite specifics is very much like India-Pakistan relations - a tragedy of a divided nation.

NATO's Bucharest Summit in April 2008, welcomed Ukraine's and Georgia's Euro-Atlantic aspirations for its membership

Russian President Vladimir Putin with Indian Prime Minister Narendra Modi

MUSINGS FROM RUSSIA

G7 Leaders at NATO meeting

India and Russia have a treaty of special and privileged strategic partnership and the past experience shows that Moscow has always stood by protecting our vital security interests. On their part even a common Russian can fathom the spirit of "Sudama ke Chawal". When Prime Minister Modi told President Putin at their meeting on the sidelines of the Samarkand summit of Shanghai Cooperation Organisation (SCO) that this is not the era of war, his words were also meant for the Western leaders who are fighting a proxy war against Russia.

This is the once in a lifetime opportunity for India to assert itself as an independent pole in the rapidly forming multipolar world instead of getting involved in a purely European crisis. Already lakhs of Indians have spilled their blood for the Anglo-Saxon colonial masters during the two world wars.

If Modi government had joined the Western sanctions against Russia, then we would have been left high and dry with accompanied unprecedented inflation in the developed Western economies

MYTH ABOUT MILITARY INCAPABILITY OF RUSSIANS

The experience of the Ukraine conflict vindicates the government of India's "Atmanirbhar Bharat" or self-reliance in defence.

But the clutter about poor quality of Russian equipment by the arms lobbies to wean away India from Russia is totally baseless due to the following reasons:

1. Traditionally and psychologically, Russian soldiers can fight only enemy armies and in the initial phase in Ukraine they saw people of the same cast and creed, but when later they encountered mercenaries from other parts of the world, they developed the sense of facing an enemy, a similar thing happened when the Kremlin had sent army columns to restore order in first Chechnya war in 1996.
2. Ukraine has been holding the Russian advance with the huge stockpile of Soviet weapons and air defence systems deployed in the country during the USSR-era to counter the invading NATO armies. Even the successful use of Soviet-era Tu-141 drones to strike targets deep inside Russia by Ukraine were developed back in the early 70s of the last century.
3. Russia, which has modernised and developed new systems, so far has refrained from using them to keep them safe in the event of a direct clash with the NATO.

The Russian military-industrial complex is alive and kicking and working 24x7.

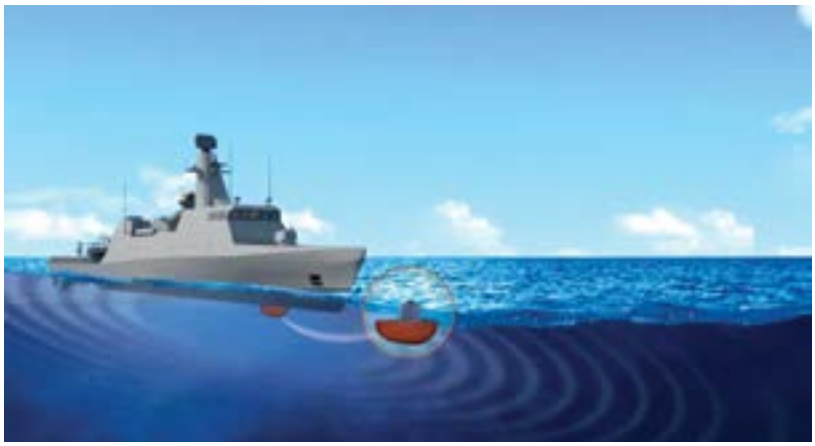
MOSCOW'S 180^0 TO THE EAST

India remains the focus of Russia's attention. Even the Moscow Declaration signed during Chinese president Xi Jinping's much hyped Moscow visit declared that both sides intend to develop cooperation in the format of Russia-India-China.

Shortly after the Chinese supremo Xi's three-day Moscow visit the Kremlin had formally discarded the cherished dream of a common European home from Lisbon to Vladivostok. On March 31, President Putin signed a decree on a new foreign policy doctrine in which expansion of Moscow's relations with India and China has been given pre-eminence. Development of ties with Asian, African and Latin American countries have also been set as the main vector of the Russian foreign policy. In a major blow to the dollar based global financial system Moscow has announced that it will trade with the third world in Chinese yuan and national currencies to end the dollar's monopoly. Of course, it is a long process but the time has come to say goodbye to the old world and get used to a new normal where a weakened EU has lost its glitter and the US could be willing to accommodate China to give birth to much dreaded G-2.

*–The writer is a Moscow-based independent analyst. The views expressed are of the writer and do not necessarily reflect the views of **Raksha Anirveda***

DSIT ISRAEL SIGNS CONTRACT WITH A LEADING EUROPEAN SHIPYARD TO SUPPLY, INTEGRATE FULL ASW SONAR SUITE



Tel Aviv. Israeli company DSIT signed a contract with a leading European shipyard to supply and integrate a full ASW sonar suite. The contract includes DSIT's BlackFish and WhitePointer systems and acoustic dome integration with the customer's designated combat management system. BlackFish HMS is an advanced medium frequency system designed for the self-protection of medium-to-large surface vessels engaged in both littoral and deep water Anti-Submarine Warfare (ASW) operations.

According to the company, the BlackFish system provides modern, sophisticated underwater search, detection, tracking and classification capabilities. Implementing cutting-edge electronics and acoustic technologies, machine learning, automation, and signal processing, the BlackFish system protects surface ships from submarines, moored mines, underwater obstacles and torpedoes. Its exceptionally high acoustic performance enables a high probability of detection as well as a long distance detection range of submarines and approaching torpedoes. Open architecture allows easy integration with any existing C4I systems and other sensors.

WhitePointer, an Underwater Communication System that according to the company enables reliable voice and data transmissions between surface vessels, submarines, and other underwater platforms such as SDVs, DPVs, AUVs UUVs, and divers. The system, which includes a high power, synthesized transceiver, supports underwater communication networks with multiple users. Up to 30 frequencies can be programmed, and a unique monitoring feature enables the user to listen to any transmission occurring at NATO frequency, while operating the transceiver at a different frequency. Both BlackFish and WhitePointer will be installed in a single dome.

DSIT says that the comprehensive system was selected by the Shipyard and the Navy, following a thorough competition, in view of its high reliability, excellent performance and track record, simplicity of operation and maintenance, as well as good value for money. The BlackFish system's advanced algorithms developed by DSIT to reduce operator load, combined with alerting capabilities for a wide range of underwater threats, offer precise location and classification of underwater threats.

BOEING, US ARMY APACHES ACHIEVE 5 MILLION FLIGHT HOURS

MESA, Ariz. Boeing and the AH-64 team are observing a unique milestone as the US Army's AH-64 Apache attack helicopters have officially reached five million flight hours. The accomplishment is equivalent to flying nonstop for more than 208,333 days or 570 years and nine months. Additionally, 1.3 million of those five million flight hours were accomplished during combat.

Since 1984 when the first AH-64 took flight, the US Army has operated A, D and E-model Apaches. The US Army currently operates D-model Apaches in addition to the AH-64E Apache. Boeing is upgrading the E-model to Version 6.5, which will include updated software, and integrating the Army's new improved turbine engine. Additionally, the company announced the Modernized Apache in October 2022, a Boeing concept aligned with the US Army's future modernization efforts, keeping the AH-64 a relevant, multi-domain lethal combat-multiplier for US warfighters and international customers. Built by Boeing in Mesa, Ariz., the AH-64 is the attack aircraft of choice for 19 defence forces around the globe, with additional international interest. In September 2022, Poland announced the selection of Boeing's AH-64E Apache for the Polish Armed Forces' new attack helicopter fleet.

COMMERCIAL PROPOSAL FOR 100 HEAVY-WEIGHT LOGISTICS DRONES ISSUED BY MINISTRY OF DEFENCE

New Delhi. The Ministry of Defence, intends to procure quantity 100 Logistics Drones (Heavy Weight) along with Accessories under emergency procurement through Fast Track Procedure under Buy (Indian) category and seeks participation in the procurement process from prospective bidders. The components required are flying system along with Ground Control Station, Ground Data Terminal and other accessories as required for control of flying System and display of data. The mission range should not be less than 10 Km (to & from 5 Km each or One side 10 km. Refuelling/Recharging/Swap of batteries permissible at 5 Km) and endurance up to 30 minutes. The Payload Weight is expected to be up to 20 Kg and all Up Weight not more than 60 Kg. The drones should be equipped with Day and Night Camera. The flight mode should have Fully Autonomous, Manual and Return to Home Modes for various contingencies.

VIEW POINT

AMMUNITION 101: UNDERSTANDING THE BASICS OF A FIREARM CARTRIDGE

Advanced ammunition are the reality of the new age warfare and a country's economic development and progress in the field of science and technology gets automatically reflected in the capacity of its weapons and ammunition. India as an emerging world power must focus on boosting indigenous design, research and development as well as manufacturing capability in advanced and smart ammunition. Written lucidly by Sanjay Soni, Director - Hughes Precision Mfg. Ltd, India's leading ammunition manufacturer in private sector, the article provides insights to help understand the basics of firearm cartridge

By **SANJAY SONI**

Friends, before we move further into more technical topics like lethality of ammunition, I thought we can cover the basics of an ammunition cartridge. That will give you a foundation for understanding the more technical aspects of ammunition.

What is a firearm cartridge, and how does it work?

A cartridge – sometimes referred to as a round – is a fully-assembled firearm ammunition consisting of a primer, projectile, propellant, and a casing that holds it all together. These four items are known as the components of a cartridge; and are used in a variety of firearms which include pistols, rifles, shotguns and automatic weapons or machine guns. They all work together to release the projectile under high velocity, through a process of expanding gasses which are the driving force behind the bullet.

Having a basic understanding of cartridges and their individual components is vital to any avid shooter. Correct knowledge plays an import part of ensuring that you're achieving the best results from your shooting goals, whatever they may be.

THE 4 COMPONENTS OF A FIREARMS CARTRIDGE

1. **Primer –** this is the explosive that sets off the propellant. The primer is struck by the firing pin once the trigger is squeezed and creates a spark that ignites the propellant
2. **Casing –** typically made from brass or mild steel/ bimetal, the casing holds everything together

3. **Propellant –** otherwise known as powder, the propellant is ignited by the primer and creates the gasses and energy necessary to drive the bullet
4. **Projectile –** otherwise known as the bullet, the projectile leaves the firearm and travels through the air causing physical damage onto the intended target

The complete product – all four components combined – is known as the cartridge.

Cartridge Primers: What Are They, And How Do They Work?

As we have already mentioned, the primer is responsible for creating the spark which ignites the propellant. Upon being struck with sufficient force, the primer reacts chemically to produce heat which in turn ignites the main propellant charge and fires the projectile.

Without primer ignition, there would be no bang; the gun would misfire.

When it comes to centerfire ammo, there are two common types of centerfire primers that are used, namely Berdan and Boxer primers.

THE CARTRIDGE CASE

The cartridge case, often referred to as brass, is the container which holds all of the cartridge components together. They are most often made from brass or mild steel, and in some cases even aluminium.

BRASS CARTRIDGE CASES

Brass is the alloy of choice when it comes to higher-end cartridge cases, particularly those used for precision shooting. It is an expanding material that provides a gas-tight seal within the chamber, which stretches and shrinks at a rapid rate allowing the casing to be extracted immediately after firing. It is also soft enough to allow for a longer barrel life; reducing throat erosion when compared to other casings such as mild steel.

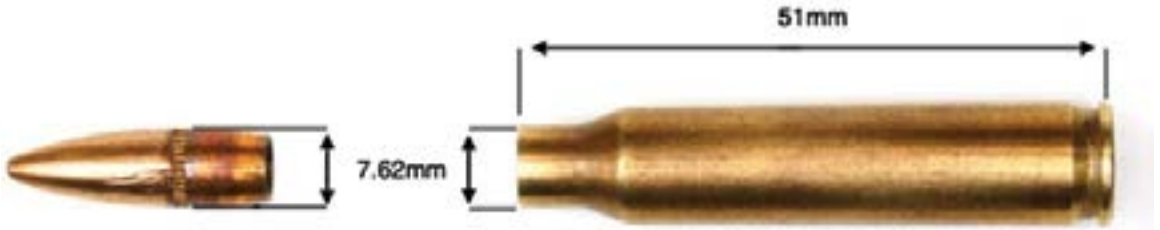
Some manufacturers produce higher quality brass than others, which promotes accuracy due to the way in which it expands, causing a tighter and more consistent seal within the chamber and therefore resulting in more consistent muzzle velocities. Higher quality brass also results in a longer life-span when used during reloading.

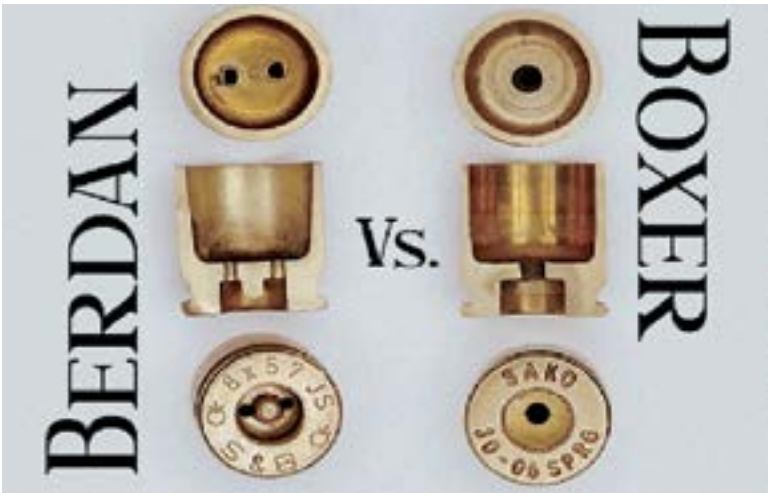
STEEL/BIMETAL CARTRIDGE CASES

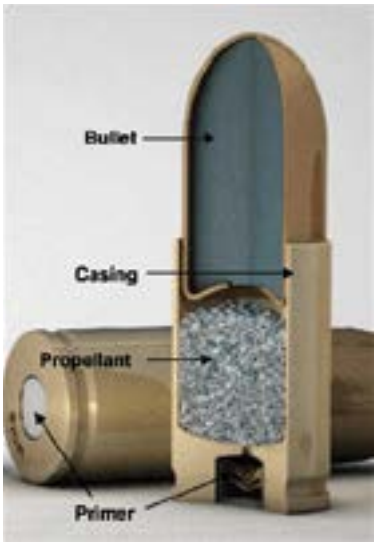
Other manufacturers such as those who most commonly cater for the Ak market sell cheaper ammunition options with mild steel casings. These steel casings are sometimes coated with lacquer to prevent rust, and are often mistaken for brass.

The harder properties of steel casings – that being almost 50% harder than a brass casing – increases throat erosion, supposedly to a point where a rifle's throat can become spent after only half of its expected lifespan.

A cartridge – sometimes referred to as a round – is a fully-assembled firearm ammunition consisting of a primer, projectile, propellant, and a casing that holds it all together. These four items are known as the components of a cartridge; and are used in a variety of firearms which include pistols, rifles, shotguns and automatic weapons or machine guns



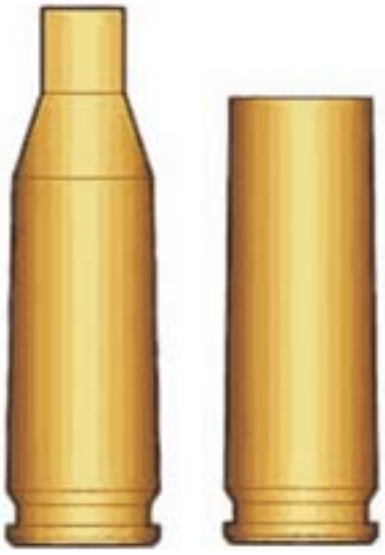




Tip: once the cartridge has been fired, you can determine which primer was used by looking down into the empty casing and observing either two flash holes, or one (as seen in the image above).

VIEW POINT

Left: brass casing, Right: lacquer coated steel casing



Types of Case Rim

Although appearing more cost effective in the short term, steel cased ammo should typically be avoided when fired from high quality weapon systems with tighter tolerances.

CARTRIDGE CASE DESIGN

There are two types of general shapes that we may find in a cartridge case. These are either straight-walled cases or bottleneck cases.

Straight-walled cases (image right) are most commonly found in pistols and revolvers, whereas bottleneck cases (image left) are most commonly found in rifles and machine guns, although there are some exceptions to this rule.

At the base of the cartridge case we find the rim, which provides a lip for the extractor to engage, and in many cases also serves to headspace the cartridge. Upon close inspection of various cartridge cases, you will come to notice that there are 2 types of case rims commonly used – with each serving their own purpose.

Rimmed – while sometimes referred to as the flanged cartridge due to the prominently protruding rim, this is the oldest type of cartridge case which has a rim that is larger than the base. The rim is used to hold the cartridge in the chamber of the firearm, making the case length of less importance.

Under the metric cartridge designation system, a capitalised "R" added at the end of the designation indicates a rimmed cartridge. An example of this can be seen in the 7.62x54mmR.

Rimless – on the rimless cartridge case, the rim is the same diameter as the base, and there is a gap formed between the rim and the body of the cartridge known as the extractor groove. Because there is no protruding rim, the cartridge must headspace on the case mouth for a straight-walled case, or on the case's shoulder for a bottleneck case. The lack of rim makes feeding from a box magazine very smooth. Headspace is one of the most critical measures in your rifle, and is defined as the distance from the face of the locked bolt to a datum line or shoulder in the chamber that stops forward movement of the cartridge

MODERN FIREARMS PROPELLANT

Modern propellant which is used in the majority of firearm cartridges today is known as smokeless powder. This propellant produces a negligible amount of smoke when fired in comparison to black powder, which is where it gets its name. Although not completely free from smoke, the combustion products of smokeless powder are mainly gaseous and produce very little smoke when fired from small arms, capable of producing six times more gas and pressure than black powder.

While the term gunpowder is still widely used today, it in actual fact refers to the outdated olden day propellant otherwise known as black powder. Black powder is commonly used in fireworks and antique firearms, but not in most firearm cartridges that we come across today

Smokeless powder is a highly combustible single

based propellant – namely Nitrocellulose – which has a clean and equal burn rate, and is typically sold in one of three different shapes. The size and shape of the propellant grains can increase or decrease the relative surface area, and can significantly change the burn rate of the propellant. This allows the burn rate to be controlled. Additives and coatings can be added to the propellant to further modify the burn rate.

SMOKELESS POWDER SHAPES

Ball Powder – also known as spherical powder, this propellant shape is faster and easier to manufacture, reducing the overall cost. It is commonly rolled or flattened slightly to change the shape, enhancing loading density and ignitability. It feeds best through a powder dispenser, allowing for more accurate loads when hand-loading bulk ammunition.

Ball powder can have a greater shelf life than other powders, often burning at lower temperatures which may assist in extending barrel life. However, it is often considered the worst shape for precision loads, starting with a large pressure spike and weakening as the powder burns up.

Flake Powder – in the form of flat, round flakes or disks, this propellant is most commonly used in lower-velocity handgun and shotgun calibers. The powder produces inconsistent loads when fed through a powder dispenser, but thanks to the very high nitroglycerin level, it features superior cold temperature performance; vital in some shotgun loads. Tubular Powder – otherwise known as extruded or stick powder, comes shaped like small cylinders and is most popular in rifle cartridges. When fed through a powder dispenser, it is difficult to produce consistent measurements and is therefore best measured manually.

Most stick powder burns hot, which may increase barrel wear when compared to other powders, but it produces the highest level of shot consistency and accuracy which is vital for precision rifle loads.

SMALL ARMS PROJECTILES

As we have already mentioned, the bullet – or projectile – is the part of the cartridge which leaves the firearm and travels through the air causing physical damage onto the intended target. Bullets come in many different shapes, sizes and weights, each specifically designed to achieve their own result during free-flight and upon impact of a target.

PROJECTILE WEIGHT

When referring to the mass or weight of a projectile (the bullet head itself), we use grain as a measurement. A grain is a very small unit of measurement whereby

Boattail vs Flat Base Projectiles-Guns and Ammo

437.5 grains is an ounce, or 15.43 grains is a gram.

For example:

- A 55gr .223/ 5.56mm bullet weighs 55-grains, 0.125 ounces, or 3.5 grams
- A 168gr .30cal bullet weights 168-grains, 0.38 ounces, or 10.9 grams

The heavier a projectile is in its caliber category, the more stopping power it will typically retain. Heavier bullets also travel further and are generally capable of flying truer along a predetermined trajectory, at least when crosswinds are present. The lighter bullet on the other hand will produce a higher velocity and a flatter trajectory, which can also be advantageous. So as the shooter, it is your job to determine which bullet weight is ideal for your intended use.

