

NATIONAL SECURITY AND AEROSPACE NEWSMAGAZINE

FORCE



day1
MEDIA PARTNER

INSIDE

Low Tech, Big Noise 4

Despite proliferation in drone start-ups, most remain in the tactical domain



Break the Silos 6

Development of unmanned technology requires a military-civil fusion policy

Together in This 30

India's joint doctrine for cyberspace operations couldn't have come a day sooner



Aatmanirbhar Bharat 35

The biggest lesson of the Ukraine war is the importance of self-reliance in military capabilities

Safe Skies 44

India is building its own advanced air defence missile system

Military Reforms

The Indian armed forces first need a technology acquisition roadmap before seeking more allocations

PRAVIN SAWHNEY

TO UNDERSTAND INDIAN DEFENCE allocations for 2025-26, a look at some figures is necessary:

- (a) Total allocation: Rs 6,81,210 crore (Rs 6.8 lakh crore). This is 1.9 per cent of the GDP
- (b) Capital outlay (new acquisitions and modernisation): Rs 1,85,000 crore. 75 per cent is to be spent on procurements from domestic vendors to support Make in India. And Rs 7,147 crores is for Border Roads

Organisation (BRO).

- (c) Revenue outlay (salaries): Rs 3,11,732 crore which is 45 per cent of the total budget
- (d) Defence pension: Rs 1,60,795 crore which is 23.60 per cent of the total budget
- (e) Research and Development (DRDO): Rs 26,816 crores
- (f) Agnipath scheme allocation: Rs 11,039 crores. Of this it is Rs 9,414 crores for the army.
- (g) iDEX scheme allocation: Rs 450 crores



“

‘Intelligence supremacy will be the core of future warfare. Big data, which is equal to intelligence superiority, should be considered a product, like hardware and software. It will be a mix of cognitive and operational dynamics’

‘The operational importance of the virtual battlespace has been lost on the Indian military which continues to assess land, air, and sea as the only warfighting domains. It does not consider cyber, outer space, near space, and EMS as war domains, but as force multipliers for the fighting domains’

‘In a war with India, the People’s Liberation Army will exercise total war control by dominating cyberspace, electromagnetic space, and outer space domains. It will, therefore, exert control over war aims, war concepts, speed, tempo, intensity, and outcome. This involves seizing the initiative, paralysing the enemy, dominating the escalation ladder, and laying grounds for war termination on one’s own terms’

‘China’s Belt and Road Initiative trajectory is aligned with the arrival of the third and fourth industrial revolutions. The third industrial revolution was the digital revolution—with computer hardware, software, and networks as its fundamental components. The fourth industrial revolution is about the interaction between the physical, digital, and biological domains with AI and Big Data’



Now in bookstores. Also available both in print and digital version on Amazon and Flipkart. You can also write directly to Aleph (Rupa Publications) for bulk copies

EDITOR	Ghazala Wahab
ROVING EDITOR	Pravin Sawhney
SPECIAL PHOTOGRAPHER	Amin War
IT MANAGER & COORDINATOR	Saroja Kumar Sahoo
MANAGER SUBSCRIPTIONS & MARKETING	Sweetly Singh Dhariwal
ASST. MANAGER PRODUCTION	Uday Haldhar
DESIGN CONSULTANT	Black Innovation
PUBLISHER AND PRINTER	Pravin Sawhney

FORCE IS DISTRIBUTED BY CNA AT ALL MAJOR BOOKSTORES IN:

BANGALORE | HYDERABAD | MUMBAI | DELHI | PUNE
CHENNAI | CHANDIGARH | JALANDAR | LUDHIANA |
COCHIN

In addition to:

Abdullah News Agency, Lal Chowk, Srinagar 190 001
T 0194-2472621 M +91.9419074859

Janta Agencies, Shrichand Chinar Complex, Maulana Azad
Road, Srinagar, Kashmir-190001
T 0194-2474755 M +91.9419066192
Contact Ghulam Mohiudeen

Modern Book Depot, SadarBazar, Agra Cantt, Uttar Pradesh
T 0562-2225695

EDITORIAL OFFICE

FORCE

ARROWHEAD MEDIA PVT LTD

E-19, Sector 3, Noida 201 301, Uttar Pradesh, India

T +91.120.4278691 / 92 / 93

F +91.120.4278692

E writeback@forceindia.net

Printed at Design To prints,

D-123 1st floor sector -10

Noida 201301

©2025 FORCE All rights reserved. Reproduction in whole
or in part without permission is prohibited.

RNI No. Deleng/2003/12712

ISSN 0972-9453 Force

Now, my five observations to explain why Indian military is not preparing for the modern war where the People's Liberation Army (PLA), India's identified primary threat, is at the cutting edge.

First, the salaries and pensions bill where the manpower heavy 1.3 million (13 lakh) Indian Army gets the lion's share is 68 per cent of the total allocation leaving a pittance for acquisitions and modernisation. So, the strength of the army needs to be reduced drastically. Especially when the hot war with the PLA, given the huge gap in the capabilities of the two militaries, will be a short, swift and intense — a dramatic repeat of the US' 1991 'shock and awe' campaign called Operation Desert Storm against the Iraqi military. In military parlance, the PLA will win the decisive campaign at the strategic and operational levels of war with no need to join battles at the tactical level of war with the Indian defence services.

Second, paradoxically, even as the army will have little role in a hot war, it will be most needed against grey zone operations in peacetime on the Line of Actual Control (LAC). Unlike the superior PLA, the Indian Army is required to firmly hold the entire LAC to avoid repeat of April 2020 deep incursions by the PLA whereby it (permanently) occupies over 2,000 sqkm Indian territory in east Ladakh. For this reason, the Agnipath scheme for recruitment of soldiers for a limited period of service with no pension was introduced.

Third, to project government's Make in India campaign as a success, private domestic vendors get three-fourth of the capital allocation leaving little for procurements from abroad. Both issues don't make sense. Given the fact that for the first time since Independence both military lines with China and Pakistan are live, the defence services need urgent acquisitions from abroad to maintain adequate force levels. This is especially true for the Indian Air Force (IAF) whose combat strength is excessively low. Regarding private vendors, none put resources into in-house research and development. The way out is to have joint ventures with foreign vendors as junior partners. Thus, on the one hand, foreign vendors do not part with their cutting-edge technologies. On the other hand, key components sourced from abroad raise the overall cost of weapon platforms. For example, a Russian Su-30MKI aircraft assembled

in India under the Make in India cost Rs 100 crore more than off-the-shelf purchase from Russia.

Fourth, allocation for the Defence Research and Development Organisation (DRDO) is a pittance. This needed to be hiked substantially. The most important issue is the periodic technical audit with the service representative in attendance. The DRDO rarely meets its deadlines. Take the case of Agni-5 missiles with MIRVs. The project sanctioned in 1984 has after four decades finally been operationalised. In this period what constitutes deterrence against the PLA has changed dramatically. The same is the case with the Kaveri engine; instead of the project being scrapped long ago, now it is suggested to be used in unmanned aircraft, which does not make sense in a man-unmanned teaming configuration.

And five, a mere Rs 450 crores for iDEX (innovation for Defense Excellence) for emerging technologies (for instance drones for the three defence services) shows that the Indian military believes these are meant for future warfare. The reality is that the shift from manned to unmanned systems is happening at a fast pace. For example, Artificial Intelligence (AI) at frontline in combat has two dimensions: 'AI at rest' which is the use of AI virtually in systems for faster and accurate decision-making to close the kill chain quicker than the enemy. And 'AI in motion' which is the physical manifestation of AI in the form of robots. The PLA has already inducted the 'AI at rest' in combat. Regarding 'AI in motion', PLA has (a) operationally tested military grade 5G wireless communications, and (b) is slated to start production of humanoid robots by end of this year. It is obvious that PLA would get the preference over commercial use of these robots.

In short, what the defence allocations show is lack of understanding of modern war by the Indian military leadership. Evidence of this is the comment by retired Air Marshal Anil Chopra. He says, "The capital outlay is not sufficient to address the capability gap with China. I hope more funds will be given later this year to fast track modernisation."

This statement is putting the cart before the horse. The Indian military first needs to understand the science and art of modern war, then make its technology acquisition roadmap before seeking more allocations. ■

Low Tech, Big Noise

Despite proliferation in drone start-ups, most remain in the tactical domain



GHAZALA WAHAB

SINCE THE LAUNCH OF IDEX (Innovation for Defence Excellence), with the mysterious 'i' in lower case, by Prime Minister Narendra Modi at DefExpo in April 2018, one segment of 'defence excellence' that has taken off with a roar is unmanned aerial systems.

In the last six years, there has been a proliferation of small companies/start-ups manufacturing some kind of aerial drones—from tactical surveillance and dropping of small cargo (such as emergency aid) to electronically disrupting larger adversarial UAVs and carrying out small suicide missions. Since the utility of a small drone is determined by its payload, most of these systems currently in circulation are off-the-shelf, multiple role UAVs. Yet, this doesn't mean that the Indian armed forces are now flushed with homemade unmanned aerial systems. Quite the opposite, actually.

The indigenous UAVs so far have been deployed by the Indian Army and the Central Armed Police Forces (CAPFs) in the tactical surveillance roles or for small drops. Perhaps, the CAPFs have

also experimented with dropping small quantities of explosives in parts of the Dandakaranya forest through drones. In early 2024, there were several sightings of airdropped IED timers and scattered parts of drones in Chhattisgarh. The IAF has yet found no use for them. "We can at best consider these for perimeter security of our air force stations," says a senior IAF officer. According to him, the IAF needs long endurance surveillance and combat UAVs, none of which have been successfully developed in India, neither in the public nor private sector.

The only made in India UAV that the Indian Air Force has inducted is DRDO's Medium Altitude Long Endurance (MALE) Tapas BH-201, which in its earlier avatar was called Rustom II. Being designed for ISR, Rustom II did not meet the qualitative requirements of either the IAF or the Indian Navy. Thereafter, it was renamed Tapas BH-201 in 2016. This was in keeping with government of India's penchant for acronyms. Hence, even though the services refused to induct the system, DRDO converted Rustom into an acronym—Tactical Airborne Platform for

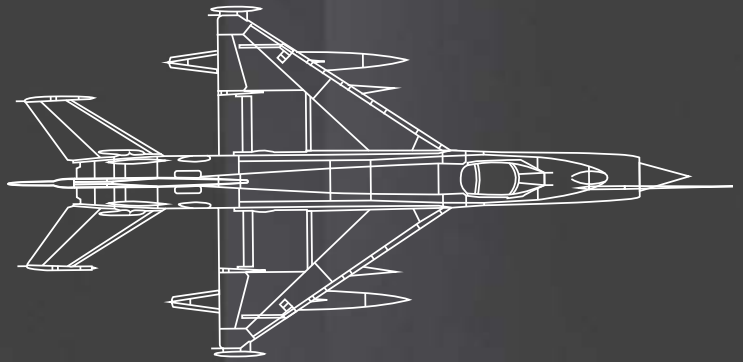
Aerial Surveillance-Beyond Horizon (Tapas-BH)—in the hope that it might magically improve its efficiency.

Finally, the IAF and the navy were persuaded to buy the system to encourage DRDO. In 2024, while the IAF agreed to buy six of Tapas, the navy opted for four. Currently, DRDO is working on an unmanned combat aerial vehicle, announced in 2009 as Autonomous Unmanned Research Aircraft (AURA). By 2013, DRDO declared that research undertaken during the AURA phase was successful, leading to the future development of an operational jet-powered stealthy UCAV called Ghatak with internal weapons bay. In 2022, DRDO flew its scaled down prototype called SWiFT, which stands for Stealth Wing Flying Testbed. A full-scale prototype of Ghatak is likely to fly later this year.

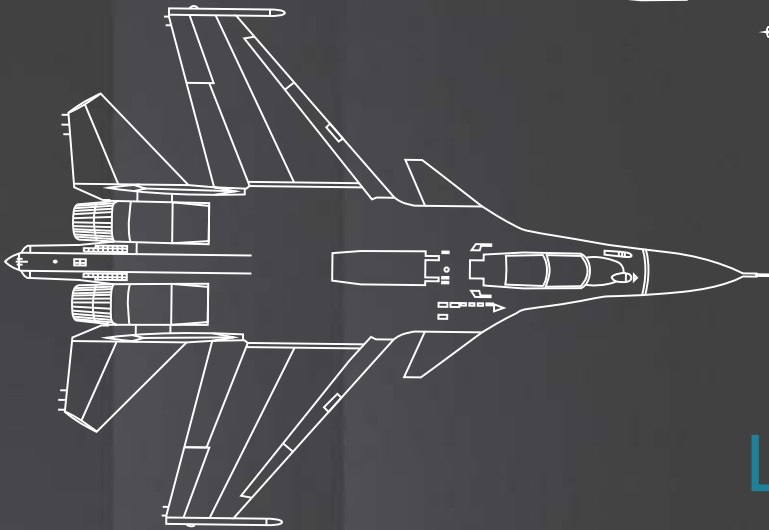
There are three reasons why despite the sprouting of start-ups, the Indian military still does not have adequate operational unmanned aerial systems for combat support, such as ISR, forget actual combat. The first is the concept

(Continued on page 18)

3rd generation

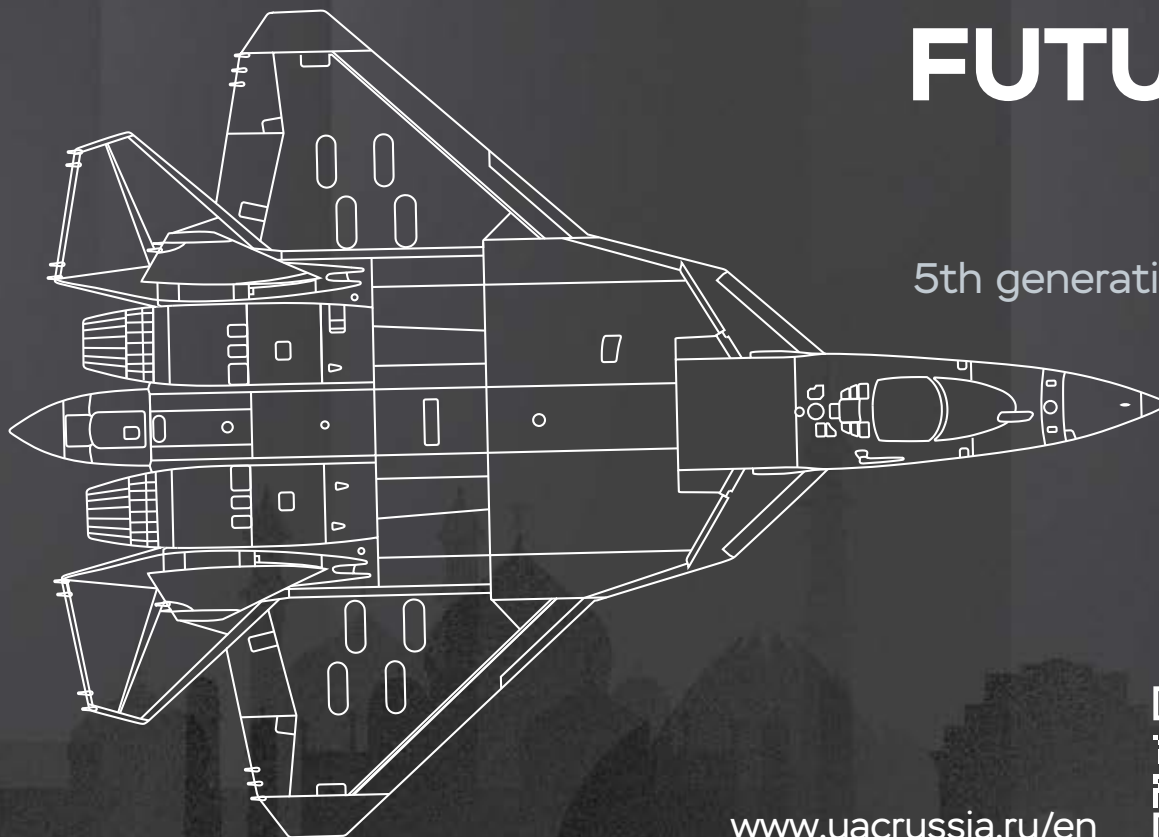


4th generation



LONG HISTORY
**WITH A BRIGHT
FUTURE**

5th generation



Break the Silos

Development of unmanned technology requires a military-civil fusion policy



HAL's CATS programme of manned-unmanned teaming is an example of public-private partnership

THE US USES THE TERM 'CIVIL-Military Integration' (CMI) for the integration of military and civil technology and industrial bases. The US CMI has seen several vicissitudes since the Second World War in which civil and military industries have gone through three stages, comprising pre-Cold War, Cold War and post-Cold War periods. In these three stages, the US civil and military industries were coupled, decoupled and coupled again, to form CMI in 1994. Chinese examined the CMI and articulated their Military-Civil Fusion (MCF) strategy to harness capabilities of both, civil and military technologies, to enhance the scale of production and economic viability. The Academy of Ocean of China has examined these developments in detail in an article in 2018.

US CMI For National Industrial Base

The CMI in the US was first achieved when the Defence Technology and Industrial Base (DTIB) was integrated with Commercial Technology and Industrial Base (CTIB) during the Second World War to leverage strengths of both for technology development. The DTIB focuses on developing and manufacturing defence equipment like aircraft, tanks, ships, etc., while CTIB is focused on developing and manufacturing commercial machines, equipment such as cars, trucks, commercial ships, civil aircraft, other machines and equipment.

After the end of the Second World War, the defence and commercial technology and industrial bases segregated. As a result, DTIB was largely

isolated from the commercial base and thus lost some of the benefits of larger number of buyers. This isolation raised the cost of defence goods and services and reduced the defence industry's access to fastmoving commercial technologies. It also denied commercial firms the chance to exploit the results of large national level defence science and technology investments.

In September 1994, the US Congress' Office of Technology Assessment, published a study titled *Assessing the Potential for Civil-Military Integration: Technologies, Processes and Practices* that aimed at bridging the critical gaps between the two industries. According to this study, civil military integration is defined as the process of merging the DTIB and the larger CTIB into a National Technology and Indus-



Almaz - Antey
Corp.

Destined for guarding blue sky



"Almaz - Antey" Air and Space Defence Corporation", Joint Stock Company

Legal/Trading address:
41 Vereyskaya street, Moscow, 121357, Russian Federation

Inquiries:
Tel. +7(495) 276-29-65
Office:
Tel. +7(495) 276-29-80
Fax +7(495) 276-29-81
E-mail: intersales@almaz-antey.ru
www.almaz-antey.ru



In July 2024, Pentagon held the drone-defence demo. Eight counter-UAS systems were tested against swarms of up to 50 drones of different types attacking simultaneously from different directions. (Picture courtesy: X/ @SydneyFreedberg)

trial Base (NTIB). The NTIB includes non-commercial elements such as public utilities and other non-Department of Defence (DoD) government procurements. The NTIB optimised the use of DTIB and CTIB by both civil and military users, which helped in increasing the scale of manufacturing and cost competitiveness of their products.

The NTIB is also part of the Global Technology and Industrial Base. The US has R&D and technology development initiatives around the world, and it leverages its global technology initiatives as well as global talent for developing niche technologies. The CMI involves an integrated base, common technologies, processes, labour, equipment, materials, and/ or facilities to meet obit defence and commercial needs. The decisions to use integrated resources are based on the same technical, legal and economic reasoning that commercial firms use when servicing global markets. The CMI brought cost savings and increased technology transfer between the civil and military industries, though greater benefits are realised in the longer time frame. The most significant aspect of CMI is that it increases the viability of defence and civil industrial capability under economic constraints.

China's MCF

China's MCF development strategy blurs the differences between civilian and military applications of dual-purpose technologies such as robotics, AI, aerospace, aero-engines, nuclear, semi-conductors, cyber, etc. The MCF is especially significant in aeronautics, space and drone technologies. The current MCF policy came into existence in 2012 and aimed at making China a technological and scientific power by

India does not have a national MCF or CMI policy, strategy and plan for any sector. This lack of integration between civil and military sectors leads to incoherence in technology development, sub-optimal utilisation of technology development resources and ecosystem. This affects the scale of manufacturing and cost competitiveness, especially at the global level

2050. The 27-member Chinese MCF Development Committee was established in 2017. The structure of MCF Committee is similar to India's Space or Atomic Energy Commission, with four functionaries in the Secretariat and twenty-three members.

The MCF Development Committee is headed by President Xi Jinping with the Premier as the deputy head, the Executive Secretary and Executive Vice-Premier as the other members comprising secretaries, politburo members, members from the Chinese Military Commission (CMC) departments, researchers and technology experts, ministers from various ministries and other relevant senior functionaries. The MCF has been part of every strategic initiative taken by China ever since Xi Jinping became President in 2012, that include initiatives such as 'Made in China 2025' and the 'Next Generation Artificial Intelligence Plan'. The MCF has led to parallel growth of government-led civil, military and private sectors.

In addition to the MCF Development Committee, the Chinese Military Commission (CMC) has the Science and Technology (S&T) and the Equipment Development Departments (EDD) that promote R&D, innovation and indigenous development. The S&T Department promotes strategic management



2025
AERO INDIA
The Runway to a Billion Opportunities

Visit us at : Hall E
10th Feb-14th Feb 2025



— A Maharatna CPSE —



स्वदेशी रूप से निर्मित INDIGENOUSLY BUILT

INNOVATE

COLLABORATE

LEAD



The 1st Defence PSU to get Maharatna status



Ranked 29th globally



Excellent MoU rating for 22 consecutive years



Global footprint, exporting to 30 countries with liaison offices in London and Moscow, and a marketing office in Malaysia



Manufactured over 4300 Aircraft & 5500 engines. Overhauled over 12400 Aircraft & 36650 engines

www.hal-india.co.in



HALHQBLR

of national defence science and technology and innovation, pushing for integrated development of military and civilian science and technology. The EDD is responsible for R&D, testing, authentication and information construction.

Need For National MCTF In India

India does not have a national MCF or CMI policy, strategy and plan for any sector. This lack of integration between civil and military sectors leads to incoherence in technology development, sub-optimal utilisation of technology development resources and ecosystem. This affects the scale of manufacturing and cost competitiveness, especially at the global level. There is a need to formulate a national military-civil technology fusion (MCTF) policy, as there are multiple sectors that would benefit from such fusion. The name MCTF is proposed instead of MCF to emphasise the pre-eminence of technology collaboration.

Need For MCTF For Indian Aeronautics and Drone Sectors

The development of drone and aeronautics technology is led by the ministry of defence in India. The corresponding civil drone and aeronautics technology development is non-existent. In addition, the lack of a military-civil technology fusion (MCTF) policy, technology development structures and ecosystem, becomes a hindrance in the growth of domestic civil aeronautics and drone technologies.

The MoD under its defence *atmanirbharta* policy, regularly undertakes indigenous design and development projects. The Ministry of Civil Aviation (MoCA) on the other hand, does not have a civil aviation/ drone *atmanirbharta* policy. The *atmanirbharta* in aviation/ drones was not included in the National Civil Aviation Policy-2016,137 which is a limitation in achieving MCTF.

In the defence aeronautics sector, India has made significant progress in the last decade with the development of ALH Mk-I, II, III & IV; Light Combat Aircraft (LCA, Mk 1/ IA & II), Hindustan Turbo Trainer-40 (HTT-40), Saras (Mk-1 &2), Dornier-228 and many more defence aircraft are being developed by Indian industry. India leveraged procurement of 56 C-295 aircraft to establish a manufacturing facility in India, though details of which critical systems of C-295 would be manufactured by Indian entities, remain

unclear. On the other hand, Indian airline operators placed an order for 1,100 aircraft worth USD110 billion in 2023 with no local manufacturing or ToT. The corresponding impetus to develop and manufacture commercial and civil aircraft in India is absent due to lack of self-sufficiency in civil aviation and MCTF policies.

Lack of MCTF in Counter Drone Technologies

In the counter-drone technologies segment, India developed indigenous counter-drone solutions for the defence forces though the iDEX challenges. The counter-drone solutions for civil aviation and protecting the critical industries requires tweaking of counter-drone technologies to prevent collateral damage. However, there are no corresponding civil counter-drone technology development challenges due to absence of MCTF.

Lack of MCTF In Drone Technologies

In the defence drone sector, the Mehar Baba Swarm Drone Competition played an important role in evolution of drone swarm in India. In addition, few defence drone-related problem statements were included in the iDEX competitions. However, no such competition has been launched in civil drone technology development to fill critical gaps in India's civil drone industry. The reliance on imports for civil drone critical systems and subsystems remains a major vulnerabil-

China's MCF development strategy blurs the differences between civilian and military applications of dual-purpose technologies such as robotics, AI, aerospace, aero-engines, nuclear, semi-conductors, cyber, etc... The current MCF policy came into existence in 2012 and aimed at making China a technological and scientific power by 2050. The structure of MCF Committee is similar to India's Space or AEC, with four functionaries in the Secretariat and 23 members

ity and impediment in scaling-up manufacturing. The lack of MCTF is becoming a limitation in achieving the goal of India being a global drone hub by 2030.

The civil drones are being used in the agriculture sector with the launch of the Kisan Drone and Kisan Didi scheme. The drones are also being used for the Survey of Village Abadi and Mapping with Improvised Technology in Village Areas (SVAMITVA) scheme. The ministry of agriculture, ministry of panchayati raj and other ministries also lack policies on *atmanirbharta*, procurement of indigenously designed drones and use of indigenously designed drones for commercial services.

Lack of MCTF in Satellite Navigation

The future and outcomes of the Navigation with Indian Constellation (NAVIC) challenge launched by the Ministry of Electronics and Information Technology (MeitY) on 15 August 2022 to build an indigenous satellite-based navigation system, remains uncertain. It has been a challenge for standalone civil navigation technology development with the potential to provide indigenous satellite navigation solutions. The development of a suitable NAVIC receiver has been a slow process without user involvement. The lack of user involvement and assured procurements has been a major limitation in the development of indigenous technologies.

This indicates a lack of synergy among the civil-military stakeholders. The MoD, MoCA and the Indian auto industry—three potential users of NAVIC competition—could have joined it as partners. They could have been involved in the formulation of the problem statement, vetting of participants, development, trials and validation of NAVIC systems developed by the participants and could have provided assured orders. The MCTF could have resulted in rich dividends and a boost to *atmanirbharta* in satellite navigation.

Atmanirbharta in India is focused on defence aviation and defence UAV sectors. However, similar initiatives are needed in the civil aviation and drone sectors as well, to complement defence *atmanirbharta* initiatives and achieve MCTF. ||

(This article has been extracted from writer's monograph called Military-Civil Technology Fusion For Making India Atmanirbharta Global Drone Hub@2030 for IDSA. It has been extracted with permission)

BHARAT FORGE



Bharat Forge Aerospace's state-of-the-art facilities include advanced forging presses, 5-axis machining centres, and NADCAP - Certified heat treatment units. Supported by cutting-edge R&D, our expertise drives precision, innovation, and excellence in aerospace manufacturing.

With digitisation enhancing efficiency and new capabilities under the **Technology Development Fund (TDF)**, Bharat Forge is well-prepared to meet the evolving needs of the aerospace sector. We continue to set global benchmarks while building a sustainable and innovation-driven future.



BEYOND HORIZONS

SHAPING INNOVATION STRENGTHENING AEROSPACE



| BFL Aerospace

Mundhwa, Pune - 411 036, India.

aerospace@bharatforge.com

Follow us:

+91-20-67042777

www.bharatforge.com



Scan to know more



A poster of Iran's Operation True Promise

Cheap, But Effective

Cost-effective drones are changing the economics of warfare

A FORCE REPORT

ASYMMETRY OFTEN PLAYS A decisive role in conflicts, particularly when one side holds a significant power advantage over the other. Throughout modern history, technological progress has mainly favoured militarily superior nations, widening the gap between them and their adversaries. In response, less powerful nations seek asymmetrical tools to level the playing field. Low-cost drone warfare emerges as a critical means to bridge this capability gap, offering a strategy to offset the dominance of more powerful forces.

On 13 April 2024, Iran launched a retaliatory drone and missile strike named Operation True Promise in response to an alleged Israeli bombing of the Iranian embassy in Damascus on 1 April 2024. The attack reportedly included over 180 Shahed drones, more than 120 ballistic missiles like Kheibar Shekan and Emad,

and over 30 Paveh cruise missiles. While most of the drones were intercepted by the combined effort of Israel's air defence system, United States' (US) military, United Kingdom's (UK) Royal Air Force and French fighters shot down some missiles. Even Jordan reportedly shot down some missiles that entered their airspace.

Iran's drone assault on Israel highlighted the emerging paradigm of warfare, demonstrating that from Iran to Ukraine, the current era is characterised by the prevalence of cost-effective drone warfare. The attack did not cause any significant damage to Israeli infrastructure, but it highlighted the economic benefits of cheap drones for countries like Iran which is under heavy economic sanctions and the challenges it poses for Israel and US bases in the region.

The combined expenditures of the United States and Israel in countering the Shahed drones likely totalled

approximately USD 1.5 billion. In contrast, the overall cost for Iran to deploy the Shahed drones was estimated to be around USD 3 million. This vast difference illustrates how adversaries can strain their military budgets by compelling them to constantly replenish and reinforce their air defences and air force at considerable expense.

Both Hamas' Al-Qassam Brigades and Hezbollah have adopted the same strategy of using relatively inexpensive rockets and drones to impose a high cost on Israel's sophisticated and expensive air defence systems. Hezbollah can deploy swarms of drones simultaneously against a single target to overwhelm Israel's air defence systems. The group has an arsenal that includes unguided artillery rockets, as well as ballistic, anti-air, anti-tank, antiship missiles, mortars and drones. The bulk of Hezbollah's arsenal consists of short-range and unguided projectiles, mostly 'Katyusha' variants.



Al-Qassam Brigades has used drones for surveillance and reconnaissance purposes but also to neutralise the Iron Wall's CCTV cameras in simultaneous attacks. They have also relied on fixed-wing kamikaze Al-Zawari drones to contribute to the numerous rocket launches to the saturation of the Iron Dome system.

Iran's Economics of Cheap Drones

This strategy is not only cost-effective for these groups, but it also poses a significant challenge for Israel's air defence systems. Despite the advanced capabilities of systems like the Iron Dome, the sheer volume of incoming threats can be difficult to manage. This strategy effectively turns Israel's technological superiority into a potential weakness, as each successful penetration of the air defence system by a cheap rocket or drone inflicts damage out of proportion to the cost of the weapon used.

Even if Israel shoots down most drones, some may get through, potentially causing damage and achieving the attacker's goals. This creates an

asymmetric cost equation—a successful drone attack can be much cheaper for Iran than Israel's defence. The prevalence of these cheap drones could potentially change the conduct of warfare.

Iran has successfully developed cost-effective versions of drones based on captured US and Israeli models, such as the Predator, Reaper, Sentinel, Scan-Eagle 5 and Hermes drones. While Iran has replicated the physical designs of these Unmanned Aerial Vehicles (UAVs), they may not have fully reproduced all the advanced onboard electronics and capabilities. Nonetheless, their ability to create affordable alternatives underscores the country's determination to leverage drone technology for strategic purposes, despite potential limitations in sophistication compared to the original models.

Drones come in a full spectrum. Most of the drones that are used by the West, like the Reaper drone, which has been somewhat the iconic drone that has been used since 9/11, cost in the range of USD 30 million. The drones that are developed by Iran are the drones that called kamikaze drones. All they do is carry a payload of explosives and they ram into a target and blow up. In military circles, they're called lawnmowers on wings. Shahed drones are called Iran's AK-47 because it is extremely versatile and can be produced in high quantities at a low cost.

Iran's extensive use of drones goes back to the Iran-Iraq War in the 1980s. Iran initiated its use of UAVs in 1985, deploying the Ababil-1 and Mohajer-1 for reconnaissance missions on Iraqi positions beyond the front-line trenches. However, after the US Navy inflicted sig-

The strategy of using a large number of low-cost drones to overwhelm sophisticated air defence systems, as used by Iran, is a critical lesson as it shows how a technologically superior defence system can be rendered ineffective by sheer volume. Even if the physical damage caused by such attacks is minimal, the psychological impact can be significant

nificant damage on Iran's air and naval forces during Operation Praying Mantis in 1988, Iranian strategists acknowledged their inability to confront the US on open waters.

This realisation led Iran to significantly increase its investment in drone technology. Since then, the Iranian government has been transparent about its interest in UAVs. The Islamic Revolutionary Guard Corps Aerospace Force is the main entity managing Iran's expanding UAV fleet, although other Iranian military services also utilise them. This initiative was fuelled, in part, by the nation's limited access to advanced Western technology necessary for acquiring, developing and sustaining a sophisticated air force.

Iran has now achieved self-sufficiency in the production of drone engines. It has revealed that its arms exports have surged four to five times over the past two years, as the official Islamic Republic News Agency reported. Iran's primary drone manufacturer, Shahed Aviation Industries, is reportedly designated by the US as a subsidiary of the Revolutionary Guards. To evade sanctions, they've engaged with numerous small companies and established global smuggling networks to procure necessary components.

Tehran's utilisation of drone diplomacy not only generates foreign currency to support its defence industry but also reinforces its strategic alliances with countries like Russia and China, positioning it as a formidable player in the arms trade. Shahed drones have been deployed in various countries including Syria, Russia, Ethiopia, Tajikistan and Venezuela, with the Shahed-136 being particularly notable. With a payload capacity of up to 50 kilograms and a range of 2500 kilometres, this drone enables Iran to target locations within Israel directly, eliminating the need for proxy forces in neighbouring areas like Lebanon, Syria, Iraq and Gaza.

Reports indicate Russia has been replicating attack drones it obtained from Iran in 2022, deploying them in military operations against Ukrainian forces. Russian replicas of the Shahed-136 drone are designated as Geran-2 or Geranium-2 in Russian. While Iran has consistently denied selling drones to Russia for use in Ukraine, it has acknowledged sending a 'small number' before the February 2022 invasion. Russia uses several other cost-effective drones in its military operations. One of these is the DJI Mavic 3 from China, which is used



A cheap drone procured online can be used to crash a projectile into a chosen target (Picture courtesy: XI @Pion_257)

by both Russia and Ukraine for surveillance and bomb delivery. This drone is priced at around USD 2,000, making it a cost-effective choice compared to more expensive military equipment.

Another drone used by Russia is the AQ-400 Scythe, a kamikaze drone designed by Terminal Autonomy, a company based in Kyiv, Ukraine. The body of the AQ-400 Scythe is made from plain furniture-grade plywood, while the electronics were sourced from Germany and the UK. This drone has a thermobaric warhead weighing up to 42 kilograms, which is also manufactured in Ukraine. It can also carry a couple of 122 millimetre artillery shells. The AQ-400 Scythe has a range of about 750-900 kilometres, depending on the weight of the cargo. It costs around USD 15,000.