PROJECTILE SHAPE

By now we should all understand that bullets are not the same. Even though some may look similar, or have similar specifications, they are all in fact very different from one another. There is a huge difference between different bullet brands, types, powders, and loads, even if the bullets you are using are both the same

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VIEW POINT

Very Low Drag Bullets have an ultra-streamlined boat tail design, which typically sacrifices bullet retention upon impact for a superior ballistic coefficient, very flat trajectory, and great ability to overcome wind. The VLD bullet is generally characterised by its pronounced boat tail, short shank, and very long, highly tapered ogive with a small hollow point

weight. Even bullets of the same weight, shape, size and load, but from different manufacturers will have completely different trajectories.

Two very distinctive characteristics that differentiate one bullet from the next – aside from weight – is the shape of the projectile's base and tip, along with the presence or a cannelure, or lack thereof. The base is found in one of two shapes.

FLAT BASE PROJECTILES

Differentiated by the obvious flat base, these bullets have a number of advantages when engaging targets at closer ranges. The design of the flat base bullet is inherently more accurate and is often preferred amongst short range benchrest shooters. The shorter bullet profile of the flat base will also stabilise easier in rifles with a slower twist, and upon impact, the flat base bullet experiences less jacket and core separation. In other words, the jacket holds onto the core better, allowing for deeper penetration with maximum weight retention. When engaging targets at further distances, the flat base design is slower, producing greater drag and more wind drift. They are specially designed to cause greater damage at close range, and are commonly found in hunting and self-defence ammunition.

BOAT TAIL PROJECTILES

The outline of the boat tail bullet resembles the shape of a boat, with a thin nose and a tapered base. The design produces a far flatter trajectory, retains more energy, and overcomes wind better than the flat base bullet. The higher ballistic coefficient and superior aerodynamical shape improves wind resistance and reduces drag by cutting down the size of the bullet's base. But, this design which is superior for long range engagements does have its disadvantages, the main one being the bullet's terminal performance. The design often causes jacket and core separation upon impact. The boat tail is specifically designed for medium to long range engagements.

Very Low Drag Bullets have an ultra-streamlined boat tail design, which typically sacrifices bullet retention upon impact for a superior ballistic coefficient, very flat trajectory, and great ability to overcome wind. The VLD bullet is generally characterised by its pronounced boat tail, short shank (the straight section of the bullet), and very long, highly tapered ogive (the curve of the bullet's forward section) with a small hollow point.

THE BULLET CANNELURE

These are the tiny striations that can be seen (when present) on the bullet's main body, as seen in the

images above. The main purpose of the bullet's cannelure is to allow the cartridge case to tightly crimp around the bullet in order to produce a more secure fit. In other words, the cannelure allows for an enhanced grip or biting point when seating and crimping the projectile.

So do all bullets have a cannelure? No. The cannelure is typically present in military grade ammo or ammunition that is hand-loaded for general use where the bullet may otherwise be pressed deeper into the cartridge case during rough handling. Precision ammunition generally lacks a cannelure and rather has a smooth surface, as this aids in accuracy. So it really depends on your intended use as to whether you require a bullet with a cannelure or not.

But be aware that crimping a case into a cannelure will increase pressure, and should be load developed & monitored accordingly.

BULLET CATEGORIES

Although bullets come in many different shapes and sizes that are all designed to meet their own specific needs, each bullet will generally fall into one of three categories.

1. Ball Ammunition
2. Expanding Ammunition
3. Frangible Ammunition

BALL AMMUNITION

Ball rounds, which despite their name are not spherical, have a hard outer surface most commonly made of copper with a lead core. This hard outer surface assists the bullet in retaining its shape and dimensions as much as possible after impact, while transferring the least amount of energy into the target in comparison to other bullets.

Ball rounds are designed for maximum accuracy and maximum penetration at varying distances, providing the deepest penetration into a target, which can be an advantage when engaging targets from behind cover. They also the most likely bullet to over- penetrate a target, which in some instances can be significant.

EXPANDING AMMUNITION

Expanding bullets include soft-point and hollow-point rounds, which are designed to expand upon impact, increasing their diameter and therefore delivering far more energy into the target. They are also sometimes referred to as hunting bullets or self-defence loads.

Once an expanding bullet enters a target, it can open up to twice its original diameter. This wider surface travelling through a living target creates a larger permanent wound cavity, and has more chance of passing through critical organs and nerve tissue, creating far greater damage when compared to ball ammunition.

Ball rounds are designed for maximum accuracy and maximum penetration at varying distances, providing the deepest penetration into a target, which can be an advantage when engaging targets from behind cover. They also the most likely bullet to over- penetrate a target, which in some instances can be significant

FRANGIBLE AMMUNITION

Frangible ammo is far less common than ball and expanding ammo, and is often made from compressed copper powder. The bullets are designed to shatter or disintegrate upon impact of a hard surface, such as steel or bone. This eliminates any chance of over-penetration, but the bullets are still deadly when striking their intended target.

Frangible bullets are most commonly used amongst law enforcement personnel for training purposes.

CARTRIDGE DIMENSIONS EXPLAINED

To a newbie, cartridge dimensions and naming conventions may seem confusing. So by studying the following image, we can see how the cartridge and bullet dimensions are defined.

- If you examine the projectile in the image above, you will notice that bullets are measured by their diameter and not by their length, as bullet length will vary amongst different brands and types. This particular .30 caliber bullet measures 7.62mm in diameter, which is equivalent to 0.30", hence the .30 caliber
- The case however is measured by its length, from end to end. This measurement from case rim to case mouth is 51mm. These combined measurement – of the bullet and the case – give us the 7.62x51mm cartridge
- The cartridge length as a whole – otherwise known as the cartridge overall length (COL) – will vary amongst different brands and bullet types, and may be intentionally sized to suit a specific rifle & bullet combination during hand-loading.

-The writer is Director, Hughes Precision Manufacturing Pvt. Ltd. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

ISRAEL DIARY

POLICY CONUNDRUM STRANGLES ISRAELI ARMED UAVs EXPORT

Unable to make the most of the rising demand of armed UAVs globally, the Israeli industry is at odds with the Israeli Ministry of Defence as it has neither eased the heavy export restrictions nor the export laws have changed in conjunction with the lifting of gag order in 2022

By **ARIE EGOZI**

The rising demand for Israeli armed UAVs in many countries amidst heavy export restrictions applied by the Israeli Ministry of Defence (MoD) has led to a bitter debate between the industry and the ministry. As the Israeli Ministry of Defence's export laws have not changed in conjunction with the lifting of the gag order, the fact that Israel has created and utilises armed unmanned aerial vehicles (UAVs) has brought both the ministry and the industries at odds.

In mid-2022, immediately after the gag order was lifted, some countries initiated preliminary talks with the armed UAV makers – Israel Aerospace Industries (IAI) and Elbit Systems. These two companies identified a big potential market but were surprised to get a big no from the ministry. The anger reached a peak when these companies learned that while they were being refused export licenses, Turkey was scoring deal after deal with its armed UAV, mainly the Bayraktar T72.

Elbit Systems' Hermes-450 UAV

Israeli companies are manufacturing some of the more advanced combat proven armed UAV's – Heron-TP (IAI) and Hermes-450 (Elbit Systems). These are the unclassified versions and it can be assumed that there are additional classified types too. The companies repeatedly asked the ministry for the reason behind the export license refusal, but sources related to the issue said that no real reason was given.

An Israeli senior analyst who talked with Raksha Anirveda on condition of anonymity, said that while the world is galloping ahead, the Israeli Ministry of Defence, is not doing anything to join the sales spree of armed UAV.

"I can say that there is no real reason for not allowing the Israeli companies to export the armed UAVs. There was no sense in the gag order that was in force for 20 years, and now the situation has become worse," said the analyst.

The analyst described the situation as "idiotic" especially after the Israeli defence ministry asked the Israeli companies to invest more money in developing longer range, higher-speed armed UAVs. There are no exact data about what the Israeli MoD is seeking from industry related for future designs. Broadly, however, it appears the wish list includes special payloads that would enable upgrading the mission details while the platform is on its way to the operations zone. The option of air refuelling of armed UAV's is also "on the table".

The two publicly known Israeli armed UAVs are Hermes-450 (Elbit Systems) and Heron-TP (Israel Aerospace Industries) respectively.

IAI Heron-TP takes off

According to the official data sheet, the Hermes-450 has a takeoff weight of 550 KG and a max payload of 180 kgs, endurance of 17 hours and the max altitude of 18.000 feet. Israel Aerospace Industries (IAI) describes the Heron –TP as a strategic UAV with a max takeoff weight of 5,670 kgs, a max payload of 2,700 kgs, 30 hours of endurance and a max altitude of 45,000 feet.

According to Israeli defence sources, these two UAV's are only the "tip of the iceberg" and the IAF is using additional platforms equipped with special payloads and special weapon systems. The specifics of these UAV's are highly classified even as they perform missions almost daily.

Azerbaijan has been a client of the Israeli defence industries for many years. Israeli made weapons like air defence systems and loitering weapon systems were heavily used by the Azeris during the war with Armenia about the disputed Nagorno Karabach region. According to Israeli sources, the Azeris were surprised when their request to purchase Israeli armed drones was turned down.

While Israeli Ministry of Defence declined to comment, the Ministry of Defence of Azerbaijan didn't answer when Raksha Anirveda asked for a comment.

In 2021, the Israeli industries asked the Ministry of Defence to ease the export regulations that are relevant to UAV. This request referred to unarmed UAVs. It should be emphasised here that Israel behaved in accordance with its regulations willingly despite not being a member of the missile technology control regime (MTCR).

Recently, Germany decided to arm the Heron-TP UAV it leases from Israel after a long political debate. The change of attitude towards armed UAV is the result of the ongoing war in Ukraine as Germany asked Israel to equip its air force with the Israeli made Arrow-3 ballistic missile interceptor.

One specific squadron of the Israeli air force (IAF) is a major contributor to the fact that 80 % of the total flight hours performed by the force are from different types of UAVs. Squadron 161, the "Black Snake" operates the Elbit Systems' Hermes -450 UAV (Zik), one of the unmanned systems armed with different types of munitions. These munitions have been developed by Israeli companies and according to sources are very accurate and deadly. The details of these munitions missiles and bombs are highly classified. The new versions developed for use on this UAV are later added to the arsenal.

Israeli industry sources told Raksha Anirveda that in the coming years the IAF will get the new version of the Hermes-450 that according to them will be capable of carrying a heavier load of munitions.

While the IAF refused to provide details of the different munitions used by its different armed UAV squadrons, industry sources said that the variety of munitions that are designed for use on UAV have been increased to meet the growing operational requirements.

–The writer is an Israel-based freelance journalist. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

In mid-2022, immediately after the gag order was lifted, some countries initiated preliminary talks with the armed UAV makers – Israel Aerospace Industries (IAI) and Elbit Systems. These two companies identified a big potential market but were surprised to get a big no from the ministry

SPOTLIGHT

Redefining the military airlift and refuelling space, challenging the thinking behind current and future generation platforms, Embraer's C-390 Millennium matches the ever-evolving operational needs of Air Forces around the world

C-390 MILLENNIUM: NEW GENERATION MULTI-MISSION MILITARY AIRCRAFT

By **SRI KRISHNA**

The Embraer C-390 Millennium which was on display at the Aero India 2023 in Bengaluru and drew large crowd is the new generation military multi-mission aircraft that brings unrivalled mobility, high productivity and operation flexibility at low operational costs on a single and unique modern platform.

Embraer is offering the C-390 Millennium to India as Indian Air Force (IAF) to meet its requirement for a new Medium Transport Aircraft (MTA) in the 18-30 tonne class is likely to acquire up to 80 aircraft to boost the country's air arm. The Brazilian airframer also manufactures the A-29 Super Tucano and P600 AEW&C. The Indian Air Force's Netra AEW&C is built upon the ERJ 145 regional jet platform, and the fleet of three Netras is the product of collaboration between Embraer and DRDO.

"We are proud to bring Embraer's iconic C-390 Millennium to India for our guests to experience the true capabilities of this 21st-century military multi-mission aircraft. India is a key market and Embraer is keen to establish partnerships in the country that can further boost India's defence industries and capabilities," said Bosco da Costa Junior, President & CEO, Embraer Defence & Security.

The C-390 entered service with the Brazilian Air Force (FAB) in 2019 and with a fleet of five aircraft, all refuelling versions, designated KC-390, have already accrued more than 7,500 flying hours. Embraer also has orders for the C-390 Millennium from Portugal and Hungary, both NATO member nations. The Netherlands, also a NATO nation, selected the C-390 Millennium in 2022.

The C-390 Millennium can carry 26 tonnes of cargo compared to other medium-sized military cargo aircraft. It can attain a top speed of 470 knots. The C-390 is capable of transporting and launching cargo and troops and performing a wide array of missions

including: medical evacuation, search and rescue, humanitarian search and rescue, aerial refueling (fighters and helicopters), aerial firefighting and humanitarian assistance.

The company offered this aircraft to the Indian Air Force (IAF) in June 2022 and has the capability of performing different operational roles which include aerial refuelling, transporting VIPs to cargo, and also carrying out more challenging logistical operations. This aircraft is the heaviest to be manufactured by the Brazilian aerospace giant – Embraer and can be operated with a three person flight crew — two pilots and a loadmaster. It has the capacity to carry 80 troops, or a combination 74 stretchers and eight attendants or 66 paratroopers.

According to Jackson Schneider, President & CEO, Embraer Defence & Security, the company is open to work with an Indian partner and would deliver the best solution to India by integrating locally manufactured components, capabilities and capacities. And after fulfilling India's orders, it would be exported too with Indian parts on board, he had said.

In the new competition, Lockheed Martin is expected to be a tough competitor to the Brazilian Embraer's C390. Since the IAF is also looking to either lease or buy mid-air refuellers, these aircraft can be used in that role too. To meet its urgent requirement, talks has been going on with Airbus for leasing A-330 multi-role tanker transport (MRTT) and Boeing's KC-46 tanker which is a derivative of Boeing 767 passenger aircraft.

According to a recent report, the Embraer C-390 tactical transport has attained Full Operational Capability (FOC) in service with the Brazilian air force with the FOC being issued by Brazil's Institute of Industrial Development and Coordination which is responsible for certifying military aircraft. The C-390s in Brazilian service can now carry out all missions for which the aircraft was designed.

At an FOC award ceremony, Embraer also commenced the delivery process for the Brazilian air force's sixth C-390 – the first aircraft in the FOC configuration. The Brazilian FOC configuration will also apply to all exports of the C-390. As part of the certification process, C-390 prototypes flew over 3,500 hours, and the equivalent of an additional 85,000 hours were flown using test benches and devices and as its top official Junior said "this certificate places the C-390 in a select group of aircraft in the world."

Elaborating further, he said "it is a unique moment in Embraer's history. The C-390 is redefining the military airlift and refuelling space, challenging the thinking behind current and future generation platforms. Air forces around the world are focused on matching their ever-evolving operational needs with their budgets, seeking a platform that can perform multiple missions, recognizing that today's choice will affect their operational capabilities tomorrow."

– The writer is a senior journalist and media consultant. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

The C-390 is capable of transporting and launching cargo and troops and performing a wide array of missions including: medical evacuation, search and rescue, humanitarian search and rescue, aerial refueling (fighters and helicopters), aerial firefighting and humanitarian assistance

SPOTLIGHT

UKRAINE OPTIMISES CARDBOARD DRONES FOR ISR MISSIONS, STEALTH STRIKE

The Corvo Precision Payload Delivery System (PPDS) - a new addition to the Ukrainian drone fleet, is a low-cost drone that flies itself autonomously with no operator control needed. Ukraine has adapted the system for intelligence, surveillance and reconnaissance missions as well for 'kinetic missions

By **RA EDITORIAL DESK**

The prolonged war with Russia has made Ukraine continuously look out for low cost yet effective drones as cost matters a lot in the war of attrition. It has been enhancing its drone fleet with wide range of models and among these Corvo drone stands out for its unusual feature.

The Corvo Precision Payload Delivery System (PPDS) drones are the new addition to the Ukrainian drone fleet. It is a low-cost disposable logistics drone which was developed for the Australian Army to deliver small, urgent supplies under an AU$1.1 million government contract. Interestingly, Australian Army is yet to purchase the UAV.

Melbourne based company SYPAQ is supplying the Corvo drones to Ukraine under an initiative launched by the Australian government last July.

The Corvo Precision Payload Delivery System is a flat-pack drone with a body made of waxed cardboard. Simple to construct using just a glue gun, knife, pen and tape along with a spanner to attach the propeller, Corvo PPDS are easy to put together. Only certain parts require attention to detail, but the precision manufacturing of the flat-pack kit makes it simple. The Corvo PPDS is launched with a lightweight catapult. Operation is also simple with flight being programmed via a straightforward interface on an Android tablet. And, thanks to the flat-pack design, it's easy to ship the drones.

The PPDS flies itself autonomously with no operator control needed. It uses GPS guidance where available and in case GPS is jammed, the control software can work out its position from speed and heading. Thus, the drone can carry out missions even under conditions of complete radio jamming, which is important in Ukraine.

According to media reports, Ukraine has adapted the system for intelligence, surveillance and reconnaissance missions suggesting that

the PPDS are sent out over Russian-occupied territory with a camera or other sensors to gain information. It has a range of 120 km with potential to bring back pictures from 60 km range and has the reach to direct strikes by HIMARS and other long-range systems.

The Corvo Precision Payload Delivery System (PPDS) is a propeller-driven drone that are constructed from thick, wax-coated cardboard and heavy-duty rubber bands that secure the wings. They are controlled by a military-grade guidance system that requires no user input once the aircraft is launched. It can carry payloads of 3 kilograms (7 pounds) and 5 kilograms (11 pounds).

Ukrainian forces have been using home-made drones, backed by advanced software successfully for bombing missions. Yet, Corvo drones may also be adapted for 'kinetic missions' – delivering bombs.

The fixed-wing design of Corvo PPDS may provide the right fix to the operator's complaint associated with small quadcopter drones limited range that Ukraine deploys in thousands currently. Its dual use - both for reconnaissance and strike makes it a viable system despite the fact that it may not last more than a few missions.

Last month, a British newspaper quoted Ukraine's ambassador to Australia, Vasyl Myroshnychenko, as saying "It looks like something that kids would play with but when you see what it can do it's really amazing. They have been very good at inflicting lots of damage on the enemy" — a clear indication that the cardboard drones are already being used for kinetic missions.

In the Russo-Ukrainian war, drones have emerged as one of the key weapons despite being prey to shoulder-fired anti-aircraft missiles, anti-aircraft cannons, counter-UAV jammers, and even machine guns and rifles. In near future, drones will become consumables like bullets or artillery shells considering the modern warfare's voracious appetite.

"When it's operating with no data link, obviously it's set and forget, and it does a great job of flying down range, monitoring the terrain and figuring out a landing pattern and approach, given the weather conditions," says SYPAQ chief engineer Ross Osborne.

Though exact cost are not known, it is assumed that the cost is in the range of US $670–$3,350 per drone. Media reports suggest that more than 60 of these Corvo drones have been sent by the Ukraine Armed Forces on sorties on the frontline.

They are controlled by a military-grade guidance system that requires no user input once the aircraft is launched. It can carry payloads of 3 kilograms (7 pounds) and 5 kilograms (11 pounds)

AERO INDIA 2023: A REALITY CHECK

India needs to marry its policies and programmes to attain greater self-reliance in the defence sector and the Aero India show provided a well-timed opportunity for county's defence planners to focus on this ambitious programme through a well-planned strategy

By **ASAD MIRZA**

Prime Minister Narendra Modi inaugurated the 14th edition of Asia's largest aero show - Aero India 2023. In his inaugural speech PM Modi said that today, India is not just a market for defence companies in the world. India is a potential defence partner today. This partnership is even with those nations that are much ahead in the defence sector, nations that are looking for a dependable partner for their defence requirements. The theme of Aero India 2023 was "The Runway to a Billion Opportunities".

The PM's focus on Aatmanirbharta in the Indian Defence sector was displayed, as the event showcased the country's progress in design leadership, growth in UAVs Sector, Defence Space and futuristic technologies.

As per Ministry of Defence's figures over 800 exhibitors, including 110 foreign exhibitors, participated in the show. This year the show themed 'the runway to a billion opportunities' was focussed on promoting indigenous aerospace and defence sectors.