Cheap drones have changed the war for Ukraine too. Cheap, consumer, mainly Chinese models have been adapted to drop explosives on multimillion-dollar tanks, and more sophisticated drones have been used to great effect against the Russian navy. Those drones have been key in Ukraine's ability to destroy quite a large part of Russia's naval fleet in the Black Sea. These Ukrainian-made surface drones, armed with about 660 pounds of explosives, can hit a target about 500 miles away. These drones have limited the Russian navy's movements and have been used to strike critical infrastructure like the Kerch Bridge.

Ukraine has found it challenging

to source drones and drone parts from Chinese suppliers due to new export control restrictions imposed by Beijing. Despite these challenges, Ukraine has been able to adapt and use these drones effectively in the conflict. In the Nagorno-Karabakh War too, cost-effective drones played a significant role. Both Armenia and Azerbaijan, which didn't have substantial air forces, used drones as an affordable alternative. These drones were perfect for operating within the remote mountains, forests, and valleys of Nagorno-Karabakh.

Azerbaijan was able to achieve air superiority in the battlespace using Turkish Bayraktar drones. These drones were used effectively to disable a large

Iran has successfully developed cost-effective versions of drones based on captured US and Israeli models, such as the Predator, Reaper, Sentinel, Scan-Eagle 5 and Hermes drones. While Iran has replicated the physical designs of these UAVs, they may not have fully reproduced all the advanced onboard electronics and capabilities

number of Armenian tanks, fighting vehicles, artillery units and air defences. They also penetrated Nagorno-Karabakh's deep rear, weakening Armenian supply lines and logistics, which facilitated later Azerbaijani success in battle.

Lessons for India

The strategy of using a large number of low-cost drones to overwhelm sophisticated air defence systems, as used by Iran, is a critical lesson as it shows how a technologically superior defence system can be rendered ineffective by sheer volume. Even if the physical damage caused by such attacks is minimal, the psychological impact can be significant. It forces the defending nation to be on constant high alert due to the unpredictability and ease of drone attacks.

India faces potential drone threats from Pakistan and non-state actors within its territory. Given the geographical proximity and historical context, the threat of low-cost drone attacks from Pakistan or non-state actors within its territory is real for India. Cheap drones are already being used along the border for surveillance and smuggling activities. Therefore, the need for developing a robust air defence system and anti-drone technologies arises.

India's pace of development and deployment of these technologies is not at par with the rapidly evolving drone threats. India has laid out a drone policy in 2021, but an anti-drone policy is yet to be developed. A comprehensive counter-drone strategy involving all stakeholders is needed.

While India has obtained high-end drones like the Reaper from the US, its indigenous drone programmes have not yet yielded the desired results. The Defence Research and Development Organisation (DRDO) is working on Tapas, a fully indigenous medium-altitude and long-endurance drone. However, it has not yet met the service requirements of altitude and endurance in recent evaluations.

On the other hand, Iran has developed a robust drone industry. Iran's drones are inexpensive and versatile and allow for plausible deniability. They have at least nine different types of suicide drones, which explode on impact.

Given these circumstances, it is prudent for India to invest more in research and development for its indigenous drone programs, learning from countries like Iran, which have successfully developed a wide range of indigenous drones. ||

Leading by Example

Airbus sees continued growth in helicopter sales in 2024



A FORCE REPORT

AIRBUS HELICOPTERS LOGGED 455 gross orders (net: 450) in 2024, highlighting a steady market growth with a strong performance this year for its light, light twin-engined, and heavy helicopters. The orders came from 182 customers in 42 countries. The Company delivered 361 helicopters in 2024, resulting in a preliminary 57 per cent share of the civil and parapublic market.

“Airbus Helicopters’ order intake in 2024, with an increase bordering 10 percent in units for the second year in a row, highlights its stable growth in a complex global environment,” said Bruno Even, CEO of Airbus Helicopters. “I would like to thank our customers for continuing to place their trust in Airbus Helicopters in 2024,” he added.

The Super Puma programme performed strongly on both the civil and parapublic and military markets with 58 orders thanks to the German Bundespolizei, the Japan Coast Guard, the Ministry of Defence of the Netherlands, and the Romanian Ministry of National Defence. 2024 saw the launch of a comprehensive upgrade, known as Block 1, for the NH90 as well as the start of flight testing for France’s Special Forces Stan-

dard 2 configuration, and the delivery of the first Standard 3 configuration to the Spanish Air Force. The H145 and H145M programme welcomed many new defence and security customers such as the Brunei Air Force, the Belgian Ministry of Defence, the Indonesian Air Force, the Bahraini Police Aviation Command as well as the Irish Ministry of Defence.

“Defence and security is a strategic priority at Airbus Helicopters. We are proud to support our customers with helicopters that enable them to protect and serve their nations as we saw in 2024 with the U.S. National Guard’s Lakota supporting disaster relief efforts after Hurricane Helene and the H135 and NH90 in the flooding in Valencia, Spain. We continue to innovate and expand the mission capabilities that we offer—we integrated Flexrotor into our UAS portfolio, we demonstrated crewed-uncrewed teaming capabilities with the VSR700 and an H130, and we are laying the groundwork for the European Next Generation Rotorcraft through dedicated concept studies,” continued Even.

2024 saw the first flight of Racer and the unique compound helicopter surpassed its 407 KM an hour objective in just seven flights along with the maiden

flight of CityAirbus NextGen in Donauwörth. On the civil and parapublic market, the H175 completed its de-icing flight test campaign in Canada and Norway ahead of certification this year and the H160 continued its progressive entry into service around the world with more than 30 helicopters now in service.

“Supporting our customers is essential and our global footprint is a key element to achieving that. We celebrated several milestones in 2024 that attest to that—firstly the 40 years of our facility in Fort Erie, Canada. This proximity will be important for our landmark contract for the 19 H135s that will be delivered to our first Canadian defence customer. Secondly, we marked fifty years of presence in the UK and inaugurated a brand-new facility in Oxford. We will continue to grow our international footprint with the addition of an H125 final assembly line in India in partnership with TATA,” Even continued.

The Company also ramped up the use of sustainable aviation fuel (SAF) for its own development test flights and training flights in Marignane, Albacete, and Donauwörth to nearly 20 per cent, and added the use of SAF at its facility in Oxford, UK. ■

'Boeing is Driving Aerospace Innovation in India Through the Expertise of Engineers and Technologists at the BIETC in Bengaluru and Chennai'

— Managing Director, Boeing Defence India, Nikhil Joshi

What makes P-8I an essential asset for the Indian Navy, especially considering the evolving maritime security threats in the Indo-Pacific region?

The P-8I is designed for long-range anti-submarine warfare (ASW), anti-surface warfare (ASuW), and intelligence, surveillance, and reconnaissance (ISR) missions. With a fleet of 12 P-8Is, the Indian Navy has significantly enhanced its ability to secure and protect its vast coastline while playing a larger role in regional maritime security. This patrol aircraft, a critical asset in the navy's fleet, has logged over 40,000 flight hours since its induction. The P-8I's ISR capabilities have also proven invaluable during disaster relief and humanitarian missions. Overall, the P-8I has provided the Indian Navy with a decisive edge in the strategically vital Indian Ocean region. With a range of over 1,200 nautical miles, the P-8I enables the navy to conduct extensive maritime surveillance, covering areas from the east coast of Africa to the busy trade routes of the Malacca Strait.

How does Boeing ensure the operational readiness of its aircraft and support the Indian armed forces in sustaining their fleets?

Cost-effective solutions, timely support, and flawless execution are central to BDI's commitment to its customers. As Boeing's dedicated local entity in India, Boeing Defence India (BDI) provides holistic lifecycle solutions, including timely maintenance, repairs, and access to technological advancements. These services ensure high fleet availability and mission readiness, enabling the Indian armed forces to effectively safeguard national security. We are working with the Indian Air Force (IAF) and the Indian Navy (IN) to provide operational capability and readiness for the P-8Is, the C-17s, the Head of State aircraft and the Chinooks and Apaches. Boeing's integrated logistics support is already enabling the highest



levels of fleet readiness. We support the IAF's C-17 fleet under the Globemaster Integrated Support Program (GISP), that maintains high mission capability rates, by providing them access to an extensive support network for parts availability and economies of scale.

Boeing provides comprehensive C-17 Globemaster III training solutions for aircrews and loadmasters with advanced simulation, courseware and computer-based training. C-17 operators can practice the complete range of tasks required for tactical military airlift operations and humanitarian missions, along with mission rehearsal of all scenarios including emergency procedures. Boeing's in-country C-17 training centre has completed thousands of training hours for aircrews and loadmasters. Boeing also offers long-term Performance Based Logistics (PBL) solutions for the platforms, namely, P-8I, Apache and Chinook,

with a promise to provide similar levels of availability currently provided for the C-17 fleet through our GISP programme. Boeing also offers training on platform simulators, just as we do today for the C-17 platform.

PBL strategies have a proven track record of transforming the legacy transactional support between Boeing and its customers, to solutions that increase aircraft availability, resolve Aircraft On-Ground (AOG) situations, and reduce the life-cycle cost of operating defence aircraft. PBLs translate to higher aircraft availability through better utilisation of inventory and the requirement for fewer spare parts. Specifically for India, a PBL strategy will help resolve operational issues and enable further growth of the *Aatmanirbhar* Bharat vision by strengthening India's national defence industry. Boeing has globally executed over 12 Apache, and over six Chinook PBLs, bringing over 30 years of experience to enable long-term success of vertical lift readiness in India.

Notably, our offerings of the PBL solutions (referred variously as, Aircraft Support Agreement (ASA), Aircraft Maintenance Contract (AMC) or Comprehensive Maintenance Contract (CMC) include our digital offering—Mission Accelerator (MA). MA helps enhance the availability of platforms significantly by providing predictability into maintenance. It also helps in the operations and training of aircrew.

What truly stands out on the sustainment programmes is the overwhelmingly positive feedback we are receiving from our defence customers in India on the significant value our platforms and support ecosystem bring to their missions, which fills us with pride and deep satisfaction.

How does Boeing's approach to building local MRO capabilities support the Indian Armed Forces' operational needs and contribute to strengthening

indigenous defence capabilities?

Boeing tailors its MRO services for Indian defence customers by providing highly flexible, responsive, and localised solutions to meet their specific operational demands. Our approach includes a combination of advanced capabilities, local partnerships, and strategic investments in technology and infrastructure. Key elements include:

Localised support: The Boeing India Repair Development and Sustainment (BIRDS) programme enables engineering, maintenance, skilling, repair and sustainment services of defence and commercial aircraft in India. The BIRDS hub is designed as a network of local suppliers, creating a robust MRO ecosystem for defence and commercial aircraft. This initiative establishes industry benchmarks for maintenance, platform availability, customer satisfaction, and rapid turnaround times.

Customized offerings: Our integrated logistics support and long-term Performance Based Logistics (PBL) solutions for platforms such as P-8I, Apache, and Chinook, promise to provide the same high level of availability currently offered to the Indian Air Force C-17 fleet through our Globemaster Integrated Support Program (GISP). Our PBL solutions, including Next Generation Product Support, increase efficiency, minimise downtime, reduce lifecycle costs, and enhance combat effectiveness.

Skilling and training: To ensure long-term sustainability, Boeing conducts training programmes for Indian technicians and engineers, particularly through its network of suppliers and MRO partners. Further, a vital component of the BIRDS hub includes training programmes that enhance skilled labour by developing sub-tier suppliers and supporting micro, small, and medium enterprises (MSMEs). This helps build a skilled workforce capable of maintaining and servicing the latest technologies.

Advanced Technologies and Innovations: With a substantial portion of Boeing's global talent pool situated in India, Boeing India Engineering & Technology Center (BIETC) is instrumental in delivering customised digital solutions for Indian customers while also generating intellectual property locally. It plays a key role in supporting BDI by addressing critical engineering requirements, driving operations and service engineering, fostering co-de-



velopment, and advancing indigenous aerospace programmes.

How does the BIETC support Boeing's defence platforms used by armed forces in India and around the world?

Boeing is driving aerospace innovation in India through the expertise of engineers and technologists at the BIETC in Bengaluru and Chennai. This talented workforce supports key defence platforms, including the F/A-18 Super Hornet, P-8I, F-15, KC-46, AH-64 Apache, CH-47 Chinook, and other aerospace programmes, not just for India, but for the world.

With a substantial portion of Boeing's global talent pool situated in India, BIETC is instrumental in delivering customised digital solutions for Indian customers while also generating intellectual property locally. It plays a key role in supporting BDI by addressing critical engineering re-

quirements, driving operations and service engineering, fostering co-development, and advancing indigenous aerospace programmes. To stay ahead of evolving needs, we continuously invest in skilling, re-skilling, and up-skilling programmes, empowering our workforce to deliver world-class solutions and contribute to India's aerospace growth.

BIETC serves as a hub for advanced R&D, digital innovation, and engineering excellence across defence, space, and commercial sectors. Our engineers utilise cutting-edge technologies such as AI, Machine Learning, IoT, Cloud, Model-Based Engineering, and Additive Manufacturing, with a steadfast focus on quality, safety, and productivity. In January 2024, the Indian Prime Minister inaugurated our 43-acre engineering and technology campus in Bengaluru, built with a USD200 million investment. ||

KNDS' Exclusive Negotiations For the Acquisition of Texelis' Defence Business

On January 29, KNDS and Texelis signed a Memorandum of Understanding (MOU) concerning the proposed acquisition by KNDS France of Texelis' Defence business.

Under this agreement, the two parties announce that they are entering into exclusive negotiations with a view to carrying out this transaction, which will require the separation of Texelis into two companies—Texelis Défence and Texelis Transport.

Information and consultation of employee representative bodies on this project is scheduled to take place in the next few days. The final completion of this transaction, expected by the end of 2025, remains subject to the finalisation of agreements and to the usual conditions precedent for this type of transaction.

Texelis is a French company whose defence business specialises in land mobility and design of cutting-edge solutions for armoured land vehicles. Texelis is a major player in the French defence industry, producing numerous parts and mobility components for the French Army armoured vehicles. Since winning the SERVVAL contract with KNDS France, Texelis has been able to develop, qualify and produce complete mobility solutions for 4x4, 6x6 and 8x8 vehicles. An innovative company, Texelis is at the forefront of hybridization for armoured vehicles, as well as energy management applied to mobility.

"This structuring project will enable us to strengthen our growth and increase our skills in the mobility field, with a high-performance French company that we know well and that is already our partner in the temporary business ven-



ture Serval," said CEO of KNDS France, Nicolas Chamussy.

Chairman of Texelis, Charles-Antoine de Barbuat, commented: "The future integration of Texelis' Defense business into the KNDS group would open up numerous growth prospects, beyond the initial success of the collaboration. In addition, the Transport business has all the assets needed to pursue its development independently." II

Low Tech, Big Noise...

(Continued from page 4)

of iDEX itself. Innovation implies painstaking research, experimentation, trials and often failure. However, iDEX became a competition, replacing innovation with shortcuts to victory. Most Indian start-ups procured off-the-shelf UAVs from the global marketplace, and sought to modify them. Hence, both the numbers and the success rate remained limited. Companies with deeper pockets, say Adani Defence, partnered with global manufacturers. In this case, Israel's Elbit Systems. The product of this partnership is the indigenously assembled long-range surveillance UAV, Dhristi, one of which crashed earlier this year during a validation flight. In none of the above cases has there been a development or absorption of technology.

The spirit of iDEX entered the IAF too. In October 2018, it announced its own drone competition called Mehar Baba Swarm Drone Competition. According to an IAF officer, the idea of the competition was to encourage academia and start-ups to collaborate in developing drone swarms. As of now, it remains in the realm of future development.

The second reason is the vast mismatch between ambition and capability. In 2021, Hindustan Aeronautics Ltd (HAL) announced an ambitious Combat Air Teaming Systems programme at the initial development cost of Rs

1,000 crore. In HAL's vision, the system will comprise four elements: A mothership, a couple of UCAVs (as loyal wingmen) called CATS Warrior, small cruise missiles called CATS Hunter and loitering munition to operate as swarm called ALFA-S. Four years later, the only notable progress has been the engine ground run of the full-scale demonstrator of CATS Warrior.

The biggest challenge here is the mothership itself, the role that HAL has assigned to the still underdeveloped LCA Mk-II. During Prime Minister Modi's US visit, GE had signed an agreement with HAL for coproduction of aero-engines to power LCA Mk-II. The production is yet to begin. And LCA Mk-II is not expected to fly before 2026. If all goes well, then mass production is likely to begin in 2029.

Left with no choice but to throw its weight behind the ambitious CATS programme, a senior IAF officer says, "We are not the only ones facing problems in man-unmanned teaming programmes. Even the Europeans are grappling with ethical issues of how much autonomy should be given to unmanned systems."

And that is the third reason. Even without the maturity of the homegrown technology or the capability, we compare ourselves with those who debating the consequences of far-advanced technology. Seriously, crawl before you jump. Instead of annual competitions, shortlist a couple of start-ups and invest in them. Hopefully, that will yield better results. II

'BEL Has Always Been a Profit-Making PSU Despite Various Challenges Including Stiff Competition'

— Director (marketing), BEL, Suresh Kumar K.V.



the areas BEL is focussing as part of diversification efforts include solutions for civil aviation, unmanned systems, railway & metro systems, network & cyber security, smart city solutions, space electronics, arms & ammunition and seekers, medical electronics and Artificial Intelligence.

Tell us about your expansion plans

From time to time, depending upon the growth needs and opportunities, BEL has been taking major initiatives to modernise and expand its infrastructure. Some of the new infrastructure initiatives taken up recently include setting up of a Defence System Integration Complex for Missiles and Weapon Systems at Palasamudram, Andhra Pradesh; state-of-the-art manufacturing facility for Electro Optics and IIR Seekers at Nimmaluru; Fuze manufacturing facility at Nagpur; manufacturing facility for Land-based EW systems at Ibrahimpatnam, Telangana; modernisation of storage magazine and hot integration facility for arms & ammunition at Vellore; and integration facility for QRSAM at Agra.

How do you look at the current international market for defence products, and what strategies is BEL employing to strengthen its global presence?

The ministry of defence has set an ambitious target of Rs 50,000 crore exports by 2028-29. BEL is therefore fast expanding its global presence by making all out efforts to tap new export markets across the globe. In the last few years, we have made substantial progress, both in terms of export orders acquisition and dispatches. We have identified multiple products and systems for targeted marketing in focussed export markets. In a bid to develop new markets in the Indian Ocean Region and friendly foreign countries (FFCs), we have also operationalised new overseas marketing offices.

All these efforts have paid rich dividends. Our exports business saw a robust uptick in FY 2023-24 with sales growing by 92 per cent to a record USD 92.98 million. BEL's products continued to find increased acceptance in coun-

tries such as France, USA, Spain, Israel, Germany, Armenia, Sri Lanka, Mauritius, UK, etc, a clear indication of the company's growing capabilities. BEL also has a healthy export order book of USD 387 million. BEL is enhancing its geostrategic reach and strategically opening overseas marketing offices in the Indian Ocean Region, Southeast Asia, Middle East Region and Americas.

Can you elaborate on your diversification plans?

Defence has traditionally been contributing to around 80 per cent of the Company's annual sales revenue. BEL, however, has been continuously exploring opportunities in allied defence and non-defence areas. The Company aims to increase its non-defence share in the overall business in the coming years. The total opportunity in the non-defence business segment being pursued by BEL in the next 10-15 years is more than Rs 2 lakh crores. Some of

Please tell us about your company's financial performance, turnover, order book position, etc.

BEL has always been a profit-making PSU despite various challenges including stiff competition. FY 2023-24 saw the company achieve a record turnover of Rs 19,819.93 crore as against Rs. 17,333.37 crore in FY 2022-23, thereby registering a growth of 14.35 per cent. The growth was driven by strong performances across all segments. Defence contributed to 81 per cent of revenue in FY 2023-24 with the balance 19 per cent coming from the non-defence segment. Profit after tax grew by 33.7 per cent to Rs 4,020 crore in FY 2023-24 as against Rs 3,007 crore in FY 2022-23.

BEL also continued the momentum in order acquisition by booking highest ever annual order inflow of Rs 35,046 crore during FY 2023-24. The company's order book position as on 1 January 2025, stands at around Rs 71,000 crore, giving it stable revenue visibility. ||

Reasons Why You Should Advertise in

FORCE



FORCE's broad approach to security is an improvement on the alarmist tone often struck in Indian newspapers and magazines. At more than a dollar per issue, FORCE costs roughly half of what Time and Newsweek cost on Indian newsstands.
- US Foreign Policy Journal wrote:



WITH C3R, FORCE IS YOUR MOST EFFECTIVE BET TO REACH THE RIGHT AUDIENCE. THOSE WHO INFLUENCE; AND THOSE WHO DECIDE

CREDIBILITY

FORCE is not a mere magazine; it is a credible resource-base with authoritative editorial. Our readers reference FORCE for research work, promotional examinations and formulations of SQRs. Hence, an advertisement in FORCE has a shelf-life of years and not merely a month.

COST-EFFICIENCY

FORCE is the first Indian magazine to integrate all aspects of national security and civil aerospace into one collective whole. Hence, your advertisement reaches a broad segment of decision-makers across services and domains.

COVERAGE

Today, external defence demands greater synergy between air, land and sea. Homeland security requires better cooperation between the military, paramilitary and other civil agencies. FORCE is one medium that 'speaks to' and 'speaks of' both these prongs.



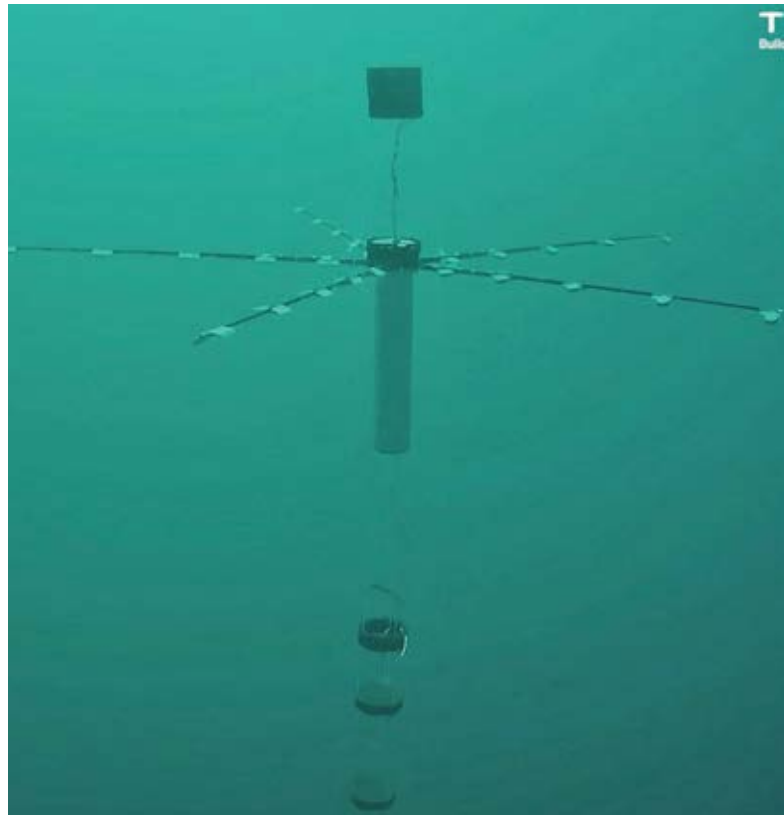
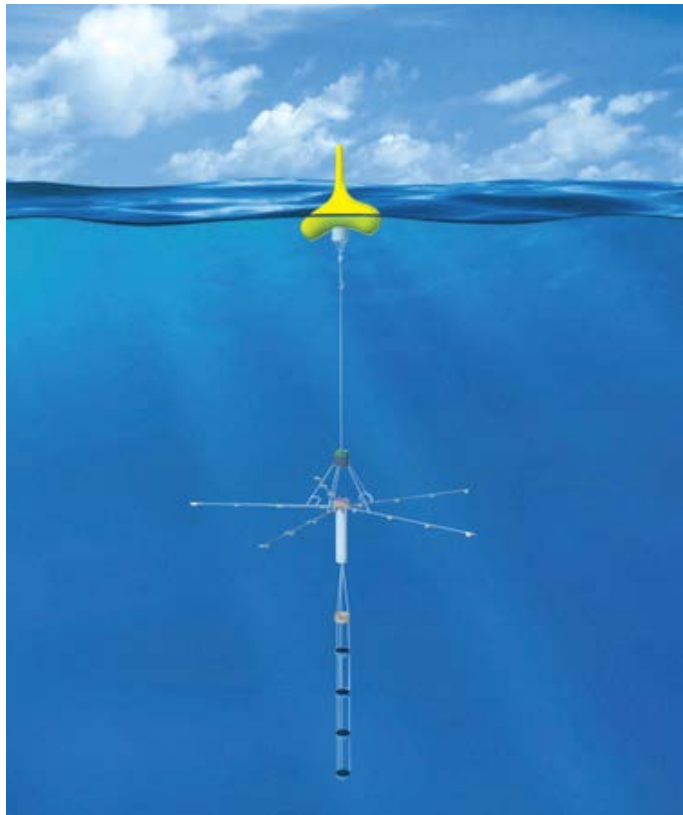
REACH

A measure of FORCE's reach can be gauged by the fact that when one of India's biggest jewellery brand wanted to target the Indian military, it used FORCE as the vehicle (http://www.forceindia.net/force_youtube.aspx). It understood that to convince the last person in uniform about its brand value, there could be no better vehicle than FORCE.

For more information, write to Ghazala Wahab at ghazala@forceindia.net; forceindia.mag@gmail.com; ghazalaforce@gmail.com. Or visit www.forceindia.net

To Make in India

Thales presents advanced defence and aerospace innovations at Aero India 2025



THALES WILL SHOWCASE ITS CUTTING-EDGE technologies across the defence and aerospace sectors at the 15th edition of Aero India 2025, India's flagship air show, highlighting the Group's commitment to 'Make in India for India and for the world', aligned with the Aatmanirbhar Bharat vision.

Thales offers a comprehensive array of capabilities and services designed to support the Indian armed forces in attaining operational excellence. At Aero India 2025, Thales will showcase its latest capabilities—across air, land and naval defence as well as space, cyber and digital—that are tailored for modern and future needs of the forces.

Thales provides state-of-the-art equipment on board fighter aircrafts, including the RBE2 AESA radar, the Spectra electronic warfare suite, optronics, the communication, navigation and identification suite (CNI), key cockpit display systems and a logistics support component. The Thales stand at Aero India 2025 will have a dedicated section on these capabilities.

Thales will also highlight its combat-proven airborne optronics, including TALIOS (Targeting Long-range Identification Optronic System) pod, the 2-in-1 system that delivers unmatched image quality, and the InfraRed Search and Track (IRST) system. Also on display will be Thales's air defence solutions such as the Lightweight Multi-role Missile (LMM), the STARStreak missile and ForceShield, alongside air surveillance capabilities such as the GM 200 MM/A radar and the SkyView air command and control system.

For the first time in India, Thales will showcase its innovation in avionics through the FlytX suite for helicopters, in advanced aeronautics navigation systems such as TopAxyz, TopShield and TopStar M. Connectivity solutions such as SYNAPS-A, the airborne member of the SYNAPS software-defined radio family designed to support battlespace digitisation, Modem 21 Air Compact, and the NextW@ve TRA 6030 radio, will also be brought to Aero India this year.

As a leader in the fast-growing market of Unmanned Aircraft Systems (UAS), Thales will provide an overview of its portfolio of drone solutions, including its EagleShield drone countermeasures (an integrated nano, micro, mini and small drone countermeasures solution to protect and secure civil and military sites); the PARADE system that provides 360 degree protection of people, properties and activities, optimised for micro and mini UAS, ranging from 100g to 25kg; and Gamekeeper (a holographic radar that allows detection, tracking and classification of unlimited targets simultaneously including micro and mini drones), in addition to its safe and efficient UTM (Unmanned Traffic Management) system for cooperative and non-cooperative drones, to be unveiled for the first time in India.

Thales will also present its LGR 68 and LGR 70 Laser Guided Rockets that come with laser guidance precision, are jamming-proof and are extremely precise for guiding ammunition to target.



As part of its underwater solutions for efficient Maritime Security Operations, Thales will feature its Sonoflash sonobuoy, an anti-submarine warfare system that allows the detection, classification and localisation of submarines. It will also showcase the AirMaster C radar- the latest addition to its Air Master range of airborne surveillance radars -that is highly adaptable and can be integrated into both manned and unmanned airborne platforms.

AI Systems: Thales is a major AI player in these complex environments. The company is Europe's top patent applicant in the field and devotes a lot of effort to research on AI, both in-house and through academic and industry partnerships. The Group, a major player in trusted AI, provides armed forces with greater efficiency in data analysis and decision-making, while taking into account the specific constraints, such as cybersecurity, embeddability and frugality, associated with critical environments. You will be able to see how Thales embarked AI on its solutions such as TALIOS or AirMaster C radar.

Hiring at Aero India 2025: Thales is expanding its team in India and seeking engineers in hardware, software and systems for its engineering centres in Bengaluru and Noida. Thales HR executives will be present during the public days of the show on 13 and 14 February 2025 to meet engineers and share various possible career opportunities available.

"As India progresses towards its Aatmanirbhar Bharat vision, Thales is proud to be a trusted partner in the nation's

- Thales will be present at Aero India 2025 (3.3 in Hall B) to exhibit its cutting-edge capabilities across defence and aerospace.
- In support of the modernisation and indigenisation ambitions of the Indian armed forces, Thales will reinforce its commitment to 'Make in India for India and for the world', as well as the 'Aatmanirbhar Bharat' vision.
- Thales HR representatives will be available on February 13 and 14 at the stand to engage with engineers and discuss various career opportunities at the company's engineering centre in Bangalore and Noida.

ambitious journey. We remain committed to 'Make in India' and are advancing our roadmap by strengthening our local teams, collaborations and bringing advanced defence and aerospace technologies to the country. We look forward to continue equipping the Indian armed forces with the next generation of innovative and effective solutions to support their strategic defence ambitions. Aero India 2025 will serve as a key platform for us to present our flagship capabilities and engage with the authorities, forces and our industry partners." said president & CEO, Thales International, Pascale Sourisse. ||

► EYES AND EARS

Rajnath Singh flags-off 'Sanjay, the Battlefield Surveillance System' from New Delhi



Defence minister Rajnath Singh flagged-off 'Sanjay, the Battlefield Surveillance System (BSS)' from South Block, New Delhi on January 24. Sanjay is an automated system which integrates the inputs from all ground and aerial battlefield sensors, processing them to confirm their veracity, preventing duplication and fusing them to produce a common surveillance picture of the battlefield over secured army data network and satellite communication network. It will enhance bat-

tlefield transparency and transform the future battlefield through a centralised web application which will provide inputs to command and army headquarters, and the Indian Army decision support system.

The BSS is equipped with state-of-the-art sensors and cutting-edge analytics. It will monitor the vast land borders, prevent intrusions, assess situations with unparalleled accuracy and prove to be a force multiplier in Intelligence, Surveillance & Reconnaissance. This would enable com-

manders to operate in both conventional & sub-conventional operations in a Network Centric Environment. Its induction will be an extraordinary leap towards data and network centrality in the Indian Army.

Sanjay has been indigenously and jointly developed by the Indian Army and Bharat Electronics Limited (BEL) creating a conducive ecosystem towards achieving Aatmanirbharta as a follow up to the Indian Army's 'Year of Technology Absorption'. These systems will be inducted to all operational brigades, divisions & corps of the Indian Army in three phases w.e.f. March to October 2025. This system has been developed under the Buy (Indian) category at a cost of Rs 2,402 crore.

Minister of state for defence Sanjay Seth, Chief of Defence Staff General Anil Chauhan, Chief of the Army Staff General Upendra Dwivedi, defence secretary Rajesh Kumar Singh, secretary (defence production) Sanjeev Kumar, chairman & managing director, BEL Manoj Jain and other senior officials of MoD & BEL were present on the during the flagging-off ceremony. ||

► OCEAN MAPPING

INS Sarvekshak Completes Hydrographic Survey at Mauritius

INS Sarvekshak completed the final phase of the hydrographic survey of Mauritius covering an extensive area of over 25,000 square nautical miles. During a reception ceremony held on-board, High Commissioner of India to Mauritius, Anurag Srivastava formally handed over the fair sheet of the hydrographic survey, along with newly-prepared nautical charts and survey equipment to G.C.S.K. (Grand Commander of the Star and Key of the Indian Ocean), the President of the Republic of Mauritius, Dharambeer Gokhool. The creation of new nautical chart will enable Mauritius to develop its maritime infrastructure, resource management and coastal development planning. This



milestone event reflects enduring partnership between India and Mauritius in fostering maritime development and regional cooperation.

In addition to the operational commitment, the ship organised a joint India-Mauritius yoga session on January 20, bringing together the ship's crew, personnel from the National Coast Guard, Mauritius and Indira Gandhi Centre for Indian Culture (IGCIC). Commanding Officer, INS Sarvekshak, Capt. Tribhuvan Singh called on minister of housing and lands, Mauritius, Shakeel Ahmed Yousuf Abdul Razack Mohamed and discussed the details of survey operations undertaken by the Indian Navy. The visit reaffirmed continued commitment and wide-ranging partnership between the two countries. ||

► HOME DELIVERY

Indian Navy Inducts Seventh Missile Cum Ammunition Barge (MCA) Barge, LSAM 14

Seventh Missile Cum Ammunition Barge (MCA) Barge, LSAM 14 (Yard 82) was inducted on January 7 at Naval Dockyard, Mumbai. The chief guest for the ceremony was Cmde Gaurav Doogar, GM (HR), ND (Mbi).



The contract for construction and delivery of eight MCA Barges was concluded with Secon Engineering Projects Pvt. Ltd, Visakhapatnam on 19 February 21. These Barges have been indigenously designed by the shipyard in collaboration with an Indian ship designing firm and successfully model tested at Naval Science and Technological Laboratory (NSTL), Visakhapatnam to ensure their seaworthiness. The Barges have been built in accordance with the relevant naval rules and regulations of Indian register of shipping (IRS).

Six of these MCA Barges have already been inducted and are providing an impetus to the operational commitments of Indian Navy by facilitating transportation, embarkation and disembarkation of articles/ ammunition to Indian Navy platforms both alongside jetties and at outer harbours. ||

► TECH LEAP

DRDO Conducts Scramjet Engine Ground Test



Defence Research & Development Laboratory (DRDL), a Hyderabad-based laboratory of Defence Research and Development Organisation (DRDO) has taken the initiative in developing a long-duration supersonic combustion ramjet or scramjet powered hypersonic technology. DRDL recently developed these technologies and demonstrated a cutting-edge Active Cooled Scramjet Combustor ground test for 120 seconds for the first time in India. The successful ground test marks a crucial milestone in developing next-generation hypersonic missiles.

Hypersonic missiles are a class of advanced weaponry that travel at speeds greater than Mach 5 i.e., five times the speed of sound or more than 5,400 km/hr. These advanced weapons have the potential to bypass existing air defence systems and deliver rapid and high-impact strikes. Several nations including USA, Russia, India and China are actively pursuing hypersonic technology. The key to hypersonic vehicles is scramjets, which are air breathing engines capable of sustaining combustion at supersonic speeds without using any moving parts.