Organising such events helps both the defence sector and the industry to identify potential suppliers and showcase respective technological advancement. It becomes a win-win situation for both, but the underlying mandate remains that a big push needs to be required from the government's side to promote new start-ups and motivate them with government orders, in order to complement its 'Aatmanirbhar Bharat' campaign and promote such new companies.

Organising such events helps both the defence sector and the industry to identify potential suppliers and showcase respective technological advancement

BUSINESS AT AERO INDIA

Reportedly over 200 deals were signed worth Rs 80,000 crore at the show, which saw participation from international defence companies, and Indian MSMEs and start-ups. At the governmental level at the "Bandhan" event at the show, Defence PSU Bharat Electronics Ltd (BEL), signed a Memorandum of Understanding (MoU) with Aeronautical Development Agency (ADA) managed by DRDO, for the Advanced Medium Combat Aircraft (AMCA) programme for the Indian Air Force.

The MoU brings together the complementary strengths and capabilities of BEL and ADA, as both will cooperate in design, development, qualification, production and supply of Internal Weapon Bay Computer and other LRUs for AMCA and provide lifetime product support to the Indian Air Force.

On the start-up front, the innovation intermediary and key business incubator T-Hub announced a strategic partnership with Hindustan Aeronautics Limited (HAL). This partnership was aimed to support start-ups in the Aerospace sector and both organisations formalised their alliance by signing an MoU for a two-year term.

This collaboration aims to support start-ups in the aerospace and defence composite market, which is predicted to grow at a compound annual growth rate (CAGR) of 13.1 percent from 2021 to 2027. The partnership is expected to offer industry expertise, resources, and access to markets, providing start-ups with the necessary tools to develop and scale their technologies.

Under the partnership, HAL will assist various new start-ups in building Proof of Concepts (PoC) for new products, providing them the opportunity to gain valuable industry expertise and support to bring their ideas to fruition. Meanwhile, T-Hub will provide access to a diverse network of start-ups with expertise in niche technological areas, as well as mentorship, training, and support services to help start-ups succeed.

This partnership is expected to help the rising number of start-ups in the Aerospace and Defence sectors in India.

SHOW STEALERS

The US Air Force stole the show with its F-35 stealth fighters for the first time in India. But the state-owned defence PSU Hindustan Aeronautics Limited (HAL) also showed its prowess, with its light helicopter product range - twin-engine Advanced Light Helicopter, 3-ton single-engine Light Utility Helicopter (LUH) and the newly-inducted 5.8-ton Light Combat Helicopter (LCH) 'Prachand' - dominated the show.

Lockheed Martin made an impressive display of its F-21 fighter aircraft, C-130J transport aircraft, MH-60R 'Romeo' multi-mission helicopter, Javelin weapon system, and S-92 multi-role helicopter, among others. William Blair, chief executive, India Private Ltd said Aero India allowed Lockheed Martin to showcase its advanced capabilities and address our customers' biggest challenges for the 21st century.

Another global major Schiebel Group, Austria represented by Schiebel India, a subsidiary of the Austrian defence manufacturer, participating in Aero India 2023 for the first time unveiled its flagship CAMCOPTER® S-100, the only tactical VTOL UAS in its class with extensive operational experience on the opening day of the aero show.

In addition, various defence manufacturers from Israel were also the centre of attraction at show. Various Israeli defence companies presented advanced technological solutions that address security challenges faced by many countries around the world today. Some of the ground-breaking technologies include Air Defence Systems, Unmanned Aerial Systems (UAS), Aerial and Ground Precise Guided Munitions, Electronic Warfare (EW) systems, Land and Naval solutions, Avionic Systems, Air and Missile Defence Systems.

On the start-up front, the innovation intermediary and key business incubator T-Hub announced a strategic partnership with Hindustan Aeronautics Limited

AERO INDIA: POST EVENT COVERAGE

Brig Gen (Retd) Yair Kulas, Head of SIBAT, said that the Israeli-made solutions showcased were just a few examples of the cutting-edge technologies that Israel has to offer in the field of aerial defence, which we are proud to share with our partners, such as India.

International collaboration was also in evidence in this product range, as the Indo-French Ardiden 1H1 'Shakti' turboshaft engine powers the ALH (Mk 3, Mk 4) and the LCH, while another variant Ardiden 1U powers the LUH.

GOVERNMENT'S FOCUS

However, in the current global scenario and the technological advancement, the GoI should promote indigenous design and development of superior weapon systems using Artificial Intelligence, which is the way to go forward, globally.

Ministry of Defence is working on the details of indigenous manufacturing of aero-engines to provide a new fillip to the aerospace sector and achieve complete self-reliance.

In his inaugural address at a seminar at the Aero Show, Defence Minister Rajnath Singh stated that after completing 75 years of independence, India is entering 'Amrit Kaal' and it is time to ensure that Indian aircraft fly with indigenously

MAJOR MoUs SIGNED

Gopalan Aerospace India Private Limited and Omnipol of Czech Republic signed an MoU for manufacturing and assembling the first passenger aircraft (L 410 UVP-E20 version) by a private company in India and between HAL and Elta Systems Limited of Israel for cooperation on future business in maritime patrol radar for Indian platforms.

Crown Group also signed two MoUs with Aniba Solution and Garden Reach Shipbuilders and Engineers (GRSE), and GE Marine and HAL have agreed to work together on LM500 marine gas turbines. Furthermore, Bharat Electric Limited (BEL) and Goa Shipyard Limited (GLS) have joined forces to address global market opportunities for naval platforms.

AE Systems and NewSpace Research signed an agreement to collaborate on uncrewed systems. Bharat Forge Limited (BFL) and Paramount Group signed an MoU to collaborate on developing and producing composite rotor blades, mission systems, and store management systems for medium-lift helicopters.

Another MoU was signed between GRSE and Rolls-Royce Solutions GmbH (MTU) for Licensed production with localisation of the MTU 16V4000M73L engine to support the indigenous content for the Next Generation Fast Attack Craft vessel for the Indian Navy.

made engines. He stressed on the need to focus on indigenous design & development of essential weapon systems using emerging technologies like AI, drones, stealth, hypersonic and quantum computing. He exuded confidence that the DRDO, with its capability and dedication, will soon make quick progress in that direction and add to the list of its achievements that include 'Prithvi', 'Akash' and 'Agni' missiles.

The Defence Minister also exhorted the DRDO to encourage start-ups and new R&D establishments to develop incremental innovations, minor sub-systems and their technologies through schemes like Technology Development Fund and Innovations for Defence Excellence (iDEX). "DRDO is no longer just a service provider for defence R&D. It is now also a facilitator for in-house industrial R&D, start-ups and private sector labs. There is a need to take advantage of this synergy," he said.

Rajnath Singh urged the DRDO to set short-term, mid-term and long-term goals and work to build disruptive, cutting-edge or frontier technologies. While we are progressing towards becoming one of the strongest countries in the world, we should have strong support of next level Armed Forces capable of facing any new challenge, he said. And this should also be the underlying

philosophy of the MoD and GoI besides various defence sector producers in the country.

Events like Aero India 2023, offer many start-ups a chance to showcase their innovative products and get noticed by key decision-makers. To offer the start-ups a much-needed platform to showcase their trailblazing innovations, many such platforms are needed indeed.

–The writer is a political commentator based in New Delhi. He can be contacted on www.asadmirza.in. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

AT AERO INDIA 2023

Airbus and the Indian Institute of Science, Bengaluru signed a MoU to expand the country's access to aerospace education and research. This partnership will help develop relevant skills and create a talented workforce that will power the future of the aerospace sector in India. The MoU also emphasises developing, certification, and applying new materials for producing aircraft, engines, and accessories.

Bharat Forge Limited signed an Memorandum of Understanding (MoU) with General Atomics, US, to collaborate on Lithium-Ion Battery System for naval platforms/submarines to address the requirements of the Indian Navy. The parties have also agreed to partner in permanent magnet motors.

Also, during the aero show, some impressive products were launched, including Vertically Launch Short Range Surface-to-Air Missile (BDL), SAL Seeker ATGM for BMP II (BDL), and Jishnu (BDL). Indigenously-built 'Counter Drone Radar' based on technology from the Defence Research and Development Organisation (DRDO) (Astra Microwave Products Limited), 9-millimetre sub-sonic ammunition (Munitions India Limited), and Software-defined NAVIC/GPS receiver module based on indigenously-developed processors (Astra Microwave Products Limited) were also showcased.

AATMANIRBHARTA QUEST

BEYOND THE SURFACE

Ceramic radomes are significant in missile and aerospace systems as they help maintain the radar's reliability while ensuring the desired aerodynamic performance. CUMI's licensing agreement with DRDO will enable it to manufacture ceramic radomes indigenously. The ceramic radome technology developed by DRDO can revolutionise the industry by ensuring the safe and effective operation of radar systems in missile and aerospace programme

By **GIRISH LINGANNA**

Carborundum Universal Limited (CUMI) has signed a licensing agreement with the DRDO for the transfer of technology to manufacture ceramic radomes used in aerospace and missile systems. Radomes are a protective covering that houses the radar antenna on an aircraft or missile. The radome's function is to protect the radar antenna from external weather conditions while allowing electromagnetic waves to pass through it. The importance of the radome lies in its ability to protect the radar antenna while maintaining signal transmission efficiency. In this article, we will delve into the significance of ceramic radomes in missile and aerospace systems and how they help maintain the radar's reliability while ensuring the desired aerodynamic performance.

THE INVISIBLE SHIELD: THE IMPORTANCE OF CERAMIC RADOMES IN AIRCRAFT AND MISSILES

Aircraft and missiles rely heavily on radar sensors for navigation, targeting, and communication. A malfunctioning radar can severely impact the mission's outcome, and hence the radome becomes a critical element in ensuring the radar's reliability. A radome is a protective covering made of composite material that houses the radar antenna on an aircraft or missile. Its function is to protect the radar antenna from external weather conditions while allowing electromagnetic waves to pass through it. The importance of the radome lies in its ability to protect the radar antenna while maintaining signal transmission efficiency.

In aircraft, radomes are typically located on the nose of the plane and are designed to protect the weather radar antenna and other sensitive equipment from the elements. They are usually made of materials that are transparent to radar signals, such as fibreglass or other composite materials. This allows the radar signals to pass through the radome without significant loss or distortion, ensuring that the radar equipment inside can function effectively.

Radomes are also used in ground-based radar systems, where they can protect the radar antenna from the effects of wind, rain, snow, and other environmental factors. They are commonly used in air traffic control radar systems, military radar systems, and weather radar systems.

The radome's impact on aerodynamics cannot be overlooked as it affects the overall performance of an aircraft or missile. A well-designed radome can minimise drag and maintain the aircraft's or missile's speed and manoeuvrability. The importance of radomes in aircraft, rockets, and missiles cannot be overstated, as they are critical components that ensure the safe and effective operation of the radar systems used for navigation, target acquisition, and guidance.

A ceramic radome is regarded as an essential, state-of-the-art technology for ballistic and tactical missiles and high-performance aircraft. Missiles undergo extremely high surface temperatures while travelling through the atmosphere, and while reentering it from space. To withstand those temperatures, radomes located at the tip of a missile are made of ceramic. The ceramic radomes have been developed indigenously by Research Centre Imarat (RCI), one of the premier DRDO labs in the Dr APJ Abdul Kalam Missile Complex,

which has developed India's missile arsenal. RCI spearheads R&D in a diverse range of avionics systems for missile and aerospace applications. RCI is India's premier laboratory for carrying out R&D in the technologies of control engineering, inertial navigation, imaging infrared seekers, radio frequency seekers and systems, onboard computers, and mission software.

Several companies around the world specialise in the design and manufacture of radomes. Some of the top companies in this field include Saint-Gobain Sully, General Dynamics SATCOM Technologies, Meggitt PLC, Cobham Advanced Electronic Solutions, Harris Corporation, AIM Composites, and DuPont Aerospace.

A radome is a protective covering made of composite material that houses the radar antenna on an aircraft or missile. Its function is to protect the radar antenna from external weather conditions while allowing electromagnetic waves to pass through it and maintain signal transmission efficiency

LEADING THE WAY IN SUSTAINABILITY AND INNOVATION: THE CUMI STORY

Carborundum Universal Limited (CUMI), a part of Murugappa Group, is one of the largest and oldest conglomerates in India. CUMI is a name that needs no introduction in the field of material sciences. The 120-year-old Murugappa Group, to which CUMI belongs, has been at the forefront of innovation for decades. N Ananthaseshan, the Managing Director of CUMI, has been with the company since 1986, serving in various positions before taking up his current role. With a Master's in Material Science from IIT, Kharagpur and a Master's Degree in Applied Science from PSG Technology, Coimbatore, Ananthaseshan has vast experience across business verticals of CUMI. He is currently on the boards of Volzhsky Abrasives Works (Russia), Sterling Abrasives, Wendt (India), Foskor Zirconia (South Africa), and is the Chairman of Murugappa Morgan Thermal Ceramics.

Ananthaseshan has played a key role in many of the Mergers and Acquisitions that CUMI has undertaken, including Volzhsky Abrasive Works (Russia), Foskor Zirconia (South Africa), and recently PLUSS Advanced Technologies (India), Rhodius Abrasives, and

AATMANIRBHARTA QUEST

CUMI needs no introduction in the field of material sciences. It is a part of the Murugappa Group, one of the largest and oldest conglomerates in India. The 120-year-old Murugappa Group has been at the forefront of innovation for decades

Awuko Abrasives in Germany.

CUMI's lightweight ceramic ballistic solutions engineered with Alumina, Zirconia-Toughened Alumina, and Silicon Carbide are ergonomic and customisable into various sizes and shapes for use in bulletproof vests. CUMI's high-performance lightweight ceramic materials enable the highest levels of ballistic and blast-proof protection for armoured vehicles. In addition, CUMI is one of the first companies to produce the 'wonder material' graphene for aerospace & defence applications in India. CUMI also brings cutting-edge composite technology for unmanned aerial vehicles (UAVs), including CFRP tubes, panels, and customised composite structural parts for drones.

CUMI's LAToT with DRDO's RCI Laboratory for Ceramic Radome Technology is a significant step towards strengthening India's defence sector. With its rich legacy and expertise in material sciences, CUMI is poised to make a substantial contribution to India's mission to become self-reliant in the defence industry. In addition to its focus on the defence industry, CUMI has a long-standing commitment to sustainability and environmental responsibility. The company's manufacturing processes are designed to minimise waste and reduce the carbon footprint, and CUMI has implemented various initiatives to conserve resources and promote eco-friendly practices.

The licensing agreement between Carborundum Universal Limited (CUMI) and DRDO is a significant development in the aerospace and missile systems industry. The ceramic radome technology developed by DRDO is a state-of-the-art technology that can revolutionise the industry by ensuring the safe and effective operation of radar systems. With the transfer of technology, CUMI will be able to manufacture ceramic radomes indigenously, which will not only boost self-reliance but also provide a sustainable solution for the industry. The move is in line with the government's push for Atmanirbhar Bharat (self-reliant India) and is a testimony to CUMI's commitment to innovation and sustainability. CUMI's expertise in the material sciences industry and DRDO's research and development capabilities will undoubtedly lead to further advancements in the industry, which will benefit the country in the long run.

*–The writer is a Defence and Aerospace Analyst.. The views expressed are of the writer and do not necessarily reflect the views of **Raksha Anirveda***

Unravelling
CIVIL AVIATION

AIRPORT DEVELOPMENT

NOIDA INTERNATIONAL AIRPORT: THIRD AIRPORT IN NCR

The Noida International Airport is being developed through a public-private partnership model (PPP). In 2019, Flughafen Zürich AG, the operator of Zurich Airport in Switzerland won the bid to build and operate the airport for 40 years

By **SRI KRISHNA**

The Noida International Airport also known as Jewar International Airport being constructed in the National Capital Region (NCR) will be the country's largest airport and the third in the area. Once completed, the new airport will be an alternative to Indira Gandhi International Airport in Delhi thereby relieving its high and rising traffic load.

Prime Minister Narendra Modi laid the foundation stone for Noida International Airport on November 25, 2021. The project's Phase 1 is expected to be completed and opened in March 2024.

The Noida International Airport Limited (NIAL) will be the implementing agency on behalf of the Government of Uttar Pradesh. The airport is being developed through a public-private partnership model (PPP). In 2019, Flughafen Zürich AG, the operator of Zurich Airport in Switzerland won the bid to build and operate the airport for 40 years. The National Highways Authority of India (NHAI) is also constructing a 31-kilometre long greenfield highway from the airport to Sector-65, Faridabad on Delhi–Mumbai Expressway.

The proposed plan is to build a two-runway airport by 2024, and at a future date, to expand it into a 7,200 acres six-runway airport. According to the plan, the airport will handle twelve million passengers per annum (MPA) initially and up to 60–120 MPA, after its expansion over a period of 30 years. It will be the third commercial airport in the National Capital Region, after Indira Gandhi International Airport and Hindon Airport.

The project was first proposed in 2001 by then Uttar Pradesh Chief Minister Rajnath Singh as a greenfield Taj International Aviation Hub (TIAH) with the techno-feasibility report for setting up TIAH which was cleared by the Central Government in April 2003. It was to be built at an approximate cost of Rs 5000 crores by the year 2007–2008. The project was put on hold during the UPA regime because the project site was within 150 km of an existing greenfield airport in Delhi. This site was within 72 km of Indira

Gandhi International Airport (IGI), Delhi. Its operator GMR Group had protested against plans for another international airport within 150 km of the existing Delhi Airport, claiming that it would impact traffic and revenue generation. GMR has the right of first refusal (RoFR) on a new airport within 150 km of the existing Delhi Airport. The RoFR was to ensure that GMR gets preference in bidding for the Greater Noida airport in case its bid price is within 10% of the lowest bidder.

In 2012, the Samajwadi Party government led by Akhilesh Yadav contemplated shelving the project while proposing a new international airport in Agra. In June 2013, the State Government decided on the Kurrikupa village near Hirangaon, Tundla in the Firozabad district as the site for the proposed airport. In January 2014, the Defence Ministry raised some objections regarding the site near Tundla. The state government allocated land near Etmadpur for the proposed airport in November 2014.

In 2014, the Bharatiya Janata Party (BJP) was voted to power at the centre and the project was again shifted back to Jewar. The civil aviation ministry cleared the proposal for the new airport to be set up on 2,200 acres of land in June 2015 with the Defence Ministry clearing the project in June 2016. The Ministry of Civil Aviation (MoCA) gave an in-principle approval to the Uttar Pradesh government to build the airport in May 2018.

With six runways once all its expansions are completed, it will be India's and Asia's largest airport and will be the fourth-largest airport in the world. In 2019, a proposal was made to build two additional runways to bring the total to eight runways once completed, subject to the availability of land. The proposal has been approved by Chief Minister Yogi Adityanath.

According to the plan, the airport will handle twelve million passengers per annum (MPA) initially and up to 60–120 MPA, after its expansion over a period of 30 years

It will also be India's first net-zero carbon emissions airport. Only the Chicago–O'Hare and the Dallas/Fort Worth airports are larger, with eight and seven runways respectively. Other existing airports with six runways are Amsterdam, Boston, Denver, and Detroit. Atlanta, Houston–Intercontinental, Seoul–Incheon, Shanghai–Pudong, and Toronto–Pearson have five runways. As of February 2023, with three runways, the Indira Gandhi International Airport has the highest number of runways of any airport in India.

The Noida International Airport (NIA) shall be connected with various highways in Delhi NCR like Ghaziabad–Bulandshahr–Aligarh (NH-34) and Delhi–Ghaziabad–Meerut Expressway. The airport spread over an area of 1,334 hectares is estimated to cost about Rs. 29,650 crore.

AIR MOBILITY

VTOL: FUTURE OF AVIATION

A new non-conventional aircraft system has emerged from the horizon to change our traditional flying experience

By **RAKSHA ANIRVEDA BUREAU**

The aviation sector seems to be poised for a change sooner than later, if aeronautics engineers are to be believed. The vehicle leading this change is a vertical take-off and landing vehicle or a VTOL.

Leading the development in this sector is an American start-up based in Seattle- Jetoptera, which is designing VTOL vehicles with bladeless propulsion systems – committed to change the future of urban flight by making it quiet, safer, and faster.

VTOLs under development, like helicopters, rely on propellers to produce the thrust needed for flight. While VTOLs' spinning blades are typically smaller and quieter than helicopters' large single blade, they do create noise that could be disruptive if we get to the point that a fleet of VTOLs is flying overhead.

To counter this shortcoming Jetoptera is taking a different approach, replacing the standard spinning propellers with a "Fluidic Propulsion System" (FPS), which it describes as "a bladeless fan on steroids."