The ground test of scramjet combustor showcased several notable achievements, demonstrating its potential for operational use in hypersonic vehicles, like successful ignition and stable combustion. Ignition in a scramjet engine is like 'keeping a candle lit in a hurricane'. Scramjet combustor incorporates an innovative flame stabilisation technique that holds continuous

flame inside the combustor with air speed in excess of 1.5 km/s. Many novel and promising ignition and flame holding techniques were studied through many ground tests in arriving at scramjet engine configuration. Advanced Computational Fluid Dynamics (CFD) simulation tools were used for their evaluation and performance prediction.

The indigenous development of endothermic scramjet fuel, the first time in India, jointly by DRDL and industry is central to this breakthrough. The fuel offers dual benefits of significant cooling improvement and ease of ignition. The team developed a special manufacturing process to achieve stringent fuel requirements of DRDL at industrial scale.

Another key achievement is the development of state-of-art thermal barrier coating (TBC) which is designed to withstand extreme temperatures encountered during hypersonic flight. A new advanced ceramic TBC having high thermal resistance and capable of operating beyond melting point of steel has been jointly developed by DRDL and Department of Science & Technology (DST) Laboratory. The coating is applied inside the Scramjet engine using special deposition methods that enhance their performance and longevity. With demonstrated capabilities in stable combustion, enhanced performance and advanced thermal management, this breakthrough sets the stage for next generation hypersonic missiles. ||

» UNDERWATER POWER

INS Vagsheer, 6th Kalvari Class Submarine Commissioned into the Indian Navy

On January 15, INS Vagsheer, the sixth P75 Kalvari-class submarines, was officially commissioned into the Indian Navy during a ceremony in presence of Prime Minister Narendra Modi. The event was also attended by defence minister Rajnath Singh and chief of naval staff, Admiral Dinesh Tripathi. Naval Group's chairman & CEO, Pierre Éric Pommellet, was also present alongside Naval Group's team from France and India.

INS Vagsheer was built by Mazagon Dock Shipbuilders Limited (MDL) based on the Naval Group's Scorpene design.

Launched on 20 April 2022, INS Vagsheer has completed successful sea trials and now joins its sister vessels INS Kalvari, INS Khanderi, INS Karanj, INS Vela and INS Vagir, which were commissioned respectively in December 2017, September 2019, March 2021, November 2021 and January 2023.

Pierre Éric Pommellet said on the occasion, "We are honoured to be part of the success of the P75 programme, a cornerstone of the Indo-French strategic partnership and a



key achievement in India's 'Aatmanirbhar Bharat' policy. Naval Group remains fully committed to supporting the Indian Navy through future projects alongside Indian industrial partners."

The commissioning of INS Vagsheer highlights the success of India's indigenous submarines construction programme. This submarine has been fully built by MDL, with technology transfer from Naval Group. The series of six submarines of the P75 programme is fitted with a number of equipment built locally by Indian industry, including micro, small & medium enterprises

(MSMEs). MDL and Naval Group have developed a rich industrial ecosystem of more than 100 Indian companies, along with an Indian subsidiary employing more than hundreds of Indian engineers to support the Indian Navy. This strategic partnership contributes to industrial and technological sovereignty while opening new markets opportunities for local industries, showcasing their experience gained through the programme.

The Scorpene is a 2,000 tons conventional-propulsion submarine designed and developed by Naval Group for all types of mission, such as surface vessel warfare, anti-submarine warfare, long-range strikes, special operations or intelligence gathering. Extremely stealthy and fast, it has a level of operating automation that allows a limited number of crew, which reduces its operating costs significantly. Its combat edge is highlighted by the fact that it has six weapon launching tubes and 18 weapons (torpedoes, missiles). II

» FRIENDLY CALL ON

CSG Charles de Gaulle Conducts Air-Sea Manoeuvres With the Indian Navy

After stopovers in Goa and Kochi on India's western coast, the entire French carrier strike group (CSG) centred around aircraft carrier FNS Charles de Gaulle cast off on 9 January 2025 for the next phase of Mission Clemenceau 25 in the Indian Ocean. It set course for the Indonesian arc, where it would conduct exercise La Perouse.

A few hours after setting sail, the CSG carried out cooperation activities with the Indian Navy at sea and in the air. The French CSG destroyer conducted a joint navigation exercise with the Indian frigate INS Mormugao, during which the two ships practised tactical evolution manoeuvres. The two ships also deployed their respective onboard helicopters to carry out a cross-decks manoeuvre.

After the first drill, the fleet replen-

ishment tanker FNS Jacques Chevallier refuelled the INS Mormugao frigate at sea. At the same time, Indian Sukhoi and Jaguar fighter jets carried out sorties with Rafale Marines from the embarked French Navy air fleet for a joint anti-aircraft drill.

On January 10, an Atlantique 2 maritime patrol aircraft made a logistical stopover in India before heading for Indonesia, where it joined the deployed French force. Thanks to the privileged relations between France and India, the halt of the in-transit Atlantique 2 on Indian territory enabled the CSG to deploy far away from its base and maintain its operations at sea.

These activities once again demonstrated the high level of interoperability between the two navies. This joint

manoeuvre came ahead of the 42nd edition of the bilateral naval exercise, Varuna, which France and India have been holding since 1983. The CSG will take part in this annual bilateral exercise when it returns to the Indian Ocean under Mission Clemenceau 25, and will deploy all its assets alongside its Indian partner.

For 27 years, France and India have been united by a strategic partnership aimed at developing bilateral cooperation between the two countries. In concrete terms, this includes numerous exercises, be they on land (Shakti), in the air (Garuda), or at sea (Varuna). India regularly supports French Navy ships by allowing numerous stopovers for ships and crew rest (16 stopovers since 2022). II

► CROSS COUNTRY

Rs 1,561 Cr Contract Inked with HVF, AVNL for 47 T-72 Bridge Laying Tanks

Ministry of defence (MoD) has signed a contract with Heavy Vehicles Factory, a unit of Armoured Vehicle Nigam Limited, for the procurement of 47 Tank-72 Bridge Laying Tanks (BLT) for the Indian Army at a total cost of Rs



1,560.52 crore. The contract was inked by the senior officials of MoD and HVF/AVNL in the presence of defence secretary Rajesh Kumar Singh in New Delhi on January 21.

The BLT is a critical equipment which is employed to launch bridges during offensive/ defensive operations by mechanised forces. It provides integral bridging capability to the tank and armoured vehicle fleet enhancing the battlefield mobility and offensive capability. The present case being a Buy (Indian-Indigenously Designed Developed and Manufactured) will give impetus to the make in India initiative in defence. ||

► INTEROPERABILITY

Indian Naval Ship Mumbai To Participate In Multi-National Exercise La Perouse



Mission deployed in the South Eastern Ocean Region, the indigenously-built guided missile destroyer INS Mumbai arrived at Jakarta, Indonesia to participate in the fourth edition of the multinational exercise La Perouse.

Led by the French Carrier Strike Group (CSG) Charles De Gaulle, deployed in the Indo-Pacific as part of Mission Clemenceau 25, the fifth edition of La Perouse saw participation by nine Indo-Pacific nations. Australia came with its destroyer HMAS Hobart, Canada with its destroyer HMCS Ottawa, the United States with the LCS USS Savannah, Malaysia with destroyer FFG Lekir, its embarked helicopter and the vessel Gagah Samudera, the United Kingdom with the offshore patrol vessel HMS Spey and Singapore with the patrol vessel RSN Independence. Indonesia provided base support on land for the Atlantique 2 maritime patrol aircraft of French CSG.

Held in the Malacca, Sunda and Lombok straits, which are the mainstays of global maritime trade, are subject to numerous human-induced risks such as maritime accidents and environmental hazards, illegal immigration, drug trafficking, and natural risks like earthquakes and tsunamis, La Per-

ouse aimed to develop common Maritime Situational Awareness by enhancing the cooperation in the field of maritime surveillance, maritime interdiction operations and air operations along with the conduct of progressive training and information sharing.

The exercise provided an opportunity for like-minded navies to develop closer links in planning, coordination and information sharing for enhanced tactical interoperability. The exercise witnessed complex and advanced multi-domain exercises including surface warfare, anti-air warfare, air-defence, cross deck landings and tactical manoeuvres, as also the constabulary missions such as VBSS (Visit, Board, Search and Seizure) operations. During this exercise, all navies trained in the use of IORIS, a communication and coordination system dedicated to the exchange of information, documents in order to effectively and collectively face a maritime crisis in a synchronized manner.

Participation of the Indian Navy in the exercise showcased the high levels of synergy, coordination and interoperability between the like-minded navies and their commitment to a rules-based international order in the maritime domain. ||



For Indian Sovereignty

MBDA is showcasing the advanced missiles that support the Indian armed forces in their mission

AT THE CENTREPIECE OF THE COMPANY'S PRESENCE this year in Bangalore, are the weapon systems that arm the Indian Air Force's latest Dassault Rafale combat aircraft. These highly potent set of weapons from MBDA give the IAF an air combat capability that is unrivalled by any of India's neighbours.

The most famous of these weapons is the Meteor beyond visual range air-to-air missile, which is widely recognised as a game changer for air combat. The Meteor is powered by a unique rocket-ramjet motor that gives Meteor far more engine power, for much longer than any other missile. This means it can fly faster, fly longer, and manoeuvre more than any other missile—giving Meteor the ability to chase down and destroy agile hostile fighters at even the furthers of ranges. As a result, Meteor has a no-escape zone many times greater than any other air-to-air missile.

India's Rafales are also be equipped with the SCALP deep-strike cruise missile from MBDA to strike hardened and protected targets deep inside hostile territory. The IAF's Rafales are also be equipped with MICA, a potent air combat missile the Indian Air Force knows very well as it is also part of the upgrade package for the IAF's Mirage 2000 aircraft. MBDA is also proposing all these potent weapons, as well as the famous Exocet AM39 air launched anti-ship missile for the Rafale M for the new Indian aircraft carrier.

MBDA has been delivering battle-winning capabilities to the Indian Air Force and collaborating with Indian industry for over 50



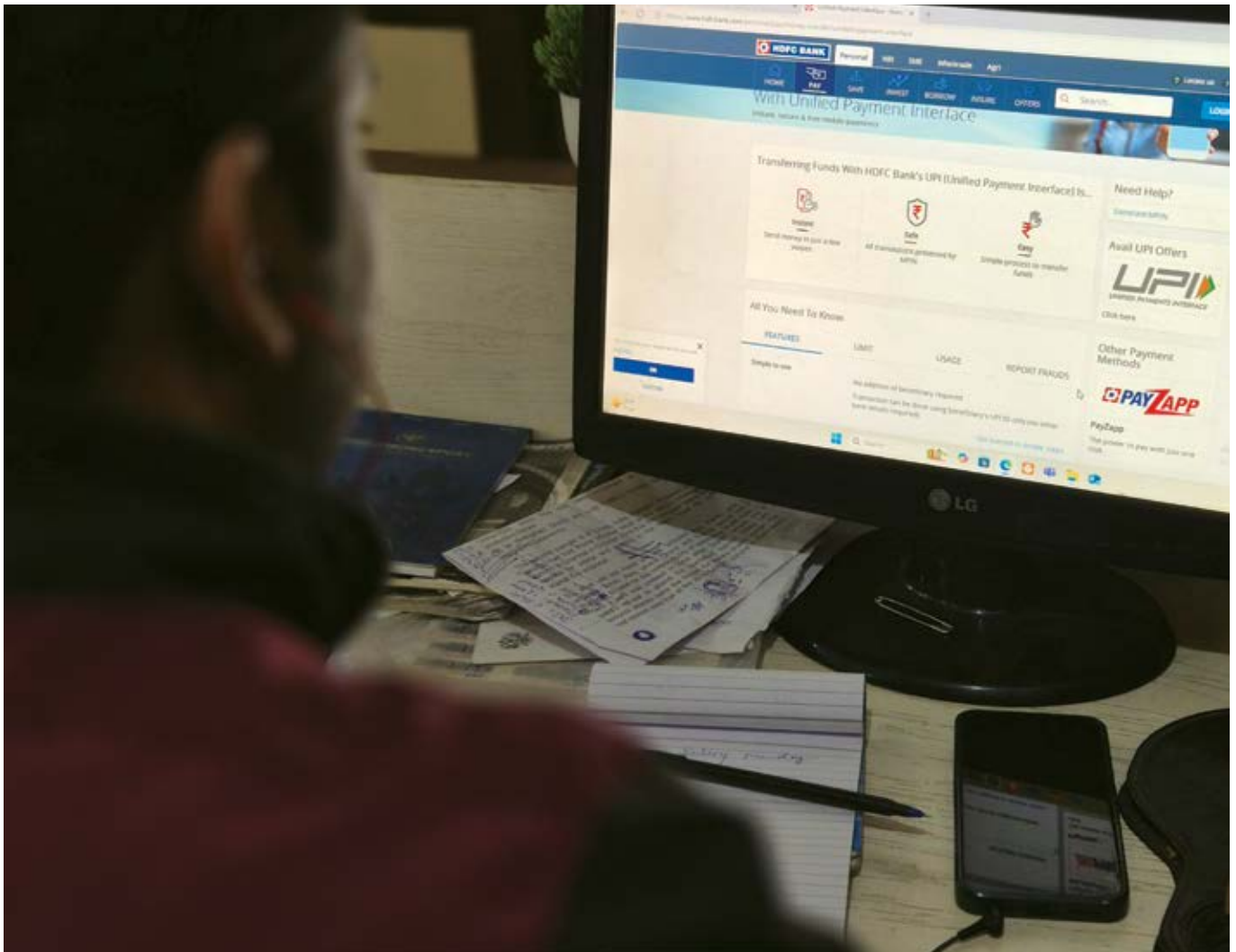


years. Today L&T MBDA Missile Systems Ltd, MBDA's joint venture with Larsen & Toubro, is exhibiting also at Aero India 2025 where it showcasing the work it performs in Coimbatore delivering Make in India projects in support of *Aatmanirbhar* Bharat for the Indian Air Force. LTMMSL is working to propose new Make in India projects to support the needs of both the Indian Navy, with short range surface to air missile systems, and the Indian Army with latest generation anti-tank missiles (ATGM5).

Throughout MBDA's history of partnership with India, there have been two guiding principles: to provide the very best technologies to the Indian Armed Forces, and to work in true partnership in support of the Indian Defence Industry. The company then is fully committed to the 'Make in India' programme, which aligns with MBDA's long-term strategy.

Other examples of technological edge equipping the Indian Air Force include the ASRAAM within visual range air combat missiles. ASRAAM is providing the IAF's Jaguar fleet with a step-change in air combat performance—a capability that will soon also enhance the IAF's new Tejas LCA Mk1A. Meanwhile the MBDA Mistral ATAM system has been successfully integrated on the Advanced Light Helicopter (ALH) and Light Combat Helicopter (LCH).

MBDA has an excellent track record providing both operational and industrial capabilities in partnership with the Indian Air Force and Indian Defence Industry. The strength of these two pillars make it a long-term true partnership, and one that should only continue to get stronger. ||



Together in This

India's joint doctrine for cyberspace operations couldn't have come a day sooner

ANTARA JHA

IN THE SHADOWY REALM OF modern warfare, where bits and bytes have become as lethal as bullets, India has taken a decisive step forward. The release of a joint doctrine for cyberspace operations by Chief of Defence Staff General Anil Chauhan recently marks an important moment. The doctrine not only highlights India's growing recognition of cyberspace as a critical domain of warfare but also reinforces the nation's proactive approach to digital defence in an increasingly interconnected world. But the questions that need to be asked are: what does this development really

mean for India's cyber preparedness? More importantly, is it enough?

The doctrine's significance lies in its all-encompassing approach, providing a blueprint for both offensive and defensive cyber operations and emphasising the integration of cyberspace into traditional military domains. This critical analysis delves deep into the doctrine's key elements, exploring its impact on India's defence posture and its broader implications for global cyber governance and military strategy.

The Dawn of a New Era

In a world where a single line of code can potentially bring down power grids

or disrupt financial systems, India's military establishment has finally acknowledged what cybersecurity experts have been emphasising for years—cyberspace is the new battleground. The doctrine's release couldn't have come at a more crucial time, as nations worldwide grapple with increasingly sophisticated cyber threats. As one defence analyst remarks, "This isn't just another military document. It's India's formal recognition that the next war might not begin with a bang, but with a silent breach in our digital defences."

Cyberspace as the New Battlefield: The nature of warfare has evolved, and with it, have the threats. Unlike conventional warfare, which is confined to land, sea, and air, cyberspace is an ever-expanding, borderless domain where hostile actions can occur without warning. India's joint doctrine for cyberspace operations acknowledges this, asserting that the digital realm is now integral to military strategies and national defence.

One of the most groundbreaking aspects of the doctrine is its recognition that cyberspace not only supports military operations but also serves as an independent battlefield where cyber warfare can be decisive. The doctrine places equal emphasis on both defensive and offensive cyber strategies, enabling the Indian armed forces to not only respond to cyberattacks but also pre-emptively neutralise threats. This dual strategy represents a shift from a reactive stance to a proactive, resilient posture.

Breaking Down the Walls: The doctrine's most significant strength lies in its integrated approach. By bringing together the army, navy, and air force under a unified cyber strategy, it breaks down traditional silos that have long hindered effective cyber defence. This integration is particularly crucial given that cyber threats don't respect conventional military boundaries. However, this raises an important question: Is integration alone sufficient? The answer, unfortunately, isn't straightforward.

Joint Doctrine

The doctrine emerges at a time when cyber threats are increasingly sophisticated, with state and non-state actors leveraging digital platforms to disrupt national security. As articulated by General Chauhan, the need for a coherent strategy in cyberspace operations is essential for safeguarding India's economic stability, political integrity, and defence capabilities. The doctrine emphasises that unlike traditional domains—land, sea, and air—cyberspace operates without territorial boundaries, making it a global common with shared sovereignty.

This shift in perspective underscores the necessity for military operations in cyberspace to be seamlessly integrated into national security frameworks. The doctrine outlines how cyber operations can influence outcomes across all operational environments and instruments of power. It establishes guidelines for military commanders to navigate this complex landscape effectively.

Integrating Cyberspace into National Security: India's doctrine aligns cyberspace operations with its broader national security framework, acknowledging the interconnectedness of cyber threats with economic stability, political processes, and military capabilities. This strategic integration

is crucial as modern warfare increasingly involves the targeting of critical national infrastructure, such as power grids, financial institutions, and communication networks, which if compromised, could cripple a nation's defence readiness.

Cyberspace as a battlefield differs significantly from traditional combat domains. The doctrine addresses these differences by advocating for an enhanced, unified command structure capable of coordinating cyber operations across all branches of the military—land, sea, air, and space. By doing so, India ensures a comprehensive defence posture that seamlessly integrates cyber capabilities into conventional military operations.

Challenge of Implementation

While the doctrine provides a framework, the real test lies in its implementation. Several critical challenges emerge:

First, there's the question of resources. Modern cyber warfare requires cutting-edge technology and highly skilled personnel. India's current cyber infrastructure, while improving, still lags behind potential adversaries. The doctrine acknowledges this gap but doesn't fully address how it will be bridged.

Second, there's the challenge of staying ahead in a rapidly evolving threat landscape. As one cybersecurity expert notes, "By the time you've developed a defence against one type of cyber-attack, adversaries have already invented three new methods of breach."

A key tenet of the doctrine is its focus

The success of this doctrine hinges on adequate resources, training, and infrastructure to support its ambitious goals. Despite the emphasis on workforce development, there remains a critical shortage of skilled cybersecurity professionals in India. Addressing this gap requires sustained investment in education and training programmes

on anticipating and adapting to the ever-evolving landscape of cyber threats. In the digital realm, cyber adversaries continuously develop new techniques to exploit vulnerabilities, necessitating a defence strategy that is both flexible and forward-looking. The doctrine emphasises constant vigilance, rapid response, and the need for India's cyber forces to stay a step ahead of potential attackers.

The doctrine also highlights the importance of conducting regular assessments and improving cyber resilience by identifying vulnerabilities in India's digital infrastructure before adversaries can exploit them. This approach mirrors global trends in cybersecurity, where proactive defence mechanisms and cyber deterrence are becoming critical tools in national security arsenals.

The Human Element

Perhaps, the most significant challenge lies in the human element. The doctrine emphasises training and capability development, but India faces a severe shortage of cybersecurity professionals. Moreover, the military's traditional training methods may need significant adaptation to prepare personnel for cyber warfare.

"You can't train cyber warriors the same way you train conventional soldiers," explains a military technology expert. "The mindset, the skills, the approach—everything needs to be different."

At the heart of the doctrine's success is the human element. Recognising that technology alone cannot safeguard cyberspace, the doctrine emphasises the importance of cultivating a highly skilled cyber workforce. Developing expertise in cyber warfare is essential for maintaining an effective defence, and the doctrine outlines initiatives for specialised training and continuous professional development of military personnel engaged in cyber operations.

The doctrine promotes advanced training programmes, simulations, and real-time exercises designed to equip India's cyber warriors with the knowledge and skills needed to handle the complex and evolving nature of cyber threats. This focus on human capital ensures that India remains ready to respond to threats and maintain operational continuity in the face of even the most sophisticated cyber-attacks.

Civil-Military Collaboration

One of the most striking features of the joint doctrine is its emphasis on collaboration, not just within the military but also with the civilian sector. This represents a recognition that cyber threats are not isolated to the military domain; they affect critical national infrastructure such as energy, finance, and communications, which are often operated by civilian entities.

The doctrine encourages robust public-private partnerships, particularly in sharing threat intelligence, fostering best practices, and coordinating responses to cyber incidents. Such collaboration is essential for creating a resilient defence ecosystem that can protect both military and civilian assets from cyber adversaries. The inclusion of the civilian sector is also a step toward breaking down silos that often exist between government agencies and private industry, enhancing India's collective cybersecurity resilience.

Strategic Implications

The doctrine's release sends a strong message to both allies and potential adversaries. It demonstrates India's commitment to developing robust cyber capabilities, but it also highlights the nation's vulnerabilities. The acknowledgment of cyberspace as a 'global common with shared sovereignty' is particularly noteworthy, suggesting a diplomatic approach to cyber conflicts.

The Road Ahead

Despite its limitations, the doctrine represents a significant step forward. Its emphasis on integration, proactive defence, and continuous evolution aligns with global best practices. However, success will depend on several factors:

1. Sustained investment in cyber infrastructure and training
2. Effective collaboration between military and civilian cyber agencies
3. Regular updates to keep pace with evolving threats
4. International cooperation in cybersecurity

Looking at the Horizon

The doctrine's release is not an endpoint but a beginning. As cyber threats continue to evolve, so must India's response. The true test will lie in how quickly and effectively the military can translate this doctrine into operational capabilities.

Despite its ambitious goals, implementing the joint doctrine will not be

without its challenges. One of the most significant hurdles is the current lack of a robust cyber infrastructure and the need for substantial investments in technology, human resources, and cybersecurity education. India must address the gap between its rapidly digitising economy and the cybersecurity workforce capable of protecting it.

Another challenge lies in ensuring that India's cybersecurity laws keep pace with the technological advancements and evolving threats. The doctrine's success hinges on a clear regulatory framework that provides legal backing for offensive cyber operations while ensuring that civilian infrastructure is adequately protected.

The gap between policy formulation and actual implementation. The success of this doctrine hinges on adequate resources, training, and infrastructure to support its ambitious goals. Despite the emphasis on workforce development, there remains a critical shortage of skilled cybersecurity professionals in India. Addressing this gap requires sustained investment in education and training programmes. The doctrine comes at a time when geopolitical tensions are high, particularly with adversaries like China enhancing their cyber capabilities. This necessitates not only robust defensive measures but also offensive capabilities to deter potential threats effectively. As India integrates advanced technologies such as artificial intelligence into its cyber defence strategies, there is a risk of over-reliance on these systems without sufficient human oversight or understanding.

Additionally, India's geopolitical environment adds another layer of complexity. As state-sponsored cyberattacks and cyber espionage become more frequent, India will need to strengthen its alliances with global cybersecurity partners and engage in international norms and governance discussions to ensure collective cyber defence.

Offensive Cyber Capabilities

Beyond defence, the doctrine underscores the importance of developing offensive cyber capabilities. In modern conflict scenarios, the ability to launch pre-emptive cyberattacks or retaliate against adversaries in cyberspace can provide a critical strategic advantage. Offensive cyber operations could target enemy communication networks, dis-

able key infrastructure, or gather intelligence, all while avoiding the traditional risks associated with kinetic warfare.

The doctrine's embrace of offensive capabilities marks a shift in India's cyber policy, signalling its readiness to take on adversaries in the digital battlefield proactively. It also reflects the changing dynamics of international security, where cyber warfare has become an indispensable tool of statecraft.

Conclusion

The implications of the Joint Doctrine for Cyberspace Operations extend beyond India's borders. By positioning itself as a leader in cyber defence, India aims to shape international norms and regulations governing cyberspace. The doctrine's focus on collaboration, not just domestically but also with international allies, reflects India's desire to be a key player in global cyber governance.

At a regional level, India's doctrine sends a clear message to neighbouring adversaries about its readiness to defend against cyber incursions. As countries like China and Pakistan continue to develop their own cyber capabilities, India's doctrine signals that it will not be passive in the face of growing cyber threats.

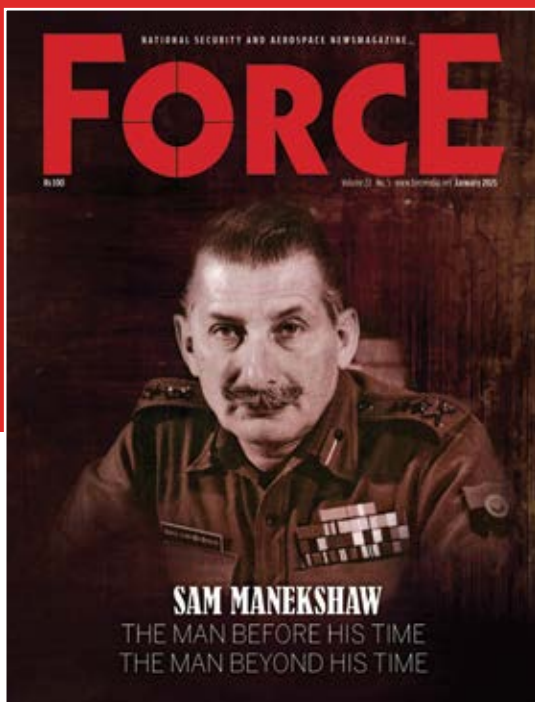
India's joint doctrine represents a crucial first step in developing a comprehensive cyber defence strategy. While it has its shortcomings—particularly in addressing resource constraints and implementation challenges—it provides a solid foundation for future development.

As cyber threats continue to evolve, India's doctrine sets the stage for a new era of cyber warfare—one in which India is not only prepared to defend itself but is also positioned to shape the future of global cyber governance. The doctrine is more than just a policy document; it is a strategic blueprint for securing national sovereignty in the digital age and ensuring that India remains a formidable player on the global stage.

The path ahead is complex and challenging, but as one senior military official puts it, "In the cyber domain, standing still is not an option. We must move forward, adapt, and evolve—or risk being left behind in the digital dust."

The success of this doctrine will ultimately be measured not by its words, but by India's ability to protect its digital sovereignty in an increasingly hostile cyber landscape. As the nation steps into this new frontier, the real work is just beginning. ■

We don't tell you how to do your job...



But we put the environment in which you do your job, in perspective. So that when you step out, you do so with the complete picture.

FORCE, a monthly newsmagazine on national security and defence, combines your news and concerns with the larger national security imperatives of India.



255 months, 255 issues focussed on India's national security and aerospace (including civil aviation)

Subscribe now! FORCE offers three kinds of subscription:

- ▶ Annual subscription is Rs 1,000 for 12 issues.
- ▶ Three-year subscription in which you get one year free. That is, pay Rs 3,000 instead of Rs 4,000 and get FORCE regularly for four years!
- ▶ Better still, subscribe for five years, get two years free. Pay Rs 5,000 instead of Rs 7,000 and get FORCE regularly for seven years!

You can subscribe either through the online edition at www.forceindia.net and pay by your credit card or by drawing a cheque/demand draft in favour of **ARROWHEAD MEDIA PVT LTD** payable at par in Noida/Delhi. If it is not, please add Rs 50 towards bank charges. Send the cheque/DD to:

FORCE, E-19, Ground Floor, Sector 3, Noida 201301 Uttar Pradesh, India

NATIONAL SECURITY AND AEROSPACE NEWSMAGAZINE

FORCE

Subscribe to FORCE now

It's easier than you think

Subscription for a year is Rs 1,000. Apart from the print issue which will be delivered to you on your doorsteps, you will also get complete access to the online edition at www.forceindia.net

Can never keep track of annual renewals?

Subscribe for three years, get one year free. That is, pay Rs 3,000 instead of Rs 4,000 and get FORCE regularly for four years!

Better still, subscribe for five years, get two years free.

Pay Rs 5,000 instead of Rs 7,000 and get FORCE regularly for seven years!



Here's how you can subscribe to FORCE

Visit FORCE online edition at www.forceindia.net and click on the 'Subscribe Now' section on the top right. FORCE now has a secure Pay Pal payment gateway. Simply fill the form and subscribe by using your credit card/Debit card/net banking. It is safe, simple and takes only a few minutes.

Or else draw a cheque/demand draft in favour of ARROWHEAD MEDIA PVT LTD payable at par in Noida. If it is not, please add Rs 50 towards bank charges. Send the cheque/DD to FORCE, E-19, Ground Floor, Sector-3, Noida 201301

*Name _____
D.O.B _____
Designation _____
*Mailing Address _____
*Subscription Details <input type="checkbox"/> Rs 1,000 for 1 year <input type="checkbox"/> Rs 3,000 for 3 year <input type="checkbox"/> Rs 5,000 for 5 year
*Phone Number _____ Mobile _____
*Email address _____
<i>* Mandatory Information</i>

For clarification or more information write to Sweety Singh Dhariwal at sweety@forceindia.net or call at +91 9953424112



Aatmanirbhar Bharat

The biggest lesson of the Ukraine war is the importance of self-reliance in military capabilities



LONG WAY TO GO
LCA Tejas Mk 1A

WARS END IN MANY WAYS. IT MAY be an outright victory like the defeat of Germany and Japan in WWII or Pakistan in Bangladesh in 1971. It can be a mediated or negotiated settlement like the Korean Armistice in 1953 or the Dayton Accord in the Bosnian War in 1995. It can also be a stalemate or a frozen conflict where active fighting may stop, but the underlying issues remain unresolved, like India-Pakistan conflicts since 1948 and the many India-China confrontations since 1962.

It is being claimed by the President-elect of the United States, Donald Trump, that the Ukrainian war will be stopped within 24 hours of his assuming office, which is two months from now. That will perhaps herald a new category of war-ending methodologies. Ending wars between na-

tions by threatening to choke arms and ammunition supplies to one of them. A brief outline of the peace proposal is already doing rounds in the Western media, perhaps leaked intentionally to prepare the world for the upcoming geopolitical realignments under the new regime in the US. In brief, the frontline of the war will be frozen at its current position, a buffer zone between the opposing forces will be created and supervised by neutral parties, territory held by the Russians will remain with Russia, and Ukraine will remain neutral and not join NATO for at least the next twenty years. All these are in Russia's favour. In Ukraine's favour are a rather undefined security guarantee from the West and a promise of continued supply of arms to build up its resources to

defend itself from any future Russian onslaught.

This security guarantee from the West, a synonym for NATO, is a rather dubious promise. NATO itself needs to survive the next four years of the Trump administration, given the threat of the US withdrawing from it. Whether these were mere electoral rhetoric or serious threats remains to be seen. But pity the Ukrainians who fought so valiantly for the last two years, and after losing 31,000 of their soldiers and almost a third of their country, to end the war so meekly under such ominous conditions.

In the absence of the US, will Europe take it upon itself to keep Ukraine supplied with resources to continue the war? It will take a consensus of 27 countries, each with its own agenda. The

American promise of 'as long as it takes' has ended, and we have heard enough of 'Ukraine cannot lose, and Russia cannot win' from the EU parliament. Now is the time to walk the talk. As yet we have heard nothing that can reassure the Ukrainians. With the German coalition in the doldrum, the Italian government accused of being pro-Russian, and the French forever occupied with their own internal issues, nothing is expected in the near future either. It is a bad time to be a Ukrainian. One is reminded of Henry Kissinger's quote—it is dangerous to be America's enemy, for America's friends, it is fatal.

That said, it is also sad that Ukraine believed in the prospect of being allowed into NATO against the Russian opposition. It was a pipedream from which Ukraine is waking up now. A neutral Ukraine, as advised by many after the Russian annexation of Crimea in 2014, would have perhaps not resulted in the Russian invasion in 2022. But then, a large portion of the economy of many countries survives on continued conflict in the world. The military-industrial complex of developed nations thrives on conflicts, and their influence on governments shapes policies. Ukraine is possibly a victim of one such machination.

It is not Ukraine alone that has to take a fresh look at its security apparatus. Europe, as a continent, now must consider its own security without the participation of the US. A recent article in *Le Monde* quotes Charles de Gaulle's famous prediction—one day USA will leave the old continent. That day has perhaps come. According to 2021 statistics, the EU has a total population of 447 million, a combined GDP of USD 16 trillion and 2 million military forces, with France providing the nuclear umbrella. So, as figures go, ensuring the continent's overall security should not pose an issue, considering Russia as the only potential military adversary. If only the 27 countries could be on the same page.

Lessons for India

The Ukrainian episode has a lesson for India. One cannot fight high-intensity wars depending on other nations. Aatmanirbhar Bharat is not just political rhetoric but a crying necessity of our time. India's defence production in financial year 2023-24 touched about USD 15 billion, out of which 80 per cent was from the defence PSUs and 20 per cent from the private sector. The latter needs to increase steadily if India has to

keep pace with time. Though on paper, HAL has a production capacity of 24 Tejas Light Combat Aircraft (LCA) aircraft per year with its three production lines, it has never produced so many and, with the PSU work culture, will never be able to do so in the future too. Unless the private sector is brought in at scale, the requirements of the Indian armed forces can never be met. Moreover, the LCA flies with American engines and hence is vulnerable to American whims and fancies, an example of which the country had witnessed in the case of cryogenic engines for our space programme. Though there is a plan to co-produce the engines in India with GE, with a supposedly full transfer of technology, the latter has to be seen to actually happen before it can be believed. I have seen such programmes discussed with European engine manufacturers. Though full TOT is promised, when one delves deep, one finds the most critical 'hot zone' technology is craftily withheld. That is perhaps not surprising since no industry likes to create competitors.

Engines for aeroplanes have been the Achilles Heel of the indigenous defence production. The first indigenous jet fighter HF 24 had to be decommissioned due to its underpowered and unreliable engine. All Indian aeronautic programmes thereafter took a long hiatus till the scare of MiG 21s finishing their lifecycle drove them to think of the LCA. The programme for the production of a suitable jet engine for the LCA started along with the LCA programme itself in the mid-1980s. A quarter of a century later, the LCA flew, but the Kaveri engine is still hyperventilating on its test bench at around 70kN thrust against a requirement of 90-95kN.