Jetoptera says this system sends a small amount of compressed air through backward-facing slits in the interior of a ring-shaped thruster. Due to the "Coanda effect" this air creates negative pressure that sucks ambient air into the front of the thruster. It claims that in noisy cities like New York, Los Angeles, and London, its aircraft wouldn't be heard until they were about 200 feet away.

Due to compression, the amount of air that flows from the back of the thruster is up to 15 times more than what's sent from the compressor. The thrusters can be positioned so that this air pushes against the ground during lift off, and then shift to propel the VTOL forward, during horizontal flight.

The FPS has no moving parts that passengers could come in contact with, and based on research funded by the US Department of Defence, the company says the system is "the most silent propulsion method in the skies."

In addition, bucking the current trend of going electric, Jetoptera is not focussing on making its

Jetopetra's VTOL vehicles with bladeless propulsion systems are designed to change the future of urban flight by making it quiet, safer, and faster

flying cars electric - the current plan is to rely on gas turbine generators, meaning the vehicles might one day alleviate ground traffic, but they wouldn't contribute to the environment by going electric.

The company is of the view that while batteries are one likely alternate source of power, yet the current battery technology is simply not advanced enough at this stage.

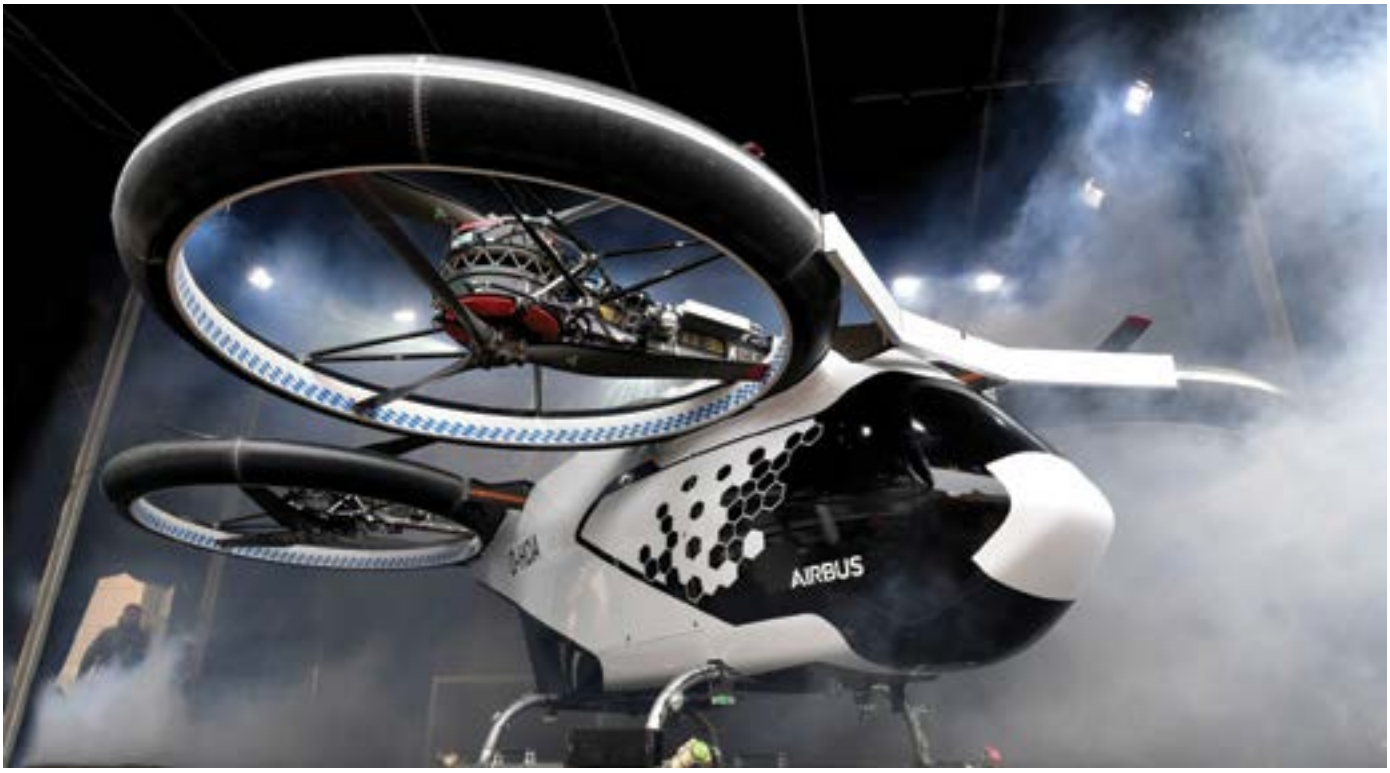
Jetoptera is currently developing several vehicles equipped with its FPS, including a two-seat commuter VTOL called the J-2000. A quarter-scale model of the aircraft test flying in 2019, reached a top speed of 90 mph. Jetoptera expects the full-scale version to have a range of 200 miles and a top speed of 200 mph, with a payload capacity between 450 and 800 pounds.

WHAT IS VTOL?

Vertical take-off and landing - VTOL aircraft include fixed-wing aircraft that can hover, take off and land vertically, as well as helicopters and other aircraft with powered rotors, such as tilt-rotors. Some VTOL aircraft can operate in other modes as well, such as CTOL (conventional take-off and landing), STOL (short take-off and landing), and STOVL (short take-off and vertical landing).

A vertical take-off and landing (VTOL) aircraft is a vehicle that can depart, hover and land vertically. This includes fixed-wing aircrafts with the ability to take off and touch down vertically as well as helicopters or other aircraft with powered rotors.

AIR MOBILITY



Latest eVTOL aircraft use batteries or electric motors instead of fuel, thus reducing the cost of maintenance and fuel leading to lower operating and maintenance costs

VTOL aircrafts' ability to take off and land vertically as well as hover, fly slowly and land in small spaces distinguishes it from the conventional aircraft. Also, the most recent VTOL aircrafts in development use electric motors or batteries instead of fuel, designating them electric vertical take off and landing (eVTOL) aircrafts.

VTOL'S FUNCTIONALITY

There are currently two different types of VTOL technology: rotary wing aircraft and powered-lift.

A rotary wing aircraft (or rotorcraft) uses lift created by rotor blades spinning around a central mast. Like; Helicopters, Gyrodyne - a compound helicopter which has the powered rotor of a helicopter, but a separate forward thrust system or a Cyclogyro – in which the rotary wing's axis and surfaces remain sideways across the airflow, similar to a conventional wing.

Powered-lift aircraft take-off and land vertically but behave differently than rotorcrafts while in flight. They often have a fixed-wing design, like; Convertiplane - which relies on a rotor for lift when taking-off, but then switches to a fixed-wing lift while in flight, Tiltrotor - also known as a pro-protor, moves its propellers or rotors vertical to achieve VTOL and then tilts them forwards while flying for horizontal wing-borne flight; the main wing remains fixed in place, Tailsitter - this aircraft sits vertically for take-off and landing, but, once in the air, the whole craft tilts forward to achieve horizontal flight.

VTOL'S ADVANTAGES

AS the latest eVTOL aircrafts use batteries or electric motors instead of fuel, they generate a huge reduction in the cost of maintenance and fuel, which leads to lower operating and maintenance costs. The electric motors are also more energy efficient than jet engines and help reduce noise pollution and gas emission.

VTOL technology also allows vehicles to land almost anywhere. This makes VTOL aircrafts more flexible and, therefore, able to perform actions that are impossible for conventional planes. This flexibility creates a major advantage for aircrafts in combat or rescue situations.

Since take-off and landing are not controlled by the wings of a VTOL aircraft the vehicle can be built in such a way that the wings are optimised for speed and efficiency. This construction can also help reduce the drag experienced by the aircraft, making it even faster.

Currently, all major aircraft manufacturers like Boeing, Airbus and British Aerospace are improving upon their past prototypes of VTOLs. Only time will declare the winner.

GULFSTREAM OPENS US WEST COAST SALES AND DESIGN CENTER

All-New Beverly Hills Showroom Continues Company's Strategic Expansions and Showcases Award-Winning Interior Design

Savannah, Georgia. Gulfstream Aerospace Corp. today announced the grand opening of its all-new Beverly Hills, California, sales and design center. The approximately 12,000 square-foot/1,115 square-meter showroom further expands Gulfstream's customer resources in the Western United States and highlights Gulfstream's industry leadership in cabin comfort and design.

The Beverly Hills Sales and Design Center features full-scale cabin mock-ups of the Gulfstream G400, Gulfstream G700 and Gulfstream G800 living areas and displays the award-winning Gulfstream G500 and Gulfstream G600 seat designs for customers to test firsthand what best suits their mission requirements. Gulfstream's interior design team works with customers inside the showroom to select from the multitude of finishes, veneers, floor coverings, leathers, textiles and other interior outfitting materials available on-site. In addition, dynamic technology, such as Gulfstream's digital cabin creator and exterior paint configurator tools, assists customers in exploring the full customization and cabin flexibility Gulfstream offers.

"We are always looking for new opportunities to enhance the Gulfstream customer experience," said Mark Burns, president, Gulfstream. "Expanding our portfolio of sales and design centers to the U.S. West Coast is the next phase in our strategic expansion plan and provides further investment in our customers and the growing worldwide Gulfstream fleet."

Along with the interior design team, the Beverly Hills Sales and Design Center is staffed by Gulfstream's LA-based sales executives and complements Gulfstream's sales and design centers in New York City; London; Savannah; Appleton, Wisconsin; and Dallas.

Also in Los Angeles County, Gulfstream's Customer Support service center at Van Nuys Airport, which opened in 2019, provides customers with a wide array of maintenance, repair and overhaul services.

AUTOPILOT SYSTEM FOR BELL 407GXI CERTIFIED IN THE UNITED KINGDOM

Fort Worth, TX. Bell Textron Inc., a Textron Inc. company, announced that the Bell 407GXi 3-axis autopilot has received certification from the United Kingdom's Civil Aviation Authority (CAA).

"We are thrilled to offer the Bell 3-axis autopilot for the Bell 407GXi to our customers in the UK," said Patrick Moulay, senior vice president, International Sales. "The system allows for decreased pilot workload and assistance in the event of inadvertent Instrument Meteorological Conditions (IIMC), overall increasing pilot comfort and ease over long distances."

It is available in the two and three-axis configurations: the two-axis version includes pitch control (altitude hold, IAS hold) and roll control (HDG hold, NAV, vertical navigation mode), and the three-axis option adds yaw control. In addition, the system is equipped with:

- Stability augmentation system to automatically recover the aircraft to near-level flight attitude at all speeds in the event of adverse roll or pitch
- Stability engagement throughout all phases of flight
- Envelope protection to prevent over speeding and under speeding

Owners can specify the autopilot system on new Bell 407GXis or have the system retrofitted.

With the autopilot, advanced Garmin avionics, and a dual channel FADEC-controlled engine, the Bell 407GXi continues to set high standards for single-engine aircraft with its advanced technical features. There are currently 1,500 Bell 407s operating across all six continents totaling more than six million flight hours.

CIVIL AVIATION NEWS

NEW AVIONICS TEST BENCHES FROM HENSOLDT NEXEYA FRANCE FOR ATR

Toulouse. ATR, the world's number one aircraft manufacturer in regional aviation, has procured latest-generation test benches made by HENSOLDT NEXEYA FRANCE, equipped with the ALYSA simulation solution. These can be used to validate newly developed ATR avionics systems that allow for optimised aircraft approach capabilities, improved aircraft operation and more user-friendly pilot interfaces. The test benches equipped with the ALYSA simulation solution were offered to ATR by HENSOLDT NEXEYA FRANCE as part of a tender and satisfy the Toulouse aircraft manufacturer's needs in the best possible way in terms of both reliability and cost efficiency.

Using simulation, the safety of new features can be operationally tested even in scenarios in which flight tests could never be conducted, such as serious system failures or errors, an avionics bus overload or extreme weather conditions. Thus, simulation not only helps with testing during product development but also with certification of ATR aircraft.Simulation is also beneficial in terms of cost efficiency, as it allows for device and software design validation in early project phases – as opposed to at the end of development, when any changes needed may increase costs by a factor of up to ten. Moreover, simulation shortens the duration of flight tests, which account for a significant share of total project cost.

As the ALYSA test bench supplied to ATR is fully modular and scalable, it can be adapted to any future device, system and system of systems developments in the long run. The ALYSA solution deployed in the ATR system is based on experience gained by HENSOLDT NEXEYA FRANCE with validation of fly-by-wire technologies (electronic aircraft control) for various aircraft manufacturers.

The solution is also in use in other industries, for example in trains. Additional features, such as a 3D engine, can be integrated thanks to the fully open design. This means test staff can pilot an aircraft equipped with new features while development is still in full swing.

INDIA EYEING PARTNERSHIP WITH EMBRAER, SUKHOI TO MAKE SMALL JETS LOCALLY

New Delhi. In a move to boost air connectivity in the country, India is trying to ramp up its small-plane fleet as airports with limited capacity and short runways are not equipped to handle narrow-body planes of Airbus and Boeing that dominate the skies.

The government is eyeing partnership with global aircraft manufacturers, including Embraer SA and Russia's Sukhoi to make small planes locally, according to media reports.

Quoting sources, the report said, the government will keep 51 per cent equity with an Indian firm, while asking the foreign partner to do technology transfer. The jets, which typically seat less than 100 people, are likely to be produced in Gujarat, the sources added. India, which is world's fastest-growing aviation market, is trying to ramp up its small-plane fleet as airports with limited capacity and short runways are not equipped to handle narrow-body planes of Airbus and Boeing that dominate the skies. This will help the government bolster tourism and facilitate faster access to remote areas in the country, which recently has been seen to surpass China in population.

The Centre mandates airlines operate at least 10 per cent of their capacity on remote routes, including Kashmir and the Northeast bordering China, which means smaller planes could be more efficient for airlines as they can fill a larger share of total seats. As part of a regional connectivity programme, India has allocated Rs 4,500 crore to develop 100 inadequately-served airports, heliports and water aerodromes, besides opening 1,000 new routes by next year.

Airbus SE estimates India will need 2,210 aircrafts by 2040 and 80 per cent of them will be smaller jets. The country has piqued global turboprop makers' interest, with De Havilland Aircraft planning to seize 80 per cent of its market for smaller planes of less than 20 passengers.

India has completed preliminary discussions with Embraer, while Sukhoi has expressed interest in manufacturing regional jets locally, the sources said. In addition, the country has also approached ATR, a joint venture between Airbus and Leonardo SpA of Italy, to make in India, they added.

ATR's small planes are the workhorse of regional routes in India with the nation's top carrier, IndiGo, operating 39 of them. Rival De Havilland's Dash-8 Q400 turboprops, which seat between 78 and 90 people, are operated by Spice Jet Ltd. State-owned Hindustan Aeronautics Ltd. is already manufacturing the 19-seater Dornier 228 aircraft used by the armed forces and Alliance Air.

NEW SAUDI ARABIAN CARRIER RIYADH AIR TO LAUNCH WITH ALL-BOEING FLEET OF 787-9 DREAMLINERS

RIYADH, Saudi Arabia. Boeing and Riyadh Air announced that the new Saudi Arabian carrier has chosen the 787 Dreamliner to power its global launch and support its goal of operating one of the most efficient and sustainable fleets in the world. Owned by Saudi Arabia's Public Investment Fund (PIF), Riyadh Air will purchase 39 highly efficient 787-9s, with options for an additional 33 787-9s. Based in the capital city, Riyadh Air will play a key role in growing Saudi Arabia's air transport network.

This agreement is part of Saudi Arabia's wider strategic plan to transform the country into a global aviation hub. In total, Saudi Arabian carriers have announced their intent to purchase up to 121 787 Dreamliners in what will be the fifth largest commercial order by value in Boeing's history. This will support the country's goal of serving 330 million passengers and attracting 100 million visitors annually by 2030. The 787-9 provides the longest range of the 787 family of airplanes, flying approximately 300 passengers 7,565 nautical miles (14,010 km), with additional cargo capacity. Passengers enjoy a better experience with the largest windows of any jet, air that is more humid and pressurized at a lower cabin altitude for greater comfort, large overhead bins with room for everyone's bag; soothing LED lighting, and technology that senses and counters turbulence for a smoother ride. The 787 family is delivering unmatched fuel efficiency to airline operators around the world reducing fuel use and emissions by 25% compared to airplanes they replace.

LUFTHANSA ORDERS 10 AIRBUS A350-1000 AND 5 MORE A350-900 AIRCRAFT

Toulouse. Lufthansa Group has signed an agreement with Airbus to expand its fleet by 10 Airbus A350-1000s and 5 Airbus A350-900s. With this firm order for the latest generation widebody aircraft, the airline will continue its decarbonisation trajectory. Compared to the previous generation of aircraft, the A350 consumes significantly less fuel, with a corresponding reduction in emissions. Passengers will benefit from the latest state-of-the-art cabin amenities and comfort on board.

In addition to the agreement on the purchase of the new aircraft, Airbus and Lufthansa have also signed a Memorandum of Understanding (MOU) to further strengthen their cooperation in the field of sustainability and future technologies. This includes the intensified use of sustainable aviation fuels, the further optimisation of operations through a more efficient flight management and exploration into the use of hydrogen.

With its latest order Lufthansa reinforces its long standing relationship with Airbus. Since the A300 in the 1970's, Lufthansa Group has operated all members of the Airbus product family, from the A220, A320-Family, A330 / A340, A350 and the A380.

The A350 is the world's most modern and efficient widebody aircraft and the long range leader in the 300-410 seater category. The A350's clean sheet design includes state-of-the-art technologies and aerodynamics delivering unmatched standards of efficiency and comfort. Its new generation engines and use of lightweight materials make it the most fuel efficient large widebody aircraft. The A350 is the quietest aircraft in its class with 50 percent noise footprint reduction vs the previous generation aircraft, making it a good airport neighbour wherever it flies.

The A350's Airspace cabin is the quietest of any twin-aisle and offers passengers and crews the most modern in-flight products for the most comfortable flying experience. At the end of January 2023, the A350 Family had won 925 firm orders from 54 customers worldwide, making it one of the most successful wide-body aircraft ever.

CIVIL AVIATION NEWS

AIRBUS HELICOPTERS AND INTERNATIONAL SOS JOIN FORCES TO LAUNCH A NEXT GENERATION EMERGENCY MEDICAL SYSTEM IMPROVEMENT PROGRAMME

Marignane. Airbus Helicopters has partnered with International SOS to launch a next generation emergency medical system improvement programme, LifeSaver, which enhances healthcare systems to improve patient outcomes. Estonia is the first country to work with International SOS and Airbus Helicopters to launch a national innovation programme dedicated to improving their emergency medical system (EMS) through LifeSaver.

Estonia is at the forefront of technological innovation, including in the medical sector. By being the first to implement the LifeSaver solution, the country is taking a medium to long-term view on enhancing their EMS response capabilities.

The programme has been created to improve, modernise and support healthcare systems worldwide, many of which have faced significant pressure in the recent years from the pandemic. The approach puts people at its heart by being designed to deliver improved medical outcomes and to save more lives. This medically led programme maximises the use of modern technology by optimising results and creating equitable access to EMS regardless of location within a country. It works based on the efficient and effective use of existing resources and optimises EMS processes to ensure efficiencies in delivery.

The LifeSaver programme can deliver efficiencies including reducing the response time of first responders, creating equity of EMS service levels throughout countries' geographies across urban and remote locations and the optimisation of a country's logistics network.

AIRLINES TO OPERATE FEWER DOMESTIC FLIGHTS

New Delhi. With high oil prices and capacity constraints at airport terminals, Airlines will operate fewer domestic flights during the summer of 2023, as compared to the previous summer, according to available information. According to media reports, data shared by the Directorate General of Civil Aviation (DGCA) show the regulator has approved 22,907 weekly flights across airlines in the summer schedule of 2023, compared to 25,309 weekly flights last year, a decrease of 9.5%. The number, however, is an increase of 4.4% from the 21,941 weekly flights airlines were operating in the winter schedule. Market leader IndiGo has decided to beef up capacity and will operate 11,465 flights this summer as compared to 10,085 flights in winter — a growth of around 14%. The biggest cut has come from financially stressed SpiceJet, which has got approval to operate 2,240 flights in the summer schedule, a fall of 30% from the winter schedule.

PARAS DEFENCE BAGS RS 64 CRORE AVIONICS SUITE ORDER FROM CSIR FOR SARAS MK-2 AIRCRAFT

New Delhi. Paras Defence and Space Technologies Ltd announced March 20 that it has won an order worth Rs 64 crore for Avionics Suite for Saras MK-2 Aircraft from the Council of Scientific and Industrial Research - National Aerospace Laboratories, Bengaluru.