Unless the private sector is brought in at scale, the requirements of the Indian armed forces can never be met. Moreover, the LCA flies with American engines and hence is vulnerable to American whims and fancies, an example of which the country had witnessed in the case of cryogenic engines for our space programme

Those familiar with the science behind jet engines know that it is one of the most complex precision machines that man has ever created. Except for the UK (Rolls Royce), USA (General Electric, Pratt and Whitney), and France (Snecma), no one else has mastered the art and science of jet engines for military and civil use. Russians and the Chinese do make engines, but they do not match up to the big three. It is naive to expect them to part with technology that they have developed over decades of research and development (R&D) and after spending tons of money. Will India sell the flight control laws of LCA, which were developed in India after years and years of trials and errors, if some nation shows interest in the aircraft? No. These technologies are national assets. So, despite the big talk by the Indian and the Americans, we will remain just licensed producers of GE engines.

I once asked the chairman of ISRO how many IIT engineers he employed. He said, "None. IIT graduates would rather chase greenbacks than join ISRO". But look where our space, missile, and nuclear programmes have reached using talents from second-string engineering colleges in India. If the Indian flag can take off from earth in an Indian spacecraft and land on the moon, why cannot a jet airplane fly with an Indian engine? Is it a problem of talent, or is it a management issue? India is the largest procurer of arms, so funding cannot be a hurdle. Will it then help to delink some defence programmes from MoD and DRDO and put them directly under the PMO, like our nuclear and space programmes are? It's a moot point. But until the LCA flies with an Indian engine, uses an Indian AESA radar to spot the enemy, and uses an Indian weapon suite to neutralise it, till then we are not really an aatmanirbhar Bharat.

The bottom line is that the fighting potential of a nation must never be compromised to fulfil a political manifesto. As some other commentators have already said, aatmanirbhar Bharat is inescapable, but its lack of pace needs to be compensated by other means of procurements. Let us not put too much hope in Trump's incoming national security advisor Mike Waltz's flirtatious willingness to 'dance cheek to cheek with India', lest we end up suffering 'fatality' by being America's closest friend. ||

Telangana-JSW Defence Signs MoU to Establish Manufacturing Facility



The government of Telangana has entered into a memorandum of understanding (MoU) with JSW UAV Limited, a wholly-owned subsidiary of JSW Defence, to establish a state-of-the-art manufacturing facility to make Unmanned Aerial Systems (UAS) in the state.

As part of this initiative, JSW UAV is set to invest approximately Rs 800 crores in the project, through a technology arrangement with a leading US-based defence technology company. The MoU was signed in the presence of the chief minister of Telangana, Revant Reddy and Parth Jindal of JSW Group on the side lines of the World Economic Forum (WEF) at Davos.

Speaking on the occasion, Revanth Reddy said, "Hyderabad and Telangana were long positioned in the global market as software and pharma leader. With clear vision and diligent efforts, we are now establishing Telangana as a clear leader for investments in manufacturing across sectors, ranging from

semiconductor, defence, private space to FMCG. My government's efforts to position Telangana as a preferred option for the world for its China Plus One strategy has started bearing results."

Parth Jindal of JSW Group said, "This MoU underscores our unwavering commitment to playing a key role in indigenizing defence technology in India. We are deeply grateful to the government of Telangana... for its guidance and support through industry-friendly policies that make initiatives like this possible."

JSW Defence Pvt Ltd, a part of the USD 24 billion JSW Group, has a strategic partnership with Shield AI, Inc, a leading US defence technology company, to indigenise and manufacture Shield AI's 'V-BAT', a Group 3 Unmanned Aerial System (UAS). This collaboration marks a significant step in boosting India's defence capabilities by bringing in world-class UAS technology to the country. ||

Safran's Infrared Multifunction Binoculars Selected by the Bundeswehr

The German Bundeswehr's procurement office (BAAINBw1) has selected Safran Electronics & Defence Germany to equip the German forces with the latest generation of portable infrared observation binoculars.

These binoculars will provide additional operational capabilities to the German infantry by covering a wide range of operational needs, including day/ night observation and target acquisition, irrespective of weather conditions, and even in GNSS2-denied environments.

Safran Electronics & Defense Germany, based in Murr, Baden-Württemberg, is the primary point of contact for the German armed forces and provides support and operational maintenance for Safran products in coordination with users and key German logistics centres.

"We thank the BAAINBw for their trust in Safran Electronics & Defense and are proud to offer our technological innovations in night vision and observation to the German



armed forces," said CEO of Safran Electronics & Defense Germany, Marzell Schiller. Safran Electronics & Defense Germany offers a wide range of products from portable optronics to resilient navigation solutions and is a trusted partner of the BAAINBw. ||

Thales Unveils its Latest Innovations in Trusted AI for Critical Systems



Thales is a global technology leader in the defence, aerospace, cybersecurity and digital solutions markets. The company has some of the world's most advanced R&D capabilities, and files more patents than any other company in Europe in the field of AI for critical systems. With its thorough understanding of the constrained environments encountered in the theatre of operations, Thales is ideally positioned to provide the armed forces, governments and other organisations with robust and dependable systems and equipment that deliver the performance needed to guarantee their technological superiority.

With a focus on cybersecurity, explainability, frugality and ethics, trusted AI leverages all the latest developments in the field of artificial intelligence, whilst endeavouring to minimise its environmental impact.

"Thales is a key player in the field of trusted AI. Our experts have developed a form of hybrid artificial intelligence that provides a high level of transparency, cybersecurity, frugality and ethical assurance, unlike many AI systems that rely solely on processing huge volumes of data and consume vast amounts of energy. Thales's AI solutions protect individuals and society at large, augment the performance of defence systems, protect the environment and improve the resilience of critical infrastructure to build a safer, more sustainable world," said chairman & chief executive officer, Thales, Patrice Caine.

Thales's AI solutions are used in a range of strategically important applications:

- **Event Security and Crisis Management:** AI-enabled solutions such as drones and their associated control systems make it possible to monitor and analyse crowd movements and suspicious behaviour in real time and control access to infrastructure sites so that potential incidents can be anticipated and managed proactively.
- **Maritime Security:** Smart sensors incorporating AI technology improve the detection, classification and identification of maritime threats, from unmanned naval systems to underwater mines, monitoring activity at sea and

on the seabed to protect communication cables and the world's key shipping lanes.

- **Decarbonisation of Air Transport:** AI optimises flight trajectories to reduce greenhouse gas emissions in particular by avoiding the formation of the condensation trails that contribute to global warming. Studies have shown that an estimated 50 per cent of these contrails are preventable. Conclusive tests at several airports have also shown that smart air traffic sequencing techniques can reduce the need for aircraft to enter holding patterns prior to landing, reducing fuel consumption and improving the carbon footprint of the aviation industry.
- **Passenger Experience and Fraud Prevention:** Robust, secure algorithms can be used to provide seamless, reliable identity controls at airports, helping to protect infrastructure and keep travellers safe.
- **Data Optimisation:** By gathering only the information that is strictly necessary, Thales's solutions reduce the amount of energy needed to store and process huge volumes of data.
- **Neuromorphic Technologies:** Innovative neuromorphic processors mimic the behaviour of the human brain and use revolutionary new components exploiting quantum electron spin phenomena. They consume up to 1,000 times less energy than conventional systems.
- **AI in Critical Systems:** Satellites, drones and air traffic control systems support concrete initiatives contributing to the fight against global warming.

Thales is a major player in trusted, cybersecure, transparent, explainable and ethical AI for armed forces, aircraft manufacturers and critical infrastructure providers. The Group files more patents than any other company in Europe in the field of AI for critical systems. It employs more than 600 engineers specialising in AI, and around 100 doctoral candidates are conducting their AI research with Thales. ||

Navantia UK Announces Investment Plan for Harland & Wolff

Navantia UK has announced plans to invest in Harland & Wolff's facilities to strengthen Britain's defence, maritime and clean energy industrial capabilities, supporting jobs and economic growth across the country.

Following the recent completion of Harland & Wolff's acquisition, senior leadership from Navantia and its British subsidiary, Navantia UK, today visited the Belfast shipyard. The team will tour all four sites—Belfast, Appledore, Methil and Arnish—over the coming days.

"Today marks the beginning of our shared journey. We are not just combining two companies; we are building a formidable team," said Navantia's chairman, Ricardo Domínguez.

Speaking to the workforce, Domínguez announced that Navantia UK will resume and expand the investment and recapitalisation plan for Harland & Wolff, which is central to the Fleet Solid Support (FSS) programme but had been paused in recent months.

The investment across the four sites will fund cutting-edge facilities, technology and training, underpinned by a comprehensive business plan to integrate these facilities into the UK's industrial and defence ecosystem.

As prime contractor for the FSS programme, Navantia UK will build three ships for the Royal Fleet Auxiliary, with integration and delivery taking place at Harland & Wolff's Belfast shipyard.

Northern Ireland economy minister Conor Murphy welcomed the agreement, stating: "I will continue to work with the company to discuss future plans for the shipyard to



scale up operations and ensure its long-term sustainability."

Brigadier Andrew Muddiman, Royal Navy Regional Commander for Scotland and Northern Ireland, said: "The patience of so many during this process has been rewarded with a firm vote of confidence by the British government in both the National Shipbuilding Strategy's order pipeline and the Belfast workforce. The Royal Navy is delighted that Navantia UK has entered the UK shipbuilding market with its acquisition of this iconic facility, which has built so many fine ships for the Royal Navy throughout its history."

The Lord Mayor of Belfast, Mickey Murray, highlighted the "momentous occasion, marking a new chapter for one of our city's most iconic industrial sites". "For generations, Harland & Wolff has been at the heart of Belfast's identity, in the very skyline of our city by the famous Samson and Goliath cranes. This partnership with Navantia secures the future of Harland & Wolff, ensuring that it remains a cornerstone of Belfast's industrial heritage and a strategically important employer for many years to come." II



GRSE & AMS Sign MoU for Advanced Weapons and Electronic Systems

Garden Reach Shipbuilders & Engineers Limited (GRSE) & Apollo Micro Systems Limited (AMS) signed a Memorandum of Understanding (MoU) for a period of five years to establish a business partnership for the joint research and development (R&D), co-production, export of underwater

weapons & vehicles, underwater mines, underwater communication systems and air defence systems and supply of advanced weapons and electronic systems for both defence and non-defence industries.

This collaboration is aimed at the development and production of cutting-edge technologies, including:

- Underwater Weapons and Vehicles
- Underwater Mines and Communication Systems
- Air Defence Systems and Vehicles

A key aspect of this partnership is leveraging and enhancing the manufacturing infrastructure of both companies to produce critical components and sub-assemblies for these systems. Additionally, the collaboration will provide services for the modernisation and upgrade of existing systems, ensuring they remain state-of-the-art and meet evolving requirements.

The partnership will address the growing demands of the defence, aerospace, and commercial markets, both domestically and internationally. The MoU underscores the commitment of GRSE and AMS to strengthen indigenous capabilities and contribute to national security through innovation in advanced technologies.

This MoU signifies GRSE's and AMS's joint commitment in driving technological excellence and fostering India's self-reliance in critical sectors. II

SIA-India hosts IndSpaceX 3.0 Wargame Stimulating NG Space Battlefields



The IndSpaceX 3.0 simulated a contest between two notional spacefaring adversaries vying for dominance at the DefSat 2025. The strategic table-top exercise addressed the degree of severities including the 4 Ds—Disrupt, Deny, Degrade and Destroy along with Information War-Delay and Information War-Deceive.

“In a turbulent world dominated by Western supremacy, countries like India cannot rely on the mercy of global powers. Initiatives like G20 and BRICS are steps forward, but true self-reliance—*Aatmanirbharta*—requires every ministry to adopt it, not just the ministry of defence. Building our own strength is the only path to becoming a global power,” said principal advisor to the ministry of defence, Lt. Gen. V.G. Khandare (retd).

The simulation had ‘Green Land,’ and ‘Orange Land,’ teams developing strategies for achieving operational space superiority amid scenarios involving information warfare, system disruptions, and resilience-building tactics. The exercise was chaired by Lt. Gen. Khandare and conducted by Lt. Gen. PJS Pannu, senior advisor to SIA-India. Director general (TM) of DRDO, Dr Subrata Rakshit served as the technical umpire, while partner at Dua Associates, Dr Ranjana Kaul contributed as an umpire.

The day began with the release of two significant reports—PRISM: 1.0: US-India Export Controls Dialogue and India-Africa Space Collaboration: Unlocking Strategic Opportunities for Growth. These reports underscore India’s growing role as a strategic leader in space and defence collaboration.

The Perspectives on Regulatory Issues in Strategic Markets (PRISM) 1.0 webinar, held in November 2024, discussed significant policy reforms, including liberalisations in ITAR (International Traffic in Arms Regulations) and MTCR (Missile Technology Control Regime), which are poised to strengthen US-India collaboration in defence and space sectors. SIA-India, in collaboration with the IndUS Tech Council, con-

tinues the webinar series with other strategic markets like Australia, Japan, and Germany.

According to director general, SIA-India, Anil Prakash, “By navigating global regulatory landscapes and fostering international collaborations, India is poised to emerge as a powerhouse in defence and space manufacturing. The PRISM series and India-Africa partnerships exemplify the synergy between innovation and policy alignment, unlocking new avenues for sustainable growth and technological leadership.”

The report on ‘India-Africa Space Collaboration: Unlocking Strategic Opportunities for Growth’ celebrates the enduring partnership between India and Africa, emphasising their shared vision to leverage space technology for socio-economic development. Highlighting India’s advancements in space technology and Africa’s growing ambitions, the report underscores how collaborative efforts in satellite technology, Earth observation, and capacity building can address global challenges like climate change, food security, and connectivity. A Memorandum of Understanding (MoU) between SIA-India and Ghana Space Science and Technology Institute, was signed in December 2024, signalling a new era for India-Africa partnerships in space technology.

Addressing the growing importance of space technology, president, SIA-India, Dr Subba Rao Pavuluri said, “The government’s strategic initiatives are reinforcing the *aatmanirbhar* vision. India plans to expand its military satellite capabilities significantly, targeting around 100 military satellites by 2030. This expansion is essential for ensuring robust communication and surveillance capabilities to safeguard national interests. Furthermore, with INR 25,000 crore allocated for defence space investments in the fiscal year 2024-25, India is making an unprecedented commitment to the defence space domain, ensuring a robust and resilient ecosystem.” ■

HENSOLDT Completes Testing of the EUA NT at the Bundeswehr Helicopter Units

HENSOLDT has successfully completed the modernisation project 'Einsatzunterstützungsanlage Neue Technologien' (EUA NT) after testing the system at four Bundeswehr helicopter bases. The aim of the project, which was commissioned by the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) in May 2022, is to upgrade the EUA, which has been in use for more than a decade, for the next 15 years of operation.

The modernised EUA NT is a deployable complete system for supporting the Bundeswehr's rotorcraft, consisting of two types of container:

- The system container contains a fail-safe IT base system with network technology for connection to IT systems of the Bundeswehr at the operational level up to the classification level of VS-GEHEIM (classified up to secret), modernised application software and the communication systems required for data and radio communication with the aircraft. The system container can be deployed as the smallest fully functional, relocatable command cell with two IT workstations to support NH90 and Tiger helicopters, for example, before, during and after the mission.
- The personnel container supplements the system container with a control centre and additional ergonomic workstations for six additional operators. Up to three personnel containers can be combined with a system container. Furthermore, several EUA-NT systems can be linked to form a data network.

The radiation-shielded units are identically equipped in terms of air conditioning and power supply. They have a power generator that starts automatically when used on vehicles or when the power supply is unstable, and an uninterruptible



power supply that ensures IT operation at all times.

In the next step, HENSOLDT will implement the series production, the retrofitting of the systems in use and measures for replication. With the EUA NT, the Bundeswehr is receiving a modern, commercially available system whose modular and open architecture not only represents the ground station platform for the Bundeswehr's current rotorcraft but is also equipped for future requirements and weapon systems.

"With the New Technologies Mission Support System, we are creating a future-proof solution based on an established system that will sustainably strengthen the operational capability of the Bundeswehr. Close cooperation with the customer and end users, as well as the consideration of operational experience from Afghanistan and Mali, have made it possible to develop a new system that is modular and highly flexible and thus ready for the challenges of the coming years. In addition, provisions have been made to further improve usability for future weapon systems," says Alex Irmscher, programme manager for ground stations at HENSOLDT. ||

India Joins Eurodrone Programme as Observer

As the Eurodrone programme is progressing towards the next milestones, interest from different nations is growing. The government of India has officially become the newest observer state in the OCCAR-managed medium altitude long endurance (MALE) remotely piloted aircraft system (RPAS), Eurodrone programme led by Airbus Defence and Space as the industrial prime.



The Organisation for Joint Armament Cooperation (OCCAR), based in Bonn, Germany and overseeing several European defence programmes, has granted India the observer status in the Programme following a formal request received in August 2024. OCCAR-EA Director Joachim Sucker delivered the Letter of Approval (LoA) signed by the former OCCAR board of supervisors' chairman, Lt Gen. Frédéric Goetyncq, to the ambassador of India to Germany, Ajit Gupte. This move is taken by OCCAR as a first step that shows India's willingness to explore opportunities to potentially collaborate on subjects of common interest between the country and Europe.