The company said in an exchange filing that the deliveries for the aircrafts are to be done in 2023-24.

Saras, designed by the Council of Scientific and Industrial Research - National Aerospace Laboratories is the first Indian multi-purpose civilian aircraft in the light transport aircraft category.

Avionics Suite of Saras MK - 2 Aircraft is the complete glass cockpit of the aircraft, including all the equipment related to control, monitoring, communication, navigation, weather and anti-collision systems along with auto-pilot system.

Paras Defence and Space Technologies Limited offers high precision products and turnkey solutions to the defence and space sector. During Aero India 2023, the company collaborated with Yantra India to jointly address the requirements of Indian Defence Forces and export markets. Paras Defence has also signed a memorandum of understanding with CONTROP Israel (Precision Technologies Ltd). The pact was signed to expand both the companies in Indian defence sector and overseas markets.

PILATUS REPORTS 2022 AS ONE OF ITS BEST YEARS EVER

New Delhi. The 2022 financial year was a very successful one for Pilatus. The company benefitted from high demand, despite the unpredictable period. With sales of 1.3 billion Swiss francs, operating income of 226 million Swiss francs and orders worth 1.6 billion Swiss francs, Pilatus achieved a very positive set of results.

Pilatus improved yet again on a very successful performance in 2021. 40 PC-24s, 80 PC-12 NGXs, 10 PC-21s and 3 PC-6s were delivered in 2022. In the General Aviation Business Unit, for example, a purchase agreement for over 20 PC-12 NGXs was signed with the US company Tradewind Aviation, virtually doubling this business airline's fleet. 2022 also brought its share of major challenges. Pilatus had to contend with disruptions to supply chains, which impacted negatively on production operations.

Continuing growth in the customer service business: Aircraft deliveries account for a substantial share of the business results, but the customer service business continues to grow as well – by around ten percent over the past year. Last year also saw Pilatus acquire Skytech Inc., the US Sales and Service Centre, gaining another 93 full-time employees overnight. Skytech will continue to sell and service PC-24s and PC-12s on an independent basis along the Eastern Seaboard.

Even greater employer appeal: Breaking with the tradition of the past 25 years, the 2,300 employees at the headquarters in Stans, Switzerland, will no longer receive a bonus payment. In return, Pilatus will raise monthly salaries by incorporating the maximum bonus pay-out in order to better meet the expectations of all employees. This change will make Pilatus even more attractive as an employer.

Outlook 2023: The New Year has also got off to a confident start and promises many highlights: the construction of the maintenance hangar in Buochs will start by mid-2023. And delivery of the 2,000th PC-12 and 200th PC-24 will go ahead during the current year. An additional building for the production of composite components is also planned at the Ennetbürgen site. Further proof that Pilatus remains firmly committed to Switzerland as a centre for ideas, work and training.

PANASONIC AVIONICS ANNOUNCES NEW SOFTWARE ENGINEERING CAPABILITIES BASED IN PUNE, INDIA

Pune / New Delhi. Panasonic Avionics Corporation (Panasonic Avionics), the world's leading supplier of in-flight entertainment and connectivity systems (IFEC), continues to enhance its global software development capabilities. The company on March 20 introduced a rapidly growing set of capabilities based in Pune, India. Panasonic Avionics' operations in Pune are the latest Panasonic investment in India. Panasonic entered the Indian market in 1972 and since then the company has grown from strength to strength and now Panasonic Avionics joins Panasonic Life Solutions India, which currently has 13,000 employees over 13 locations across India.

Panasonic Avionics' new software design centre is part of a company-wide effort to help airlines realise their passenger digital engagement vision using the most innovative IFE hardware, best-in-class enterprise software; seamless global high-speed connectivity; and worldwide support through maintenance, repair, and overhaul (MRO) services. Panasonic Avionics is investing in state-of-the-art labs in India that provide the capability to build and validate new passenger experiences in both single and twin-aisle aircraft to match airlines' need for the right kind of software solutions – all from a one-stop shop. As a result, the company is expanding its talent resources to replicate the full scale of a narrowbody or widebody aircraft, ensuring that it can fully test its IFE and connectivity software in situ and help airlines transform their in-cabin product.

The investment in Panasonic Avionics' global software engineering capabilities will also help improve the time to market of robust, next-generation in-flight entertainment systems, connectivity, and digital app solutions. In 2021, Panasonic Avionics invested in a 'build-operate-transfer' (BOT) operation that today employs over 250 skilled engineers. Over the next 12 months, Panasonic Avionics plans to unveil a new operations facility in Pune. The company is planning for further growth of engineers based in India to over 400, bringing Panasonic Avionics worldwide software development sites to four locations and global team with more than 1,000 software developers.

CIVIL AVIATION NEWS

ISRAEL AEROSPACE INDUSTRIES COMPLETES FIRST SUCCESSFUL TEST FLIGHT OF WIDEBODY FREIGHTER - BIG TWIN

Tel Aviv. The aviation group of Israel Aerospace Industries (IAI) has again proved that it's a leading centre for the conversion of aircraft. IAI has completed the first successful test flight, as part of the final certification process for the B777-300ER passenger aircraft converted to a cargo configuration, known as, The Big Twin. On conclusion of the certification process by the Civil Aviation Authorities, The Big Twin will be the first twin engine aircraft of this type, able to carry 100 tons' cargo payload. This program adds to IAI's 45-year aircraft conversion track record including the B767-200/300, B747-400, and B737-700 / 800 freighter programs, in service today.

In response to the strong demand for cargo aircraft, IAI is currently establishing a number of remote conversion facilities around the world, in addition to the facilities at IAI's home company. During the last year, IAI's Aviation Group has signed hundreds of millions of dollars of passenger-to-cargo conversion contracts with the world's leading aviation companies including AerCap, Emirates Cargo, Challenge Group, EVA Air and CargoJet.

IAI's Aviation Group is the world's leading conversion facility for many aircraft types. The Group deals with all types of manned aircraft, both military and civilian, in IAI; passenger-to-cargo conversion; maintenance, repair and operations (MRO); business jets; aerostructures and assemblies; aircraft upgrades, and more. Among IAI's customers are the world's leading logistics and delivery companies including Amazon, FedEx, and DHL.

GE AEROSPACE'S GENX ENGINES POWER FIRST WIDE-BODY AIRCRAFT ON A LONG-HAUL ROUTE TO INDIA USING SUSTAINABLE AVIATION FUEL

New Delhi. GE Aerospace's GEnx aircraft engines powered the industry's first wide-body aircraft on a long-haul route using Sustainable Aviation Fuel (SAF) to India today. Vistara, India's full-service carrier and a joint venture of Tata Sons and Singapore Airlines, operated the Boeing 787-9 Dreamliner ferry flight from Charleston, South Carolina, in the United States, to New Delhi, India, used a blend of 30% SAF with conventional jet fuel.

The GEnx engine is a high-thrust jet engine developed for the 787 Dreamliner and 747-8 airplane. Compared to its predecessor the CF6, the GEnx engine is up to 15% more fuel efficient with up to 15% fewer CO2 emissions. Representing a giant leap forward in propulsion technology, GEnx uses lightweight durable materials and advanced design processes to reduce weight, improve performance, and lower maintenance, making it the best engine choice for many long-haul flights.

GE Aerospace has been actively involved in assessing and qualifying SAF since 2007 and works closely with producers, regulators, and operators to help ensure SAF can be widely adopted for use in aviation. SAF can be made from plant-based material, fats, oils and greases, alcohols, waste streams, captured CO2, and other alternative feedstocks. The use of alternative feedstocks and processes reduces lifecycle CO2 emissions from how SAF is made compared to fossil-based fuels.

JAPAN AIRLINES SELECTS 737-8 TO GROW SUSTAINABLE WORLD-CLASS FLEET

SEATTLE. Boeing and Japan Airlines (JAL) have finalised an order for 21 super-efficient 737-8 jets. The versatile 737-8 will position JAL to strengthen its domestic and regional network as passenger traffic continues to return to pre-pandemic levels. JAL intends to begin introducing the airplanes into its fleet from 2026.

The 737 MAX will provide JAL with greater range and fuel efficiency, reducing both fuel use and carbon emissions by 15% compared to the airplanes the airline is replacing. In addition, the 737 MAX is a quieter airplane, creating a significantly smaller noise footprint than the airplanes it replaces.

The 737 MAX family has the latest CFM International LEAP-1B engines, advanced technology winglets and other aerodynamic enhancements to improve performance. More than 50 airlines globally are operating over 900 737 MAX airplanes, which have made over 1.4 million revenue flights totalling more than 3.5 million flight hours since late 2020.

AIRBUS AND NORWEGIAN AIR AMBULANCE FOUNDATION TO DEVELOP CITYAIRBUS NEXTGEN'S FUTURE MEDICAL MISSIONS IN NORWAY

Atlanta. Airbus Helicopters has partnered with the Norwegian Air Ambulance Foundation to develop CityAirbus NextGen's future missions for medical services in Norway. To this end, the parties will jointly measure the added value of electric vertical take-off and landing (eVTOL) aircraft for a selection of medical services use cases across the country to integrate the operational requirements right into the configuration of Airbus' eVTOL.

Focusing on how eVTOL aircraft can be used for different types of air medical missions, Airbus Helicopters and the Norwegian Air Ambulance Foundation will elaborate a comprehensive roadmap toward reducing emergency response time through the researched scenarios in Norway. In order to improve patient outcome and the overall performance of the Norwegian Emergency Medical Services system, the signatories will follow a long-term strategic approach to research the complementarity of existing assets, such as conventional helicopters, and eVTOLs when the technology enters into service. This approach could be further expanded in the region through collaboration with other countries to optimise operations beyond the national healthcare system.

As a result, the first step toward the creation of a medical eVTOL ecosystem will be the evaluation of the efficiency of the current emergency medical system in Norway, to then simulate different air medical services scenarios, integrating advanced air mobility assets. To develop the right concepts of operations for these complementary air medical missions, Airbus Helicopters and the Norwegian Air Ambulance Foundation will drive the definition of the foundational elements of the eVTOL ecosystem in the country, including for infrastructure, traffic management and energy sourcing and distribution.

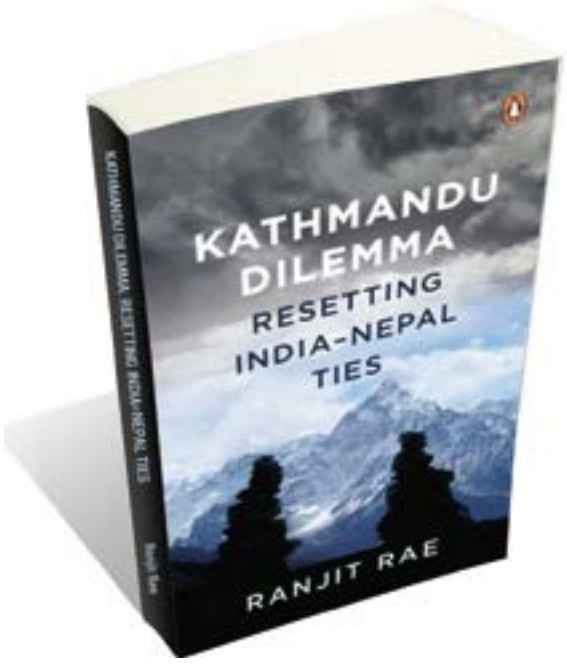
Operating a mixed fleet of H135 and H145, the Norwegian Air Ambulance is Norway's national Helicopter Emergency Medical Service (HEMS) operator. With more than 40 years of experience in emergency medical response, the Norwegian Air Ambulance supports pre-hospital care across the country by delivering air ambulance services to provide patients with advanced medical solutions through state-of-the-art aircraft configurations and equipment.

BOOK REVIEW

KATHMANDU DILEMMA: RESETTING INDIA-NEPAL TIES

The book provides a comprehensive understanding of the contemporary India-Nepal relationship but requires an elaborate description of China's growing influence in Nepal. The book is recommended for policymakers, academicians, students and anyone interested in knowing about the ground realities of the region

By **VAIBHAV KULLASHRI**



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The issue of perception of each other has been put in detail, where the author admits 2015 undeclared economic blockade caused the paradigm shift in Nepal's approach to India

Rarely have we found nations with common civilizational and cultural ethos but still holding their unique identities and bound by treaties allowing free movement across the border. In international relations, this goes beyond the concept of 'collective security'; an example of 'collective co-existence could be the right term that defines the relationship between India and Nepal. However, besides being so close in linkage, the relationship between both nations is becoming fragile, especially after Nepal adopted a new constitution. While India is never out of Nepal's calculations, for New Delhi, it is just another friend turned foe playing at the hand of aggressive China.

With this context, the book 'Kathmandu Dilemma: Resetting India-Nepal Ties' holds relevance and is timely. Written by seasoned diplomat Ranjit Rae, who served as India's ambassador to Nepal during the tumultuous years of the India-Nepal relationship, the book addresses the question that the prime minister asked the author, i.e., 'why don't they like us?'

The book covers many anecdotes explaining the complex relationship between both nations. While one completes the immigration and security checks at the Tribhuvan International Airport (TIA) and moves towards boarding the flight, there is another security check just next to the runway in which the passenger has to climb up a two-foot ladder to a wheeled iron chamber (a raised platform). The practice started after the hijacking of India's IC 814 en route from TIA Kathmandu to IGIA, New Delhi. While Nepalese were outraged by foreign security personnel on Nepali land, a compromise was made by lifting the platform above the ground, thus restricting India's security personnel from touching holy Nepali land.

While the ten chapters comprehensively cover the contemporary India-Nepal relationship; however, the book is more or less based on the author's experiences and assessment of the recent developments

between the two nations. The issue of perception of each other has been put in detail, where the author admits 2015 undeclared economic blockade caused the paradigm shift in Nepal's approach to India. Even India's quick response and financial assistance to the 2015 Nepal earthquake are perceived negatively under China's influence. The author has highlighted that Nepal's perception of India is changing drastically, especially among youth, because of New Delhi's short-sightedness and prevailing noxious anti-India nationalism.

The author is correct when he mentions that India is losing out to the USA, the UK and even China regarding preferred education centre among the Nepali youth, which has not been the case earlier. However, despite the changing narrative, the gap in the relationship is not discussed and addressed at the diplomatic level. This fissure in the relationship is where China is trying to create a further issue in the bilateral relationships. The author does admit that China's presence in Nepal is a reality and it has increased drastically since the anti-China protests in 2008, following which China tried to diversify its engagement with Nepal.

However, the author has highlighted the various policy frameworks to carry out a mid-course correction in the India-Nepal relationship. First, to develop a policy framework that allows direct cooperation between Nepal and India's bordering states i.e., Uttarakhand, Uttar Pradesh, Bihar and Sikkim. Such an initiative will enhance cooperation and address the issue of a boundary dispute, which has become a massive dispute between the two nations within a couple of years. The author highlighted that the recent incident of the Kalapani border dispute indicates India's lackadaisical approach to addressing the ground realities on Nepali soil.

Second, the author proposes that New Delhi must soften its stand on Nepal's growing aspirations. He even recommends amending the 1950 treaty wherein the needs and aspirations of the present Nepali population are addressed while keeping in mind India's geopolitical interests. He mentioned the revision of the India-Bhutan treaty as a precedent that can provide direction for amending the 1950 treaty.

The author is correct when he mentions that India is losing out to the USA, the UK and even China regarding a preferred education centre among the Nepali youth, which has not been the case earlier

Third, the author put it bluntly that India must not see any negotiation between Nepal and China as a threat to India's national security, but it must be seen from Nepal's collective development prism. He even suggested working jointly with China on infrastructure projects benefiting the Nepali population.

India has time and again proved itself and helped doze off Maoist insurgency and shape the democratic set-up in Nepal. India's ground is still firm, and people's perception is mainly because of India's reaction to incidents where New Delhi miscalculated the overall incident and acted based on the perception, which alarms Nepal of interfering in their internal matters. Nepal is sensitive to its unique identity, which over time is overshadowed by India's massive size and reach. Thereby, the author highlighted that the recent claim of Nepal on Ayodhya, Buddhist heritage and the legacy of yoga must be taken with due consideration. Nepal's identity crisis is a reality, which requires the immediate attention of Indian policymakers.

All in all, the book provides a comprehensive understanding of the contemporary India-Nepal relationship while gazing at some of the historical events. The book's standout feature remains that it comes from the person involved in various negotiations that shaped the India-Nepal relationship over time. However, the book still requires a more comprehensive understanding of China's growing influence in Nepal. The book is recommended for policymakers, academicians, students and anyone interested in understanding the ground realities of the India-Nepal relationship.

– The writer is an Assistant Professor at Rashtriya Raksha University, visiting fellow at MICE, Nepal, and a former Research Assistant at CLAWS, Indian Army Think Tank. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

APPOINTMENTS

VICE ADMIRAL ATUL ANAND TAKES OVER AS DGNO

New Delhi. Vice Admiral Atul Anand, AVSM, VSM assumed charge as the Director General Naval Operations (DGNO) on April 1, 2023.

He was commissioned on January 1, 1988 into the Executive Branch of the Indian Navy. He is an alumnus of the National Defence Academy (71st Course, Delta Squadron), the Defence Services Command and Staff College, Mirpur (Bangladesh) and the National Defence College, New Delhi. He has also attended the prestigious Advance Security Cooperation Course at the Asia Pacific Centre for Security Studies, Hawaii, USA. His educational qualifications include an MPhil and MSc in Defence and Strategic Studies, Masters in Defence Studies and a BSc Degree.

A recipient of the Ati Vishisht Seva Medal and Vishisht Seva Medal, he has held several key appointments in his naval career including the command of

torpedo recovery vessel IN TRV A72, missile boat INS Chatak, corvette INS Khukri and the destroyer INS Mumbai. He also served as the Navigating Officer of IN ships Sharda, Ranvijay and Jyoti, and was the Direction Officer of the Sea Harrier squadron INAS 300 and the Executive Officer of the destroyer INS Delhi.

His important staff appointments include Joint Director Staff Requirements, Directing Staff at the Defence Services Staff College, Wellington, Director Naval Operations, and Director Naval Intelligence (Ops). He has also served as the Principal Director Naval Operations and the Principal Director Strategy, Concepts and Transformation at Integrated Headquarters of the Ministry of Defence (Navy).

As a Flag Officer, he has served as Assistant Chief of Naval Staff (Foreign Cooperation and Intelligence), Deputy Commandant and Chief Instructor at the National Defence Academy, Khadakvasla, Flag Officer Commanding Maharashtra Naval Area and the Flag Officer Commanding Karnataka Naval Area.

VICE ADMIRAL SANJAY J. SINGH, ASSUMES CHARGE AS VICE CHIEF OF THE NAVAL STAFF

New Delhi: Vice Admiral Sanjay Jasjit Singh, AVSM, NM assumed the appointment of the Vice Chief of Naval Staff on April 1, 2023. On assumption VAdm Sanjay Jasjit Singh paid homage to the bravehearts at the National War Memorial and reviewed the Guard of Honour at South Block, New Delhi on April 2, 2023.

VAdm Sanjay Jasjit Singh is a graduate of the National Defence Academy, Pune, and was commissioned in 1986 in the Executive Branch of the Indian Navy. In his career spanning 37 years, he has served on most class of ships of the Indian Navy and has held a range of command, training and staff appointments, including Assistant Chief of Naval Staff (CSNCO), Flag Officer Sea Training, Flag Officer Commanding Western Fleet, Commandant Naval War College, and Controller Personnel Services.

Prior to taking over as the Vice Chief of Naval Staff, he was Deputy Chief of Integrated Defence Staff (Operations).

He holds MSc and MPhil in Defence and Strategic Studies from Madras University, MA in Defence Studies from Kings College, London, and MA (History), MPhil (Pol) and PhD (Arts) from Mumbai University.

In recognition of his distinguished service, the Flag Officer was awarded the Nao Sena Medal in 2009, and Ati Vishisht Seva Medal in 2020.

Vice Adm Dinesh K Tripathi Takes Over as FOC-in-C, Western Naval Command

New Delhi. Vice Admiral Dinesh K Tripathi, AVSM, NM took over as Flag Officer Commanding-in-Chief (FOC-in-C), Western Naval Command (WNC) from Vice Admiral Ajendra Bahadur Singh, PVSM, AVSM, VSM, ADC at an impressive Ceremonial Parade held at INS Shikra on February 28, 2023. On taking over, the Flag Officer paid homage to all personnel who made the supreme sacrifice in service of the Nation by placing a floral wreath at the Gaurav Stambh (the Victory at Sea Memorial at Naval Dockyard, Mumbai).

Prior to taking over as Flag Officer Commanding-in-Chief, Vice Admiral Tripathi served as the Chief of Personnel at the Integrated Headquarters of the Ministry of Defence (Navy). An alumnus of Sainik School Rewa and National Defence Academy, Khadakwasla, he was commissioned into the Indian Navy on July 1, 1985.

A Communication and Electronic Warfare specialist, he served on frontline warships of the Navy as Signal Communication Officer and Electronic Warfare Officer, and later as the Executive Officer and Principal Warfare Officer of Guided Missile Destroyer INS Mumbai. He commanded Indian Naval Ships Vinash, Kirch and Trishul. On promotion to the rank of Rear Admiral, he served as Assistant Chief of Naval Staff (Policy and Plans) at IHQ MoD (N) and as the Flag Officer Commanding Eastern Fleet.

On promotion to the rank of Vice Admiral in June 2019, the Flag Officer was appointed as Commandant of the prestigious Indian Naval Academy at Ezhimala, Kerala. He was the Director General of Naval Operations from July 2020 to May 2021, a period that witnessed a high tempo of Naval Maritime Operations. He ensured that Navy remained a combat ready, cohesive and credible force, ready to address a host of complex security challenges despite

all round severity of COVID Pandemic. The Admiral is a graduate of Defence Services Staff College, Wellington, where he was awarded the Thimmaiya Medal. He also attended Naval Higher Command Course and Naval Command College at the US Naval War College, Newport, Rhode Islands in 2007-08, where he won the Prestigious Robert E Bateman International Prize. Vice Admiral Tripathi is a recipient of Ati Vishisht Seva Medal and Nausena Medal for devotion to duty.

Airbus Selects Thomas Toepfer as Future Chief Financial Officer

Amsterdam. Airbus SE has appointed Dr Thomas Toepfer, 50, to succeed Dominik Asam, 53, as Chief Financial Officer (CFO). Thomas Toepfer, currently CFO of Covestro AG – a DAX40 company and one of the world's leading suppliers of premium polymers – will join Airbus on September 1, 2023.

Dominik Asam will leave Airbus on 3 March. Xavier Tardy, Executive Vice-President Finance for Airbus Defence and Space, will ensure continuity during the interim period in addition to his current role. As CFO, Thomas Toepfer will report to Chief Executive Officer Guillaume Faury and become a Member of the Airbus Executive Committee.

Dr. Thomas Toepfer has been Covestro's Chief Financial Officer (CFO) since April 2018 and additionally holds the position of Labour Director since January 2019. Before joining Covestro, he was Chief Financial Officer of KION Group, a leading provider of materials handling and warehouse automation solutions. Since January 2022, Toepfer has also been a member of the shareholder committee and Supervisory Board of CLAAS KGaA mbH, a leading global manufacturer of agricultural machinery. Dr. Thomas Toepfer holds a PhD in Business Administration from Otto Beisheim Graduate School of Management (WHU), Koblenz.

New Leadership at CII Delhi: Puneet Kaura, Samtel Avionics MD & CEO Takes Over as Chairman

New Delhi. Puneet Kaura, Managing Director & CEO, Samtel Avionics Limited took over as the Chairman of Delhi State during its State Council Meeting. Setting the theme for CII Delhi as ''Leveraging Technology Towards Realizing Vision 2047 – Sustainability, Competitiveness, Growth, Inclusiveness", Puneet added that technology has been playing a significant role towards bringing innovative solutions for various areas such as climate change, fintech, food security and health, amongst others. He said that the integration of technology, innovation & Research will play a critical role in accelerating the development. Puneet has been instrumental into building Samtel's – a key Indian player in state-of-the-art systems for high-end applications in Defence Avionics, Armoured Vehicles and Railway Applications competence to compete on a global scale, and today Samtel is a supplier and partner to the top global players in the Aerospace and Defence industry. Owing to his initiatives in driving Samtel to contribute towards the 'Make in India' program of the Indian govt., he was hand-picked by Niti Aayog for Prime Minister's Champions of Change 'think-tank'. He is a part of a permanent team of Young CEOs who will share ideas with the Prime Minister and Niti Aayog to lead the transformation of India.

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Milipol India

The Indo-Pacific leading International Event for Homeland Security

26 - 28 October 2023
New Delhi

BREAKING NEWS - Milipol is in India!

Milipol India, the Leading International Event for "Internal Security" for Indo-Pacific, will be held in New Delhi from the 26th to 28th October 2023.

We are thrilled to announce that Milipol India, the latest addition to the Milipol International Network of events dedicated to internal security will take place in New Delhi from the 26 th to 28 th October 2023. Placed under the patronage of the Ministry of Home Affairs, Government of India along with Ministry of External Affairs, Government of India and the French Minister of the Interior, this new exceptional event is organised by Interads Exhibition and Comexposium, acting on behalf of the Milipol headed by Civipol, the cooperation implementer of the French ministry of the Interior.

"Milipol India illustrates the strong will from France and India to further strengthen and grow their strategic and political partnership. Technology is a driving force within the Internal Security ecosystem. It's a place where innovators take the lead."

For 30 years, Milipol Events have been promoting the best-in-class products and servicesof the homeland security and civil defense ecosystem to the utmost demanding state orprivate decision makers.

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And when it comes to homeland security, India market is the place to be: Milipol India aims to bring to Indian brands a global stage to showcase their products and attracts buyers from outside the continent.

Milipol India is a formidable promotional platform for safety and security companies, which offer the most innovative technological solutions, innovation being at the heart of this market today: cutting-edge technologies and services for the fight against terrorism and organized crime, border control, critical infrastructure protection, urban security, risk analysis and management.

Milipol India will welcome more than 180 exhibitors including international pavilions showcasing their latest equipment's and technologies and 5,000 + security industry professionals from the Public and Private sector. VIP Officers from regional and international Government security forces will be there to discuss and interact with our exhibitors around their needs and their future projects.

Milipol is also, through its conference cycle, a place for exchanges and high-level debates on the most structuring subjects for the safety and internal security of States which will define the future challenges for our security forces. An event not to be-missed!

The Milipol International Network is the world reference when it comes to events dedicated to Internal security. It provides the perfect forums for unveiling the latest technologies in internal security and perfectly meets the needs of the whole of the sector while addressing the current fast evolving threats.

Milipol India will support, facilitate, and attract the world leaders to invest in India where size and volumes call for the most innovative security solutions..

We are excited to welcome you at Milipol India, where government's decision makers,operational end-users and worldwide industry leaders will meet, network and learn from each other under one roof over three days in New Delhi from the 26th - 28th October, 2023..

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NEWS ROUND UP

SHIELD AI, BOEING ENTER PARTNERSHIP TO EXPLORE STRATEGIC COLLABORATION IN ARTIFICIAL INTELLIGENCE, AUTONOMOUS CAPABILITIES

Washington. American Defence technology startup Shield AI and contracting giant Boeing announced a new partnership to investigate how to speed up delivering artificial intelligence and autonomous capabilities to war fighters.

`The two companies signed a memorandum of understanding during the Air Force Association Warfare Symposium this week in which Shield AI and Boeing's experimental Phantom Works division will "explore strategic collaboration in the areas of autonomous capabilities and artificial intelligence on current and future defence programs," according to a Boeing press release.

Shield AI will provide its Hivemind AI pilot system, which has already flown aircraft and can "enable swarms of drones and aircraft to operate autonomously without GPS, communications or a human pilot in the cockpit," the release says.

Steve Nordlund, vice president and general manager of Air Dominance for Boeing Defence, Space & Security, and Brandon Tseng, Shield AI's Co-Founder and President signed the memorandum of understanding (MoU). Since its founding in 2015, Shield AI itself has acquired a number of companies focused on artificial intelligence and uncrewed aircraft. In 2021, it bought Heron Systems — the company whose AI defeated a human F-16 pilot in DARPA's Alpha Dogfight trials — and Martin UAV, which makes the V-Bat drone.

Last year, Shield AI announced it had received an Air Force contract worth up to $60 million for a number of projects involving Hivemind. In February last year, Tseng said as part of the contract, the company will integrate Hivemind into V-Bat. Tseng said at the time that the goal was to have swarms of three to five V-Bat drones ready for operation and production by the end of 2023, increase to 10 V-Bat swarms the next year and then up to 30 in 2025.

Boeing, meanwhile, brings decades of defence production experience, not to mention government relationships, to the partnership, which is part of its broader push — along with its competitors — into next-generation autonomous platforms.

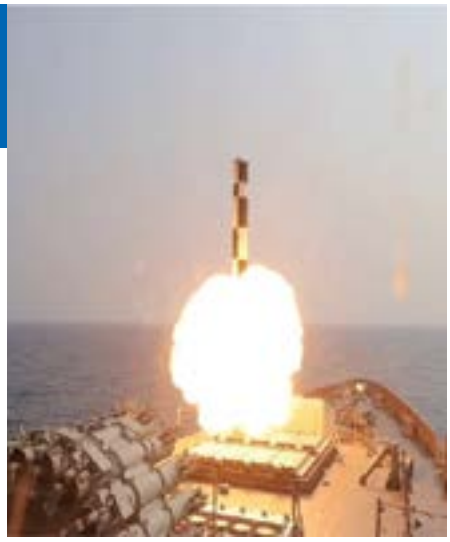
BELL AND PRATT & WHITNEY TO COLLABORATE ON HIGH-SPEED VTOL PROPULSION TECHNOLOGY

As industry partners interested in accelerating the future potential of High-Speed Vertical Takeoff and Landing (HSVTOL) technology, Bell and Pratt & Whitney are collaborating on propulsion solutions for the development of HSVTOL technology. Bell continues to work with the US Government and its industry partners to reduce risk and develop capability requirements. As Bell continues to build its strong team, we're having open discussions and collaborating with industry thought leaders, including Pratt & Whitney, to rapidly deliver HSVTOL capabilities to the warfighter.

Bell is actively developing innovative vertical lift technologies including the HSVTOL family of vehicles. HSVTOL provides next generation capability in vertical lift speed, range, and survivability. This type of technology blends the manoeuvrability of a helicopter with the speed, range and survivability features of a fighter aircraft. Bell's HSVTOL technology may serve a variety of complex missions in the future battlespace for runway independent agile mobility, SOF infil/exfil, personnel recovery, and Strike/ISR.

HSVTOL technology leverages existing Bell experience with the development of high-speed vertical lift aircraft, with the Bell 360 Invictus dashing over 200 knots, and the Bell V-280 Valor cruising to over 300 knots. HSVTOL development unlocks next generation capability for speed, range, and survivability. HSVTOL's runway flexibility provides the capability to utilize runways with conventional jet takeoff when runways are intact and independence with short field takeoff and vertical takeoff when runways are compromised.

SUCCESSFUL LAUNCH OF BRAHMOS MISSILE WITH INDIGENOUS SEEKER AND BOOSTER



New Delhi. The Indian Navy carried out a successful precision strike in the Arabian Sea by ship-launched BRAHMOS supersonic missile with DRDO designed indigenous seeker and booster on March 5, reinforcing our commitment towards Aatmanirbharta (self-reliance) in defence, the Indian Navy statement said. "The missile test was carried out from a Kolkata-class guided missile destroyer warship. BrahMos Aerospace is continuously working on increasing indigenous content in the missile," the Indian Navy officials said. BrahMos Aerospace Pvt Ltd, an India-Russian joint venture, produces supersonic cruise missiles that can be launched from submarines, ships, aircraft, or land platforms. BRAHMOS missile flies at a speed of 2.8 Mach or almost three times the speed of sound. BrahMos Aerospace is also developing the BRAHMOS NG, a compact version of the missile. Last year in April, the anti-ship version of the supersonic cruise missile was successfully test-fired jointly by the Indian Navy and the Andaman and Nicobar Command. India is also exporting BRAHMOS missiles. In January last year, India sealed a $375 million deal with the Philippines for supplying three batteries of the missile. India is also eyeing other countries such as South Africa, Saudi Arabia, UAE and Egypt to sell the missiles.

AFINDEX 2023: 'VARUNA' – INDIA'S FIRST PERSONAL AERIAL VEHICLE ATTRACTS AFRICAN NATIONS INTEREST

Pune. At the recently concluded second edition of AFINDEX 2023 in Pune, 75 indigenous technologies were on display on the sidelines as part of the summit's goal of defence partnership and defence industry outreach to the African continent.

Among these, India's first indigenous Personal Aerial Vehicle `Varuna' from Sagar Defence Engineering attracted keen interest of participating African nations. There were indigenous products from 32 industries which were manufactured under Prime Minister Narendra Modi's `Make in India' initiative. Besides the participants of the African nations, there were Army Chiefs as well as representatives of Chiefs from the region.

While nine countries including Seychelles, Tanzania, Uganda, Zambia, Ethiopia, Kenya, Lesotho, and Niger sent in their contingents to participate in the exercise, observers from eleven African nations were present. A two day conclave of the army commanders and other senior officers from the region was also organised on the sidelines of the exercise.

AFINDEX presented a platform to display modern drone technology at a global scale and also encouraged African countries to explore indigenous defence equipment to boost national security.

"Varuna is the country's first autonomous platform designed and developed indigenously, with the goal of revitalizing urban air mobility. Through vertical take-off and landing (VTOL) and electric propulsion technology, Varuna can be utilised as an air ambulance for emergency medical evacuations along with executing search and rescue missions in remote areas," said Capt Nikunj Parashar, Managing Director and founder, Sagar Defence Engineering.

Elaborating further, he said that Varuna has been designed for autonomous takeoff and landing, even on moving platforms. And this is a result of intensive R&D. It has been created as a dual-use technology, where the military forces will be the original early adopters and utilise the technology first before it is applied to future urban air mobility as it can travel 25 kms in the air with a payload capacity of up to 100 kilograms on board.

"We believe autonomous systems may contribute to a multimodal mobility system, including Urban Air Mobility which leverages the sky to better link people to cities and regions," said Capt Nikunj. Displaying to delegates from the African continent was an opportunity to showcase the capability of the Indian indigenous defence industry and also enhance combat readiness, he concluded.

NEWS ROUND UP

SUPER HORNET PRODUCTION LINE WILL CLOSE IN 2025: BOEING

Washington. Boeing will end the F/A-18E-F Super Hornet production line in 2025 and will not accept any more US orders beyond the eight aircraft Congress added to the fiscal 2023 budget. The company, describing the move as a "pivot," will refocus its people and facilities on other projects and look ahead at future work, it said in a statement.

With the St. Louis-based workforce and production facility freed up, Boeing said it will be able to increase production of the T-7A Red Hawk all-digital training system, F-15EX Eagle IIs and 777X wing components for the US Air Force and the MQ-25 Stingray unmanned tanker drone for the US Navy. Additionally, the company plans to devote more attention to developing future programs.

The company is building three new facilities in St. Louis for advanced crewed and uncrewed platforms. These, plus the MQ-25 production facility at the MidAmerica St. Louis Airport, a new Advanced Composite Fabrication Centre in Arizona, and new design and production tools at existing St. Louis

plants, represent a $1 billion investment in the company's future in military aircraft, according to the news release.

Boeing's announcement caps off a decade of fluctuations for the Super Hornet production line. The Navy initially planned to stop buying the jets in FY14, amid sequestration budget caps, only for Congress to continue adding planes incrementally over the next few years. The Navy eventually began planning for additional purchases, including a multiyear contract covering fiscal years 2019 through 2021, to help manage a projected fighter shortfall in its inventory.

The service intended to end its Super Hornet orders after that multiyear contract wrapped up. But Congress intervened again and added $977 million in FY22 for 12 planes and $600 million in the current year's budget for eight additional aircraft. The Super Hornet Service Life Modification program, which upgrades the jets and adds about 4,000 flight hours to their service life, along with an EA-18G Growler modernization program, will continue into the 2030s on a separate production line in St. Louis.

BHARAT ELECTRONICS SIGNS MOU WITH NITK SURATHKAL

Bengaluru. Bharat Electronics Ltd (BEL), a Navratna Defence PSU has signed an MoU with the National Institute of Technology Karnataka (NITK Surathkal) for co-operation in R&D for the development of emerging technologies and technical solutions for both Defence and non-Defence applications. The MoU aims at leveraging the complementary strengths and capabilities of BEL and NITK Surathkal, while facilitating indigenisation of products and solutions in keeping with the Government's Make in India and Aatmanirbhar Bharat initiative.

National Institute of Technology Karnataka, Surathkal, formerly known as Karnataka Regional Engineering College, is a public technical university and institute of national importance. NITK Surathkal is recognised for its strength in research and development in engineering disciplines, basic sciences and management. The institute lays strong emphasis on research and has collaborations with leading industry and academic institutions in India and abroad. It is ranked among the top engineering institutes in India and is known for its high-quality education and research programmes. Defence PSU Bharat Electronics Limited (BEL) was established in 1954 with a farsighted vision to make the country self-reliant in Defence electronics. Today, BEL is a multi-product, multi-technology, multi-Unit conglomerate which designs, manufactures and supplies state-of-the-art products and systems in a wide variety of fields including Radars, Missile Systems, Military Communications, Naval Systems, Electronic Warfare & Avionics, C4I Systems, Electro Optics, Tank Electronics & Gun/Weapon System Upgrades, and Electronic Fuzes in the Defence segment. Bharat Electronics has been putting in efforts to engage in collaborative R&D in addition to augmenting its own R&D set up. Its recent attempts to outsource work to Indian private industries and MSMEs, or the path breaking decision to go in for Public-Private partnerships to execute turnkey projects, ensures that it is in sync with the Government's larger goal of indigenisation and self-reliance.

INDIA TARGETS DEFENCE EXPORTS WORTH RS40,000 CRORE BY 2026: DEFENCE MINISTER

New Delhi. Defence Minister Rajnath Singh while addressing the 'Rising India Conclave' on March 29 in New Delhi said that from secure borders and self-reliance to a strong economy and transformed global image, India is rising as one of the strongest countries under the leadership of Prime Minister Narendra Modi.

Pointing out that all sectors, especially defence, have been witnessing a transformative change in the last few years and has guided India to a respectable position on the world map, Defence Minister Singh stated that domestic defence production has witnessed a significant increase in the last few years, and India is "exporting weapons and equipment to other countries."

"We are not only catering our own needs, but are also exporting weapons and equipment to other countries. From Rs 900 crore 7-8 years ago, defence exports have skyrocketed and are nearing Rs 14,000 crore in the current Financial Year. Our target is to export defence equipment

worth Rs 40,000 crore by 2026," he said.

Lauding Prime Minister's visionary leadership "which has guided India to become the fifth-largest economy and transformed its global image to that of an agenda-setter," he said "In 2013, investment firm Morgan Stanley had coined a phrase 'fragile 5' economies and named India among them. Under the Prime Minister's leadership, we successfully dealt with the problems such as the possibility of recession and COVID-19 pandemic, and today we are an inspiration to other countries. The highest-ever FDI inflow of US $83.57 billion last year is a positive sign for the economy and proof that the world has faith in the possibilities and opportunities available in India. From 'fragile 5', we are now among 'fabulous 5'." "According to a report by Morgan Stanley, India will be one of the top three economies of the world by 2027. When we celebrate the 100th anniversary of our independence in 2047, I am hopeful that we will be the world's top economy," he added.

The Defence Minister further said that India led the world on issues like terrorism and has been successful in garnering support to eliminate the menace. He emphasised that countries, which use terrorism as a tool, are well aware of the fact that "India never harms anyone unnecessarily, nor does it spare anyone who tries to hurt its unity, integrity, and sovereignty". He stated that the surgical strikes move broke the back of terrorists and sent a strong message to the world that India will eliminate terrorism on its own soil and if need be, on foreign land as well.

NATO SUPPORT AND PROCUREMENT AGENCY ORDERS ADDITIONAL AIRBUS A330 MRTT

Getafe. The NATO Support and Procurement Agency (NSPA) has ordered an additional Airbus A330 Multi-Role Tanker Transport (MRTT), increasing the Multinational MRTT Fleet (MMF) to 10 aircraft. This announcement follows Belgium's decision to increase its number of hours in the programme with an additional 1,100 flight hours per year. The Multinational Multi Role Tanker Transport Fleet (MMF) provides strategic transport, air-to-air refueling and medical evacuation capabilities to its six participating nations: Belgium, the Czech Republic, Germany, Luxembourg, The Netherlands and Norway. These Nations signed the Memorandum of Understanding that enables them to share costs proportionally according to the national commitment of flight hours per year. MMU already operates seven A330 MRTTs and reached Initial Operational Capability ceremony on March 23rd. Full Operational Capability is expected in mid-2024. Its success relies on the excellent cooperation between NATO, the participating nations and industry. The programme also stands as an example on how nations can cooperate, pooling and sharing resources to get ongoing access to state of the art capabilities. The unit has been deployed in NATO's Eastern Flank, as well as for the evacuation of Afghanistan civilians and refugees and for multinational exercises in the Indo-Pacific

region with the German Air Force, among other missions. Two of the tankers yet to be delivered are expected to enter service in 2024, while this new aircraft will arrive at the end of 2026. The MRTTs from MMF operate from MMU Main Operating Base (MOB) in Eindhoven (Netherlands) and the Forward Operating Base (FOB) in Cologne (Germany).