India's interest follows the government of Japan, which was recognised as the first official OCCAR observer state in the Eurodrone programme in November 2023. The Eurodrone is designed to carry-out various long endurance missions ranging from Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) and attack to, for example, maritime surveillance, anti-submarine warfare and airborne early warning missions in the future. It is currently under development by Airbus Defence and Space in Germany as the prime contractor, together with Leonardo (Italy), Dassault Aviation (France) and Airbus Defence and Space in Spain, for their respective nations. ||

Rafael UK Showcased Advanced Force Protection Capabilities at IAV 2025



Rafael UK presented its comprehensive portfolio of laser defence and force protection capabilities at the International Armoured Vehicles (IAV) Conference 2025, focusing on cutting-edge technologies that address the evolving threats faced by manoeuvring forces on the modern battlefield through a lecture on 'Force Protection Capabilities for Deployable Forces.' Central to these capabilities are Rafael's unique tactical laser systems, including Lite Beam, designed for light vehicle integration, as well as the Iron Beam high-energy laser solution and all its configurations. These advanced high energy-based systems enable a critical layer of protection for ground forces, enhancing survivability and mission success in complex operational scenarios.

Rafael's force protection capabilities are a culmination of decades of operational experience and innovation, offering tailored solutions to counter threats such as drones, rockets, and mortars. The Lite Beam, a tactical close-range laser defence system, delivers precision and flexibility, making it an

ideal solution for manoeuvring forces requiring rapid and reliable protection. The Iron Beam's open architecture allows for dynamic integrations, and increased mobility of the laser defence solution, also at a tactical level.

These technologies are part of Rafael's multi-layered approach to force protection, which integrates seamlessly with proven systems such as the Trophy Active Protection System (APS). Trophy, recognised as the only fully operational APS in the world, has been combat-proven for over 14 years, saving lives and ensuring the survivability of armoured vehicles against a wide array of anti-tank threats. Its continued evolution underscores Rafael's commitment to adapting to emerging challenges while maintaining its legacy of excellence.

Rafael's portfolio also includes advanced counter-UAS capabilities, and the Fire Weaver networked combat system. Fire Weaver provides real-time battlefield intelligence and precision targeting, enabling forces to operate cohesively and decisively across multiple domains. Together, these systems create an integrated framework for force protection, ensuring that manoeuvring forces remain resilient and effective in the face of today's rapidly shifting threat landscape.

"Force protection is about enabling survivability through innovation and integration," said EVP Tzvi Marmour, Head of Land and Naval Systems Division. "Our laser portfolio, and Trophy APS provide the practical, tactical solutions forces need to counter emerging threats effectively. At IAV 2025, we are highlighting how Rafael's force protection capabilities provide a decisive edge for manoeuvring forces in any operational environment." ||

BonV Aero Joins UK Defence Framework to Boost Global Heavy-Lift Drone Capabilities

BonV Aero has been selected to join the Unmanned Aerial Systems Heavy Lift Capability (UASHLC) Framework. This initiative, led by the UK ministry of defence under its Future Capability Innovation division, facilitates collaboration between global innovators and suppliers in the unmanned aerial systems (UAS) sector, focusing on heavy-lift capabilities.

This selection provides BonV Aero a platform to engage with the UK and other NATO countries, expanding its presence in the global defence ecosystem. As part of the framework, BonV Aero will be eligible to bid on tasking requirements and participate in mini competitions for UAS solutions.

"Being part of the UASHLC Framework underscores the relevance of our heavy lift eVTOL technology in meeting the evolving needs of defence forces around the world. We look forward to collaborating with NATO countries and allied defence organisations," said founder and CEO of BonV



Aero, Satyabrata Satapathy.

BonV Aero designs and manufactures high-payload eVTOLs with applications in defence, logistics and emergency response. Its Air Orca eVTOL, capable of transporting heavy cargo over long distances has already been deployed by the Indian Army.

Participation in the UASHLC Framework validates BonV Aero's technology and enhances its visibility in international markets. The company aims to collaborate with defence innovators and pursue long-term contracts and partnerships.

"This recognition reaffirms our strengths in designing and manufacturing heavy-payload aerial vehicles. We aim to demonstrate the utility of our high-payload drones in various operational scenarios globally," added Satapathy. ||

Praise for Born a Muslim

This is a sensitively written and deeply empathetic work on the place and predicament of Muslims in India. Drawing on memoir, reportage, and documentary analysis, it contains many moving stories of individuals across class and regional divides, with these case studies skillfully located in a wider political and historical context. An important and timely intervention in our public discourse, *Born a Muslim* would be of interest to thinking Indians of all faith and ideologies.

RAMACHANDRA GUHA, historian and author

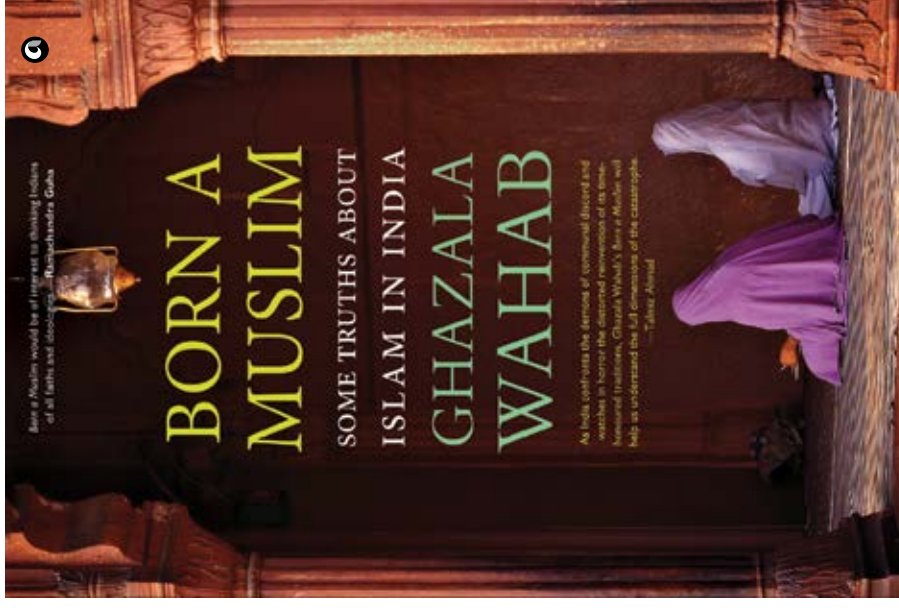
Ghazala Wahab has written a powerful reflection on what it means to be Muslim in modern India. Fusing memory and history, she has produced a poignant state-of-the-community report that every Indian should read. *Born a Muslim* is a remarkable book: a rare synthesis of lived experience and the roar of history.

MUKUL KESAVAN, historian and author

As India confronts the demons of communal discord and watches in horror the distorted reinvention of its time-honoured traditions, Ghazala Wahab's *Born a Muslim* will help us understand the full dimensions of the catastrophe being shaped for our nation and what we can do to preserve our shared national heritage.

TAMIZ AHMED, former Indian ambassador to Saudi Arabia, Oman and the UAE, and Ram Sathie Chair Professor for International Studies, Symbiosis International University, Pune

On the Stands



*Weaving together personal memoir, history, reportage, scholarship, and interviews with a wide variety of people, Ghazala Wahab highlights how an apathetic and sometimes hostile government attitude and prejudice at all levels of society have contributed to Muslim vulnerability and insecurity. *Born a Muslim* goes beyond stereotypes and news headlines to present an extraordinarily compelling and illuminating portrait of one of the largest and most diverse communities in India.*



Safe Skies

India is building its own advanced air defence missile system

ISRAEL'S WAR AGAINST IRAN, Hezbollah in Lebanon, Hamas in Gaza and the Houthi rebels in Yemen has explicitly established the need for air defence systems. Israel boasts of having an exceptionally good aerial defence system with the support of the United States, including Iron Dome, David's Sling, Arrow 2, and Arrow 3 missiles. Israel has often employed its complex network of air defences to respond to missile and drone attacks in the past few months. Israel used all the missile defence systems that were available at that time to repel over 300 drones and missiles in April and 180 projectile attacks from Iran on 1 October 2024. The Israeli Defence Forces (IDF) stated that 90 per cent of the Iranian projectiles launched were destroyed.

The Iron Dome is considered the most used missile defence system globally, with over 2,500 operational intercepts and a success rate of over 90 per

cent since 2011. The system is intended to engage short-range rockets, shells, and mortars at distances between 4km and 70km from the missile launcher, strengthening its image of accuracy and reliability.

India also needs to enhance its air defence environment to counter threats from the air, as it has two hostile neighbours. These threats originate both from the east (China) and the west (Pakistan). It is important for India to strengthen its air defence capabilities to ensure the country's security.

Indian SAMs

India's air defence missile systems play a crucial role in protecting its airspace from aerial threats, including enemy aircraft, missiles, and UAVs. Over the years, India has developed and acquired various surface-to-air missile (SAM) systems to strengthen its air defence architecture. These SAM systems are designed

to address threats at different altitudes and ranges. Here's an overview of India's major air defence missile systems.

Akash Missile System: The Akash system is a medium-range SAM indigenously developed by the Defence Research and Development Organisation (DRDO). It has a range of up to 30 km. Akash employs a solid-fuel, two-stage rocket motor and comes equipped with a high-explosive fragmentation warhead. It works in conjunction with the Rajendra radar system for target acquisition.

Akash is a mobile air defence system designed to neutralise attacks from aerial platforms, like aircraft, helicopters, and unmanned aerial vehicles. The Akash missile system enables targets to be engaged at altitudes of 18 km. It can engage multiple targets simultaneously and possesses its own indigenous radar and control equipment. It is one of the rare indigenous SAM systems in the Indian inventory. The Akash-NG

MBDA's Mistral 3





LEFT & RIGHT IAI's MRSAM missile during its test; and Almaz-Antey's S-400 ADMS

(New Generation), an upgraded version with better performance and advanced technology, has a range of 70km and enhanced accuracy.

Barak-8 (LR-SAM): BARAK-8, the long-range surface-to-air missile system, is a joint venture of Israel Aerospace Industries (IAI) with the DRDO. The system has been developed for defence against aerial threats, including fighters, helicopters, UAVs, missiles aiming at ships and others, and even ballistic missiles. It is applied in naval and shore-based systems. It has a multifunctional surveillance-firing control system radar. This system has a very advanced radar and control system based on a phased array radar system.

Barak-8 is a highly mobile missile with an advanced rocket motor. It is an active radar-guided missile powered by a dual-pulse rocket motor. Two pulses enable tracking of manoeuvring targets. It can be launched from either airborne or seaborne facilities. The Barak-8 system has been developed to engage and neutralise different aerial targets up to 100km, while the target is at an altitude of up to 16km.

S-400 Triumph: This is a Russian missile system. The S-400 is an advanced long-range air defence missile system. It is considered one of the most innovative and effective air defence systems in the world. India bought five S-400 systems from Russia, which will strengthen its

defence against hostile aircraft, missiles, and drones.

India finalised the deal to purchase five S-400 units with Russia in 2018, and the supplies started in 2021. The system can track stealth aircraft, ballistic missiles and cruise missiles. It employs a range of missiles with different capabilities, including long-range (400km), medium-range (250km), and short-range (40km) interceptors. The S-400 also integrates advanced radar systems for multi-layered defence against aerial targets at altitudes up to 30km. The S-400 missile system is equipped to track as many as 80 targets at once, thanks to its multi-tiered missile system. It comprises radar systems capable of identifying stealth targets.

SPYDER: Developed by Israel's Rafael Advanced Air Defence Systems, SPYDER integrates Python-5 and Derby missiles for short- to medium-range mobile air defence missile systems. It is designed for rapid reaction and offers 360-degree coverage against various threats. The system can engage multiple targets at an altitude of 9km at a range of 15km (short-range) and 35km (medium-range). It is capable of operating in all weather conditions and includes both electro-optical and infrared targeting systems.

The SPYDER system uses two types of missiles: the Python-5 and Derby. Python-5 is an advanced imaging infrared-guided missile, while the Derby

is radar-guided. This system is effective against enemy aircraft, UAVs, and precision-guided munitions. SPYDER's quick-reaction capability makes it ideal for intercepting incoming threats within short notice.

MRSAM: In a significant boost to India's defence capabilities, the first deliverable firing unit (FU) of the medium range surface to air missile (MRSAM) system was handed over to IAF in the presence of defence minister Rajnath Singh at Air Force Station, Jaisalmer in Rajasthan on 9 September 2021.

The MRSAM is an advanced network-centric combat air defence system developed jointly by the DRDO and IAI in collaboration with the Indian industry, comprising private and public sectors, including MSMEs. The MRSAM system offers point and area air defence for terrestrial assets against many threats, including fighter aircraft, UAVs, helicopters, guided and unguided weapons, and subsonic and supersonic cruise missiles. Under extreme saturation conditions, it can engage multiple targets at distances of up to 70km at a maximum altitude of 16km.

The missile is propelled by a domestically designed rocket motor and control system to attain excellent manoeuvrability during the terminal phase. It is equipped with an advanced radar system, a mobile launcher, and an all-weather tracking system. MRSAM is



Akash SAM system is being designed to meet the requirements of the IAF and the Army

an important addition to India's air defence network and is deployed both by the Indian Air Force (IAF) and the Indian Army. It's a land-based version of the Barak-8 system.

QRSAM: QR-SAM is indigenous quick reaction surface to air missile system designed by DRDO to provide quick-reaction air defence for mobile formations in the army. It is intended to replace legacy systems like the OSA-AK and SA-8.

QRSAM is a mobile, quick-reaction system capable of detecting and tracking multiple targets simultaneously up to a range of 25-30km. It is capable of engaging targets at low to medium altitudes. The effective engagement envisaged is at altitudes of up to 10km. It can be rapidly deployed and is designed for use by the Indian Army for defence against short-range airborne threats, including helicopters, UAVs, and low-flying aircraft. The missile can engage multiple targets simultaneously and is integrated with an AESA radar for improved targeting. It employs an active radar seeker for terminal guidance and is mounted on a vehicle for enhanced mobility.

PAD/PDV: India's Prithvi Air Defence (PAD) and Prithvi Defence Vehicle (PDV) BMD programme is designed to protect against incoming ballistic missile threats. PAD is the exo-atmospheric (outside the Earth's atmosphere) interceptor intended to engage targets at high altitudes, while AAD is the endo-atmospheric (within the Earth's atmosphere) interceptor for lower altitudes.

These are part of India's two-tier ballistic missile defence (BMD) system. PAD will have a range of up to 80km, while PDV can engage aerial targets up to 150km. The system is being developed with phased-array radars, interceptors, and early-warning mechanisms. DRDO has conducted successful tests, and the system is expected to be operational soon.

XRSAM: XRSAM is an extended range surface-to-air missile system being developed by DRDO to fill the gap between the MRSAM and the S-400 system. The XRSAM is expected to have the range of 250km, with a possible variant capable of engaging targets at 350-400km. It aims to provide interception capabilities for airborne threats, including strategic bombers and AWACS (Airborne Early Warning and Control Systems). The XRSAM will be compatible with the IAF's integrated air command and control system (IACCS), providing smooth coordination and efficient air defence. The system is expected to feature multi-target engagement capability and an advanced command and control system up to an altitude of 30km. The XRSAM is intended to be employed for area defence.

Challenges

Diverse development programmes further India's primary goal of achieving self-sufficiency in defence technology and enhancing its strategic deterrent capabilities. However, there are still issues with integrating and optimising these systems, mainly when dealing

with a multi-layered air security architecture that may engage targets as different as ballistic missiles and drones. Other challenges include encountering stealth technologies, improving missile guidance and precision, and advancing propulsion systems. The primary objectives of the projects and their designs must be developing cutting-edge missile systems, improving cyber security, and incorporating artificial intelligence and other cutting-edge technology.

Future Plans

India's air defence is undergoing a significant transformation, strongly emphasising indigenous production and network-centric operations. This focus on homegrown technology is not just a strategy but a testament to India's growing technological prowess. The planned robust layered air defence system will include various long-range, medium-range, and short-range missile systems and aircraft, cruise missiles, UAVs, and ballistic missiles, all of which are being developed within the country.

The BMD programme, which strives to create a shield over sensitive areas, is part of this effort. India is now working on Phase II of its BMD programme, which includes the development of new interceptor missiles to neutralise threats posed by ballistic missiles. Under DRDO's Project Kushaa, India plans to deploy an indigenous 'Iron Dome' by 2028-2029. The system is expected to be able to detect and destroy incoming stealth fighters, drones, cruise missiles, and munitions at ranges of up to 350km. It is expected to have interception capabilities comparable to the Russian S-400 Triumf air defence system. The ministry of defence accepted the 'acceptance of the necessity' for procuring five squadrons for the IAF at a cost of Rs 21,700 crore.

Conclusion

The air defence missile systems are a testament to India's collaborative approach, built from a combination of indigenously developed systems and systems designed by friendly suppliers from Europe, Israel, Russia, and the US. India is creating a robust multi-tiered missile defence system with the help of systems like the S-400, Akash, and Barak-8. The continuation of the existing systems, such as the QR-SAM, XRSAM, and ballistic missile defence, would complement India's airspace security. The focus is on using enhanced radar equipment, mobility, and high reactivity to answer various challenges. ■

Bestseller

DRAGON ON OUR DOORSTEP

Managing China through Military Power

A unique approach to peace to meet the challenge of a rising and belligerent China by
FORCE editors, Pravin Sawhney and Ghazala Wahab



DRAGON ON OUR DOORSTEP

MANAGING
CHINA
THROUGH
MILITARY
POWER

PRAVIN SAWHNEY
& GHAZALA WAHAB

Reaching for the skies together



We remain dedicated to the inspiring progress of India and proudly support the nation's focus toward becoming Aatmanirbhar in aerospace and defence.

Join us and help shape aerospace innovation:
boeing.com/indiacareers