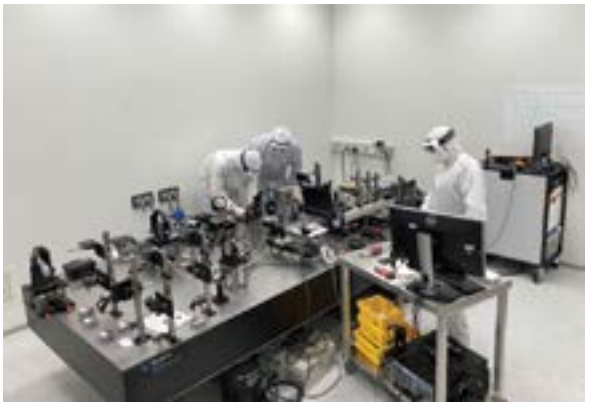
NEWS ROUND UP

HENSOLDT EXPANDS PRODUCTION AREA FOR HIGH-PRECISION MEASURING DEVICES IN OBERKOCHEN

Oberkochen/Germany. Sensor solutions provider HENSOLDT is expanding its production space for high-precision measuring devices at its Oberkochen site. In order to accommodate the growing civilian business in the area of subcontracting for the market leader of EUV machines for the production of semiconductors from the Netherlands, the space for the production of Final Focus Metrology (FFM for short) units has been doubled. Since the current space situation does not allow for further expansion, it was possible to fall back on an area in the immediate vicinity at the company YG-1 Technology Centre.

The partnership has also opened up future-oriented business areas for the YG-1 Technology Center. With a wide variety of components in terms of production structures and materials, innovative tooling technologies and concepts can be developed and tested and produced directly in prototype manufacturing on the new machines in the in-house test centre.

With the help of the expansion, HENSOLDT will be able to increase the production of the FFM unit by 20 per cent, and in the following year it will be another twelve per cent. Overall, the customer of the FFM units is planning a 30 percent increase over the next five years. As a result, HENSOLDT also expects to recruit more skilled workers in the optics and optronics sector.



In March, HENSOLDT recorded a milestone with the delivery of the 333rd FFM for the chip industry. Since 2012, these control systems have been produced at HENSOLDT Optronics in Oberkochen and continuously developed further. FFM is a high-precision measuring device in the wavelength range of ten µm. By means of high-speed position sensors, energy sensors and specially developed wavefront sensors, performance-critical process parameters of a high-energy laser, as well as shapes and positions of approx. 30µm tin droplets in a vacuum chamber are determined. On the basis of the data determined by the FFM, a control loop is closed and the performance and accuracy of a laser beam, which has to hit the tin droplets twice each to produce the extreme ultraviolet (EUV) light, is optimised, thus decisively influencing the efficiency of the light generation. The FFM functions as the decisive optoelectronic control unit, 50,000 times every second. Without EUV light, the production of today's most powerful computer chips would not be possible.

INDIA'S DEFENCE EXPORT SURPASSES RS 13,000 CRORE MARK

New Delhi. In a boost to indigenous defence industry, Indian defence exports surpassed the Rs 13,000 crore mark, with a new record expected this fiscal year due to increased demand in Europe and government efforts to engage partners such as Armenia, which is looking for reliable suppliers.

According to Stockholm-based SIPRI, India continues to be the world's largest importer of arms, but purchases from foreign vendors fell by 11 per cent between 2013-17 and 2018-22. This figure is likely to fall further as India has drastically reduced its import options, instead relying on awarding contracts to domestic firms.

According to the most recent data available from the defence ministry, the total export value of defence goods was Rs 13,399 crore as of the first week of March. The figure could rise further as deals are signed up until the end of the fiscal year.

This would surpass the Rs 12,815 crore earned last year in terms of arms sales to foreign nations in 2022-23. Exports of arms fell from a high of Rs 10,746 crore in 2018-19. According to industry insiders, queries and orders have been coming in from all over the world, but Europe has seen a significant increase in demand due to the ongoing Russia-Ukraine conflict. “Major defence equipment exported over the last five years has included weapon simulators, tear gas launchers, torpedo loading mechanisms, alarm monitoring and control, night vision monocular and binocular, lightweight torpedo and fire control systems, armoured protection vehicle, weapons locating

AFINDEX 2023: EXICOM'S RADIO TECHNOLOGY USED DURING AFRICA-INDIA JOINT EXERCISE

New Delhi / Pune: Exicom Technologies India was part of the joint exercise conducted by the Indian Army on various tactical scenarios at the recently held second edition of the AFINDEX-2023 (Africa-India Field Training Exercise), Foreign Training Node, Aundh, Pune.

The joint exercise, with over 100 participants focused on Humanitarian Mine Action and Peace Keeping Operations. The improvement of interoperability and operational readiness for UN peacekeeping missions depends on military engagement and cooperation among the participating member countries.

Exicom's radio technology was used to integrate various manned/unmanned entities like soldiers, drones, and UGVs on a centralised digital network.

Speaking about Exicom Technologies participation in the joint exercise, Raghav Agarwal stated, "It's an honour to have gained Indian Army's trust over the years. We are thankful to them for providing us with an opportunity to be in charge of such a critical aspect of an operation that had the presence of both Indian and allied decision makers."

One of the most trusted names in wireless communication services, Exicom's solutions are renowned for extending reliable communications to Armed Forces, and entities in harshest of terrain and climate conditions at remotest of locations. The impetus given by the Indian Government and policy of "Make in India" has motivated the company to continue its focus on R&D.

radar, HF radio and coastal surveillance radar," parliament was told. A slew of export orders signed with Armenia, including Pinaka Multi Barrel Rocket Launchers, artillery guns and a variety of ammunition, has helped to shore up numbers this year.

According to officials, India currently exports weapons to over 80 countries, with the United States being a major customer. Significant exports are made by Indian companies that have received orders from US defence majors to supply parts for platforms such as the F-16 fighter jet, the Chinook and Apache helicopters and others.

The government has set a target of Rs 1,75,000 crore in defence manufacturing by 2024-25, including Rs 35,000 crore in exports. According to current estimates, the defence manufacturing value for 2022-23 will likely exceed Rs 1 lakh crore.

NEWS ROUND UP

GRSE RECORDS HIGHEST TURNOVER, REGISTERS 45% YOY GROWTH AND RS 3500 CRORE ORDER BOOK SURGE

Kolkata. Garden Reach Shipbuilders & Engineers Limited (GRSE), one of the leading warship builders in the country, continues to break records and has for the first time in the company's history of 63 years as a DPSU, achieved an annual turnover to the tune of Rs 2550 Crore (Provisional & Unaudited) for FY 2022-23. The company maintained its momentum through FY 22-23 achieving a remarkable revenue growth of 45%. GRSE also signed the contract with Ministry of Defence for construction of four Next Generation Offshore Patrol Vessels (NGOPVs) on 30 Mar 23. This INR 3500 Crore (approx.) contract won on competitive bidding, boosts the Shipyard's credentials for building next generation warships indigenously, with the first NGOPV scheduled to be delivered in 44 months. The company has effectively managed its resources in this labour-intensive industry and progressed operations continuously improving internal efficiencies thereby surpassing its FY 21-22 revenues in Q3 FY 22-23 itself. It had also declared an interim dividend in FY22-23, @ 55% of paid-up share capital against 49.50% of previous year. The zero-debt company continues to build on its strong reputation as a leader in the shipbuilding sector in India.

GRSE also achieved a significant milestone in 2022 when the company ventured into "Green Technology" in Shipbuilding by signing a contract with the Government of West Bengal to construct the 'Next Generation Electric Ferry'. Becoming the only shipyard to be awarded the coveted Defence Minister Award 2022 for Excellence in Defence & Aerospace Sector at "Defence Expo 22" and another 16 prestigious awards for Design, CSR, Corporate Communication, HR, Digital Transformation etc. are testimony to the excellence in design and operations achieved by GRSE.

The shipyard is presently undertaking concurrent construction of 22 ships including 03 P17A Stealth Frigates, 04 Survey Vessels (Large), 08 ASW SWCs, 01 New Generation Electric Ferry and 06 Patrol Boats. Major production milestones achieved in 2022-23 include mega-ship

MoD SIGNS CONTRACTS WORTH RS 9,900 CR WITH HAL, L&T FOR TRAINER

New Delhi. Two separate contracts were signed by the Ministry of Defence with Hindustan Aeronautics Limited (HAL) and Larsen & Toubro for 70 HTT-40 (Hindustan Turbo Trainer) basic trainer aircraft and three cadet training ships, respectively, at a cumulative cost of Rs 9,900 crore. The contracts were inked in the presence of Defence Minister Rajnath Singh.

On March 1, the Cabinet Committee on Security, headed by Prime Minister Narendra Modi, had cleared the two deals, according to which the basic trainers will cost Rs 6,838 crore, and the cadet training ships for Rs 3,100 crore. The new trainer aircraft will provide a much-needed fillip to the ab initio training of air force pilots. Basic trainers figure on the long list of weapons and systems that India has imposed an import ban on for the last 30 months. HAL will supply the HTT-40 planes to IAF over six years. Currently, ab initio training of all rookie pilots is carried out on Swiss-origin Pilatus PC-7 MkII planes and Kiran Mk-1/1A trainers. Those training to become fighter pilots further train on the British-origin Hawk advanced jet trainers. The HTT-40 is a turboprop aircraft, designed to have good low speed handling qualities and provide better training effectiveness.

The indigenously designed, developed cadet training ships will be constructed at L&T's Kattupalli facility in Tamil Nadu and the delivery is expected to begin in 2026. These ships will cater for training officer cadets, including women, at sea after their basic training ashore to meet the future manning and operational requirement of the Indian Navy. The ships can also extend training to cadets from friendly neighbouring countries.

REVENUE

launches for the Indian Navy such as the 2nd P17A Advanced Frigate Dunagiri, two Anti-Submarine Warfare Shallow Water Craft and two Survey Vessels (Large). One Ocean Going Passenger & Cargo Vessel for Cooperative Republic of Guyana & 01 Fast Patrol Vessel (FPV) for the Indian Coast Guard were also launched and delivered in FY 23.

In the growth journey of FY 23, the company has collaborated through 'MoUs' with more than 20 firms including several MSMEs and Startups. In a major step aimed towards bolstering the 'Make in India' initiative, GRSE has also signed a Memorandum of Understanding (MoU) with Rolls Royce Solutions of Germany to manufacture high-quality marine diesel engines. At DefExpo 22, GRSE launched first of its kind 'Double Lane Modular Steel Bridges' which are used in HADR operations and in border areas for establishing road connectivity. GRSE's Diesel Engine Plant at Ranchi, has developed India's first Naval Shock Standards fully qualified, 01 MW Diesel Alternator for marine application.

AIRCRAFT, SHIPS

With majority of the equipment and system sourced from indigenous manufacturers, these vessels will be a proud flag bearer of Aatmanirbhar Bharat, Make in India and Make for the World initiatives. Shipbuilding projects currently in progress at various shipyards are rightly poised to provide requisite economic stimulus to indigenous industry. Apart from creating a separate budget for purchasing locally made military hardware, the government has taken a raft of steps to promote self-reliance in the defence manufacturing sector, including increasing foreign direct investment from 49% to 74%, and notifying hundreds of weapons and systems that cannot be imported.

BRAHMOS HAS ACHIEVED SEVENTY FIVE PERCENT INDIGENOUS CAPABILITY: CEO & MD BRAHMOS AEROSPACE

Chennai. Delivering the chief guest address at an event held by Data Patterns (India) at their plant in Siruseri, eminent scientist and BrahMos Aerospace chief Atul Dinkar Rane on March 22 said that the BRAHMOS missile project has achieved 75 per cent indigenous capability. The event was organised by Chennai-based defence and aerospace electronics solutions provider Data Patterns (India) to mark the delivery of 27th 'BRAHMOS missile checkout equipment' to BrahMos Aerospace. "When we launched our first missile in 2004, we had only 13 percent of indigenous components inside, but in the next 25 years, we have reached 75 per cent," said Atul Dinkar Rane, Director General BrahMos, DRDO & CEO & MD of BrahMos Aerospace Pvt Ltd. Achieving 100 per cent indigenous capability is not possible since the project is a joint venture with Russia and the country is dependent on Russia for some technology, he further added.

BrahMos Aerospace is a joint-venture between India's DRDO and Russia's 'Military Industrial Consortium' NPO Mahinostroyenia (earlier known as Federal State Unitary Enterprise NPOM of Russia). He said some technologies are still provided by Russia and BrahMos Aerospace has no plans to indigenise them at the moment. However, without quantifying the savings, Rane said that due to 75 per cent indigenous technologies, the overall cost of the BrahMos missile has come down drastically. "Data Patterns has been associated with BrahMos Aerospace for more than two decades and the company is now designing and producing radars across the entire spectrum of defence and aerospace requirements," said S. Rangarajan, CMD, Data Patterns (India) Ltd. Stating missile testing is conducted at least once in a year during the missile lifetime of 10 years, Rangarajan said the company is also in the process of signing an export contract with a UK-based company for supply of single processing avionics for airborne radar, some subsystems like those used in BRAHMOS missile, to South Korea and radar to a NATO country. "But these are not real exports. The real export is when we build the full equipment in India and give it to the Ministry of Defence and with the government permission supply it to the rest of the world," he added.

IN NEWS

THALES EXPANDS ITS INDIA PRESENCE WITH THE OPENING OF ITS FIRST DESIGN CENTRE

New Delhi. Thales, celebrating its 70th anniversary in India this year, has opened its first world-class Design Centre at its Engineering Competence Centre in Noida. This Thales Design Centre will serve as a hub for creative and innovative thinking, and help drive collaboration with customers, partners and academia to develop new products and services for India and for the world.

The opening of this cutting-edge facility, the 13th of its kind worldwide by Thales, is part of the organisation's expansion plans in India. It stands as a testament to India's importance for the organization and its steadfast commitment to driving innovation and growth in the country.

The Thales Design Centre in Noida boasts of a classic combination of a talented team of experts including UX designers, Design Thinking coaches and other professionals, latest tools and technologies, and an open, collaborative space that is designed to foster creativity and innovation. The objective of this Center is to working closely with customers, partners, and academia to develop new products and services, and continue to partner India in its growth and success in the years to come.

EDGE'S CARACAL UNVEILS NEW LIGHT MACHINE GUN

Abu Dhabi, UAE. EDGE Group entity, CARACAL, a leading firearms producer in the GCC region, unveiled the CARACAL LIGHT MACHINE GUN 556 (CLMG 556) at the 16th edition of the International Defence Exhibition (IDEX 2023).

The new CLMG 556, chambered in 5.56x45mm NATO, is a belt-fed, fully-automatic developed by CARACAL. Weighing around 7.8 kg, the open bolt gun features an advance long stroke gas piston system.

The CLMG 556 has been developed using the latest rapid prototyping and precision manufacturing technology, giving it similar modularity, durability and weight-saving features seen with other CARACAL firearms. It comes standard with a five position telescopic adjustable stock and three position adjustable cheek piece. For attachments, a STANAG 4694/MIL-STD-1913 long rail is positioned at 12 o'clock on the main receiver. Adding to the CLMG 556's modern features is a fixed iron sight with range adjustment and built-in bipod that has a three position adjustable height. The CLMG556 has a hammer-forged chrome-lined barrel that comes in three different barrel lengths (13" 16" and 18"), which can be quickly interchanged, providing exceptional durability.

GODREJ AEROSPACE WINS ORDER FOR MANUFACTURING EIGHT MODULES OF THE DRDO TURBOJET ENGINE

Mumbai. Godrej & Boyce, the flagship company of the Godrej Group, has announced that its business Godrej Aerospace is the first Indian private company to win the order for manufacturing eight modules of the DRDO Engine for aerial applications. Godrej Aerospace won the order competing with over 25 companies owing to its strong infrastructure, proficiency in working with unique materials, and decades of experience in producing liquid engines for rockets, as well as its service to global aviation majors. This venture opens up a world of opportunities for future projects to be manufactured indigenously in India. With the growing interest from global majors to manufacture in India, Godrej Aerospace is poised to meet the growing demand for various types of engines. This experience will pave the way for future projects to develop modules for civil aviation engines as well. Godrej Aerospace is committed to contributing to the Indian government's Make-In-India initiative and helping India achieve self-sufficiency in developing indigenous advanced fighter jet engines. The company has made an investment of around 500 crores for aerospace and defence projects and has incorporated new processes into its manufacturing processes.

LOCKHEED MARTIN DELIVERS FIRST C-130J-30 SUPER HERCULES TO THE INDONESIAN AIR FORCE

MARIETTA, Georgia. Lockheed Martin delivered the first of five C-130J-30 Super Hercules tactical airlifters to the Indonesian Air Force (IDAF) during a ceremony here today, commemorating a new era in Hercules operations for this long time C-130 operator. The IDAF's new C-130J-30s offer increased cargo capacity, speed, range, power, performance and lower operating costs over its legacy C-130s to support the IDAF's wide range of mission requirements for decades to come. These new C-130J-30s expand the IDAF's ability to partner on missions and training opportunities with allies and regional forces that also operate Super Hercules.

Indonesia has operated C-130s since the 1960s, using its Hercules fleet for critical national and regional missions such as delivering humanitarian aid and disaster relief, as well as providing military and peacekeeping support around the Pacific Rim. The C-130J Super Hercules is the worldwide choice in tactical airlift, serving 26 operators in 22 nations. To date, more than 520 C-130Js have been delivered and the Super Hercules remains unmatched in its ability to support 18 different mission requirements.

BELL 505 HELICOPTERS DELIVERED TO THE KINGDOM OF BAHRAIN

Mirabel, Canada. Bell Textron Inc., a Textron Inc. company, announced the delivery of three Bell 505 helicopters to the Royal Bahrain Air Force. Bell delivered the aircraft during an inspection and acceptance event in February 2023 at Bell's Mirabel facility.

"We are honored to provide the Bahrain Defense Force another premiere Bell asset to train the next generation of Bahrani pilots," said Sameer Rehman, managing director, Africa and Middle East, Bell. "Generations of Bahraini pilots have flown in Bell helicopters, and the Bell 505 will continue the tradition of excellence for years to come."

The Bahrain Defense Force has flown the Bell 212 and multiple generations of AH-1 attack helicopters. This delivery marks the first 505 helicopters for the country and includes a package with training, tooling, and spares.

"With low operating costs and high reliability, the Bell 505 has emerged as a customer favorite to prepare cadets for a safer and more effective transition to advanced helicopters," Rehman added.

The Kingdom of Bahrain joins other countries in the region employing the Bell 505 as their advanced military trainer of choice. Horizon International Flight Academy in the UAE operates 12 Bell 505s, and the Royal Jordanian Air Force signed an agreement for 10 Bell 505s in November 2022. More than 30 Bell 505 helicopters operate throughout the Middle East and Africa. Additionally, the Bell 505 is the military training helicopter for the Montenegro Air Force, Republic of Korea Army and Republic of Korea Navy.

Bell has delivered more than 400 Bell 505 helicopters to domestic and international customers. The Bell 505 program has collectively achieved more than 100,000 flight hours. The Bell 505 recently became the world's first single engine helicopter to fly on 100 percent sustainable aviation fuel.

IN NEWS

DRDO'S INDIGENOUS POWER TAKE OFF SHAFT SUCCESSFULLY FLIGHT-TESTED ON LCA TEJAS

Bengaluru / New Delhi. Indigenously designed and developed by Chennai-based Combat Vehicles Research and Development Establishment of Defence Research and Development Organisation (DRDO), the power take off (PTO) shaft was successfully flight-tested on March 14.

The flight-test of PTO shaft was conducted on the Light Combat Aircraft Tejas in Bengaluru, the defence ministry said in a statement. The PTO is a critical equipment that transmits power from aircraft engine to gearbox.

According to the ministry, the maiden successful flight-test of PTO shaft was conducted on LCA Tejas Limited Series Production (LSP)-3 aircraft. "With this successful test, the DRDO has achieved a greater technological feat by realisation of complex high-speed rotor technology which only few countries have achieved," it said.

"The PTO shaft, which is a critical component in the aircraft, will support the requirements of future fighter aircraft and their variants and offers competitive cost and reduced time of availability. The PTO shaft was designed with a unique innovative patented 'Frequency Spanning Technique' which enables it to negotiate different operating engine speeds," the defence ministry said in a statement.

"The light weight, high speed, lubrication free PTO shaft transmits higher power between aircraft engine gear box and aircraft mounted accessory gearbox while accommodating misalignments that arise in the drive line," the ministry added.

The successful realisation of PTO shaft is another major milestone towards Aatmanirbhar Bharat, said Defence Minister Rajnath Singh. He complimented the DRDO, public sector undertakings concerned and the industry. DRDO Chairman Samir V Kamat stated that the success showcased the country's research capability and will actively support the test aircraft programmes.

EDGE's CARACAL Sign Agreement with ICOMM for Historic Transfer of Technology in Small Arms

Abu Dhabi, UAE. EDGE entity CARACAL, a leading small arms manufacturer, today signed a partnership licensing agreement with India-based ICOMM, a market leader in developing and manufacturing missile and sub-systems, communications and EW systems, UAV's, electro-optics, shelters, composites, as well as other systems technology such as counter drones. The agreement was signed at IDEX 2023, one of the largest tri-service defence exhibitions in the world.

Under the agreement, ICOMM will partner with CARACAL in the development of a full portfolio of locally manufactured small arms for the Indian market. The partnership is in line with Prime Minister Narendra Modi's 'Make in India' initiative and marks a momentous occasion for CARACAL and ICOMM, as the first-ever Transfer of Technology (ToT) in small arms from the UAE to India.

ICOMM will manufacture the full range of CARACAL small arms, including the versatile CARACAL EF pistol (9mm), modern CMP 9 sub machine gun (9mm), CAR 816 (5.56 x 45mm) and CAR 817 (7.62 x 51 mm) assault rifles, CAR 817 DMR (308) tactical sniper rifle, CSR 50 (12.7 x 99mm) anti-material sniper rifle, CSR 338 and CSR 308 bolt action sniper rifles and the CSA 338 semi-automatic sniper rifle.

BEL WINS ORDERS WORTH RS 4,300 CRORE FROM INDIAN ARMY AND INDIAN NAVY

Bengaluru / New Delhi. The Ministry of Defence (MoD) has signed a contract worth Rs. 3,000 Crore with Bharat Electronics Ltd (BEL) for supply of Integrated Electronic Warfare Systems for the Indian Army. The Integrated Electronic Warfare Systems for Indian Army are state-of-the-art with cutting-edge technologies, and have been indigenously developed and manufactured by BEL based on Defence Electronics Research Laboratory (DLRL), DRDO, design. These integrated systems will be a real force-multiplier and will further enhance the electronic warfare capability of the Indian Army in leaps and bounds. Further, BEL has also received several contracts totalling up to Rs. 1,300 Crore (approx.) during the last fortnight from the Indian Navy for supply of indigenously developed Fire Control, Gun Fire Control, Surveillance, Tracking, ESM, Sonar Systems, etc.

MOROCCO SELECTS RAFAEL'S SPYDER AIR DEFENCE SYSTEM

Tel Aviv. Morocco has selected the Rafael SPYDER air defence system for its short range air defence needs. The SPYDER system developed by Israeli company Rafael is operated by 8 countries, including the United Arab Emirates, the first Arab country to do so, as well as the Czech Republic, the first NATO member to deploy the system. The system is also in possession of the armed forces of Georgia, Vietnam, Singapore and the Philippines.

The SPYDER made by Rafael is a low-level, quick-reaction surface-to-air missile system capable of engaging aircraft, helicopters, unmanned air vehicles, drones, and precision-guided munitions. It provides air defence for fixed assets and for point and area defence for mobile forces in combat areas.

According to an official release of Rafael there are four variants of the system. These are:

- The SPYDER-SR and SPYDER-ER 360° provide quick reaction, lock-on-before-launch (LOBL) and lock-on-after launch (LOAL) capabilities, while extending the range of defence to up to a 40 km radius.
- SPYDER-MR and SPYDER-LR offer medium & long range target interception through vertical launch while pushing the defence envelope up to an 80 km radius.

Rafael says that all the variants enable a 360° launch within seconds of the target being declared hostile and provide all-weather, multi-launch, and net-centric capabilities. The official release points to the fact that the SPYDER systems have advanced ECCM capabilities and use electro-optical observation payloads as well as wireless data link communication.

The UAE interest in the Israeli system began soon after the signing of the Abraham Accord. The UAE needs an effective system that can protect it from armed UAV's and drones launched by the Houthi rebels in Yemen.

DEFENCE MANUFACTURING TARGET WORTH RS 1,75,000 CRORE SET BY GOVERNMENT

New Delhi. The government said it has set a target of achieving defence manufacturing worth Rs 1,75,000 crore, including defence exports of Rs 35,000 crore by 2024-25. Minister of State for Defence Ajay Bhatt, told Parliament adding that the value of production undertaken by private companies and state-run defence manufacturers in 2021-22 was Rs 86,078 crore while the amount was Rs 88,631 crore in 2020-21 and Rs 63,722 crore in 2019-20. The value of production was Rs 50,499 crore in 2018-19 and Rs 54,951 crore in 2017-18. "The government has set the target of achieving defence manufacturing worth Rs 1,75,000 crore including defence exports of Rs 35,000 crore by the year 2024-25," Bhatt said. The minister also said the value of defence exports in 2021-22 was Rs 12,815 crore while it was Rs 13,398 crore till March 6 in the current fiscal.

To a separate question, he said the modernisation of armed forces to meet future challenges is a continuous process based on the long-term integrated planning process. In reply to another question, Bhatt said the Indian Navy has opened all branches to women at graduate level entries. The branches are executive, engineering, electrical and education. The number of women who have applied for recruitment under the executive branch is 3,941, the number for engineering wing is 360, electrical is 652 and 411 have applied for education wing.

RAYTHEON TECHNOLOGIES AWARDED $320 MILLION FOR STORMBREAKER SMART WEAPON

TUCSON, Ariz. The US Air Force awarded Raytheon Technologies a $320 million contract to produce and deliver 1500 StormBreaker® smart weapons, which are air-to-surface, network enabled weapons that can engage moving targets in all weather conditions using its multi-effects warhead and tri-mode seeker. StormBreaker is fielded on the F-15E Strike Eagle with testing underway on the F-35B and F/A-18; between the three platforms, StormBreaker has had hundreds of successful operational test shots to date.

ELBIT SYSTEMS SIGNS MOU WITH NIPPON AIRCRAFT SUPPLY AND ITOCHU AVIATION AT DSEI JAPAN

Tokyo / Tel Aviv: Elbit Systems, Nippon Aircraft Supply (NAS) and Itochu Aviation have signed a strategic cooperation memorandum of understanding (MoU) to promote mutual cooperation for a range of solutions between the companies. As part of the MoU, Elbit Systems will provide the main components, technology and knowledge to NAS and Itochu. NAS will provide the capabilities for local integration, manufacturing, test and maintenance and Itochu will lead the marketing of the products in Japan. This cooperation will address the growing Japanese interest in the field of defence while fully aligned with the local requirements that Elbit Systems provides Japan-based production and qualities. The MoU signing ceremony took place during the DSEI Japan exhibition with Israel's Ambassador to Japan Gilad Cohen, Osamu Matshushita, President and COO of NAS, Mashahiro Takita of Itochu Aviation and Ran Kril Executive Vice President International Marketing and Business Development of Elbit Systems in attendance.

IN NEWS

EDGE AND BAE SYSTEMS TO EXPLORE CO-CREATION OPPORTUNITIES ACROSS THE UAE'S DEFENCE INDUSTRY

Abu Dhabi, UAE. EDGE Group has today signed a Memorandum of Understanding (MoU) with BAE Systems, a global leader in advanced technology solutions, to explore potential collaboration and co-creation opportunities to enhance technologies and capabilities across the United Arab Emirates (UAE). Under the MoU announced at the International Defence Exhibition and Conference (IDEX), the new strategic partnership will see both companies bring their collective expertise in cyber, maritime, air, and defence technologies in support of the UAE's industrialisation ambitions to become a leading global hub for future defence and security solutions.

The MoU was signed by Mansour Almulla, Managing Director & CEO of EDGE and Gabby Costigan, Group Managing Director for Business Development, BAE Systems plc, in the presence of the UK's Ambassador to the UAE Patrick Moody, Air Marshal Martin 'Sammy' Sampson CBE DSO, UK Defence Senior Advisor to the Middle East and North Africa (DSAME), Mark Goldsack, Director of the Department for International Trade for UK Defence and Security Exports, and Miles Chambers, EDGE's Director of International Business Development, during a ceremony held at IDEX.

EUROFIGHTER TO SECURE 26,000 JOBS IN SPAIN UNTIL 2060

Madrid. The Eurofighter programme will cumulatively secure 26,000 jobs in Spain until 2060, according to a recent study by PricewaterhouseCoopers (PWC) on the economic impact of the 'Halcon' and 'Quadriga' contracts for the country.

The study, which was funded by Airbus, together with the technical support of ITP Aero, and performed independently by PWC over a period of six months until March 2023, estimates that, during its life cycle, the manufacturing phase (2020-2030) and maintenance phase (2023-2060) of the Halcon and Quadriga programmes will create on average 657 jobs - direct, indirect and induced - per year, reaching a total of 26,000 positions by 2060. This equates to a total annual employment impact of 2.7% direct jobs in the Spanish aerospace sector.

Both Eurofighter Tranche 4 contracts are expected to contribute nearly €1.7 billion to Spanish GDP, with the manufacturing and maintenance of Halcon generating approximately €1.5 billion and the production of Quadriga making up the remaining €200 million. The employment and economic contribution during both phases will generate a total tax collection of €430 million, from which €151 million will be direct contribution. Furthermore, for every euro collected directly, €2.8 of total tax revenue will be generated in the Spanish economy.

Signed in June 2022, the Halcon contract consists of the acquisition of 20 latest-generation Eurofighter jets to replace the ageing F-18 fleet operated by the Spanish Air Force on the Canary Islands. The Halcon programme followed the Quadriga contract, signed in 2020, to deliver 38 new Eurofighter aircraft to the German Air Force (Luftwaffe), making Germany the country with the largest number of orders for Europe's biggest defence programme. In total, the Eurofighter programme secures more than 100,000 jobs in Europe, which will be boosted through latest-generation aircraft, such as the Tranche 4, as well as in the future, through technological advances within the Eurofighter development.

GRSE SIGNS CONTRACT FOR 4 NGOPVS, ORDER BOOK SURGES BY 3500 CRORE

Kolkata. Defence PSU Garden Reach Shipbuilders & Engineers Ltd. (GRSE) signed a contract with the Ministry of Defence for construction of four (4) Next Generation offshore Patrol Vessels on March 30, 2023. The total project cost of four GRSE Vessels is around Rs 3500/- crore. The first Vessel is to be delivered within 44 months from Contract Signing and subsequent Vessels at six months intervals. The Contract was signed between JS&AM (M&S, Ministry of Defence), Dharmendra Kumar Singh, IA & AS (2000) and Cdr Shantanu Bose, IN (Retd), Director (Shipbuilding), GRSE in the presence of Pankaj Agarwal, IAS, DG (Acquisition), Cmde PR Hari. IN (Retd.), CMD GRSE, RAdm S Mehta, ACWP&A, Indian Navy and other senior officials of Ministry of Defence, Indian Navy & GRSE. The length of the NGOPVs will be 110 m (approx.) with displacement around 2900 Tons and max speed more than 23 knots. The NGOPV should be capable of fulfilling roles such as Seaward Defence, 'Out of Area' Contingency Ops, Non-Combatant Evacuation Ops, Convoy Operations/Anti-Piracy Missions, Counter Infiltration Ops, Anti-Poaching/Trafficking, HADR, Search and Rescue Missions, Hospital Ship, Fleet Maintenance Support and COMINT Ship. Garden Reach Shipbuilders & Engineers Ltd., a premier Warship building Company in India is the first shipyard of independent India to build a Seaward Defence Boat (SDB) INS Ajay for Indian Navy in 1961 along with Indian Export Warship "CGS Barracuda".

MOD SIGNS 10 CONTRACTS WORTH RS 5,498 CR WITH BEL FOR INDIAN ARMED FORCES

Bengaluru/New Delhi. The Ministry of Defence (MoD) has signed 10 contracts worth Rs.5,498 Crores with Defence PSU Bharat Electronics Limited (BEL). These contracts will bolster the defence capabilities of the country.

Air Force Projects: (a) EW Suite Equipment for Medium Lift Helicopter (90 Nos.) has been signed with BEL-Bangalore. It is indigenously designed and developed by the DRDO lab, Combat Aircraft Systems Development & Integration Centre (CASDIC). It comprises Radar Warning Receiver (RWR), Missile Approach Warning System (MAWS) and Counter Measure Dispensing System (CMDS) and will significantly enhance the combat-survivability of IAF helicopters while undertaking operational missions against adversaries — ground-based as well as airborne radars and heat-seeking, shoulder-fired missiles with effective countermeasures. **(b)** AMC for Akash Missile System has been signed for maintenance of two Squadrons with BEL-Bangalore. The Akash Missile System (AMS) is a medium-range, surface-to-air missile (SAM) system, developed by DRDO and manufactured by BEL. AMS includes Surveillance Radar, Fire Control Radar, Control and Command Centre developed by BEL. The Akash Missile system can target aircrafts up to 30 km away and has the capabilities to neutralise aerial threats like fighter jets, cruise missiles and Air-to-Surface Missiles. It is fully integrated with C4I and equipped with ECCM features.

Army Projects: (a) Automated Air Defence Control & Reporting System (Project Akashteer) has been signed with BEL-Ghaziabad. It will enable monitoring of low-level airspace over the battle areas of Indian Army and effectively control the Ground-Based Air Defence Weapon Systems. **(b)** Instant Fire Detection and Suppressing System (IFDSS) for T 72 has been signed with BEL-Kotdwara. IFDSS is indigenously designed by DRDO and will be manufactured by BEL-Kotdwara.

Navy Projects: (a) Software Defined Radio (SDR) (1265 Nos.) - Portables for Indian Navy are latest state-of-the-art radios which have been indigenously developed, jointly by DEAL (DRDO) and BEL. The SDR portables are developed in three configurations viz. SDR Manpack, SDR Fixed Pack and SDR hand-held, to meet the specific operational requirements of the Indian Navy. SDR Portables are new generation software defined radio that supports multi band, multi-channel, multi role/ mission operation with voice/ data to meet the needs of network-centric warfare of Indian Navy. These radios are feature rich compact radios which provides the flexibility of enhancing the performance by implementation of futuristic waveforms on the same hardware using software programmability. **(b)** HDVLF HF Receiver (1178 Nos.) is a communication equipment, designed to receive and demodulate Data/Voice in VLF and HF Band of operation in the ships and submarines of Indian Navy. The equipment incorporates advanced DSP technology with inbuilt high grade encryption. With induction of this state-of-the-art equipment, Naval forces will be modernised for secure and higher data capability. The equipment is productionised by BEL-Panchkula with ToT from design agency DEAL DRDO Dehradun. **(c)** Sarang (12 Nos.) will be installed on Kamov 31 Helicopters of the Indian Navy which intercepts, detects and identifies the Radar emitters comprising state-of-the-art technologies. The project is indigenously designed and developed by DLRL and manufactured by BEL-Hyderabad. **(d)** Three more projects were signed with Indian Navy - INS-SA, CMS for P17 & P28 and Varuna EW system.

Adding another milestone to the 'Atmanirbhar Bharat Abhiyaan' and 'Make in India' initiative of the Government of India, all these flagship projects showcases the indigenous design and manufacturing capabilities of Indian Defence industry led by BEL, involving other Public Sectors, Private Sectors and MSMEs.

IAI TO INTEGRATE HERON SYSTEM WITH WINDWARD'S AI TECHNOLOGY, SIGNS TEAMING AGREEMENT

Tel Aviv. Israeli developed AI technologies will enhance the capabilities of Israel Aerospace Industries (IAI) made UAV in performing maritime missions. IAI and Israeli company Windward have signed a teaming agreement that will provide the maritime community with enhanced autonomy and Artificial Intelligence (AI) capabilities through the use of persistent surveillance unmanned aerial systems (UAS).

The newly-integrated capability will utilise Windward's AI technology as part of the Heron system. This combination provides users with the ability to enhance open-source maritime data with AI-driven insights to quickly identify anomalies from patterns of life and suspicious vessel behaviour to calculate the level of risk. It will enable true tipping and cueing operations by sifting through thousands of targets and winnowing them down quickly to the relevant few, reducing the number of personnel and assets required to do so.

IAI's Mission Management System will gather the Windward outputs, and along with the real-time sensor data from the UAS will automatically filter out cleared targets using the system's rules engine and the customers' pre-defined mission requirements.

IN NEWS

NAVANTIA'S S-81 "ISAAC PERAL" SUBMARINE SUCCESFULLY PERFORMS ITS FIRST DIVE

Madrid. The S-81 'Isaac Peral' submarine carried out its first static dive March 30 as part of the test schedule agreed between Navantia, the Navy and the Ministry of Defence.

The dive took place in the waters of the La Algameca naval station, opposite the Navy's Diving Centre. It forms part of the safety milestones in the construction and testing of the S-80 submarine programme and is carried out after surface navigation and prior to the dive.

The immersion has been carried out in different phases, in order to measure the drafts in the Navantia armament dock before going out to the open sea. The submarine carried out its dive in a location close to the 50-metre buoy located in front of the Navy's Diving Centre in La Algameca. Tests on the S-81 submarine will continue until its delivery to the Navy.

"With its first static dive, the S-81 has passed a milestone on its way to full operation. The close collaboration between Navantia, the Navy and the Ministry of Defence is making it possible to make steady progress in the greatest challenge ever faced by Spanish industry. The first dive we have witnessed today is the result of the efforts of many professionals, so I would like to thank all the people involved in the programme for their dedication and commitment to ensure its success and congratulate them on this important step", said the President of Navantia, Ricardo Domínguez.

EDGE SIGNS MOU WITH HAL TO EXPLORE BUSINESS COOPERATION

Abu Dhabi, UAE. EDGE, one of the world's leading advanced technology and defence groups, signed a Memorandum of Understanding (MoU) with Hindustan Aeronautics Limited (HAL), a leader in the design, development, manufacturing, supply and maintenance of aircraft, helicopters, engines, aerospace equipment, avionics and related accessories for military and civil markets. The MoU was signed at IDEX 2023, one of the largest tri-service defence exhibitions in the world. Under the MoU, EDGE and HAL will explore areas of cooperation including the joint design and development of missile systems and unmanned aerial vehicles. Additionally, both companies will explore the utilisation of HAL's small gas turbine engines on EDGE's guided weapons, utilisation of EDGE's GPS jamming and spoofing equipment on HAL's platforms, and opportunities for further knowledge sharing. The two companies will also explore cooperation on mission computers, training programmes, and utilisation of additive manufacturing of metallic parts will also take place at EDGE's and HAL's world class facilities in the UAE and India.

AIRBUS WINS CONTRACT FROM ANGOLA FOR EARTH OBSERVATION SATELLITE ANGEO-1

Toulouse. As part of French President Emmanuel Macron's visit today, Airbus Defence and Space has announced an agreement for Angeo-1, the first very high performance Angolan Earth observation satellite, to be manufactured by Airbus Defence and Space in France, which strengthens the collaboration between the two countries. Angola has already developed various operational applications using satellite imagery from Airbus Defence and Space, such as land use mapping, agriculture monitoring and maritime surveillance and also operates its own telecommunications satellite (Angosat-2). An Airbus S250 optical satellite, Angeo-1 builds upon Airbus' more than 30 year experience in building highly reliable space systems. Once in operation, it will become the most advanced satellite in its class in the region, positioning Angola as a leading space power. This satellite will further foster the development of the country in many different sectors, improving the life of Angolan citizens. Sovereign access to satellite imagery will make a significant contribution to the development of infrastructure, mapping of natural resources, maritime surveillance including fisheries, agriculture and population. It will also provide a better understanding of the origins and impacts of climate change on the economy, such as drought monitoring, rising sea levels and water resources. This will lead to being better prepared in case of natural disasters with improved response rates and reduced loss of assets. As part of the partnership, a comprehensive training programme will be provided for Angolan engineers to build domestic competencies through targeted knowledge transfer.

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