NATIONAL SECURITY AND AEROSPACE NEWSMAGAZINE

FORCE

2025 AERO INDIA

day2

MEDIA PARTNER

INSIDE

Rajnath Singh's Day in the Sun

Air Chief Marshal A.P. Singh's flight in LCA-Mk1 A steals the thunder

GHAZALA WAHAB | YELAHANKA

STAKING HIS COMMAND, NAME AND reputation, the chief of air staff, Air Chief Marshal A.P. Singh personally carried out the flypast in LCA-Mk1 A during the inauguration of Aero India 2025. If this was the marketing coup for the beleaguered Hindustan Aeronautics Limited (HAL) on the opening day of the Show, the previous day was even better for India's premier aviation company, given the ignominy of having all its ALH Dhruv helicopters (total 330) grounded following a series of air accidents.

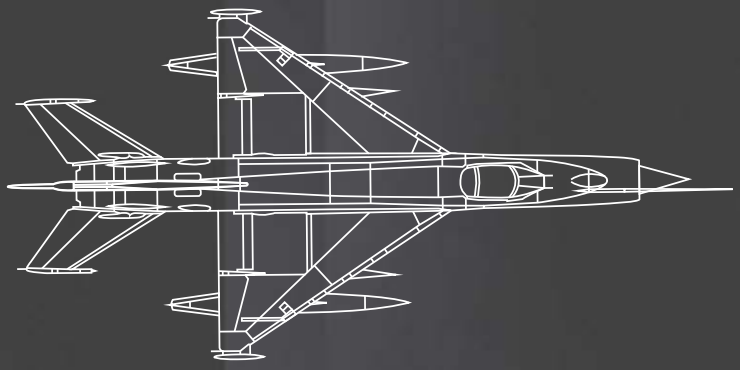
On February 9, both ACM Singh and his army counterpart, General Upendra Dwivedi flew the trainer version of the LCA in Bengaluru, reposing their faith in the made in India fighter, not only for the Indian Air Force (IAF) pilots, but also for possible export customers, some of whom were invited to the show by the government of India. There couldn't have been a higher level of marketing. Finally, Aero India has risen to it real objective—showcasing Indian ware to the world as a seller, instead of a buyer.

Defence minister Rajnath Singh, who inaugurated the show in the absence of the Prime Minister, and took the solitary spot on the tarmac as PM Narendra Modi had done in 2023, said as much in his opening remarks. According to him, until the coming to power of Prime Minister Modi, the Indian defence industry was seen only as a national security requirement. However, the present government elevated the domestic defence industry to the status of a defence industrial complex, combining defence public sector undertakings (DPSUs) and the private sector. "Not only did our government recognise the importance of the defence sector, but it also regarded it as a top economic sector," he said. "This is evident from the consistent increase in the defence budget year after year," Singh added.

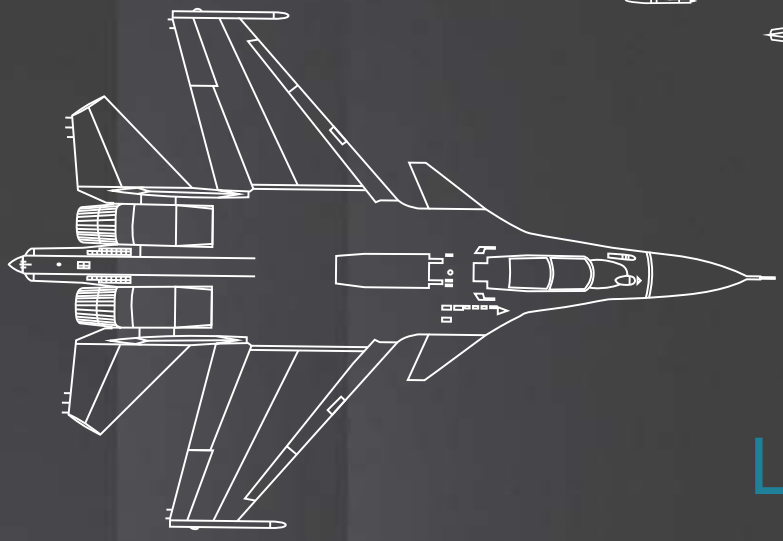
To further emphasise his point, Singh gave the example of corporatisation of the Ordnance Factories which he said has increased their efficiencies. There-

UNITED AIRCRAFT CORPORATION

3rd generation



4th generation



LONG HISTORY WITH A BRIGHT FUTURE

5th generation

www.uacrussia.ru/en

FORCE

www.forceindia.net

NATIONAL SECURITY AND AEROSPACE NEWSMAGAZINE

EDITOR	Ghazala Wahab
ROVING EDITOR	Pravin Sawhney
SPECIAL PHOTOGRAPHER	Amin War
IT MANAGER & COORDINATOR	Saroja Kumar Sahoo
MANAGER SUBSCRIPTIONS & MARKETING	Sweety 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

RNI No. Deleng/2003/12712

ISSN 0972-9453 Force

fore, "India has taken a giant leap in innovation and technology development," he said, adding that all these efforts have led the total turnover of the Indian defence industries to touch Rs 1.25 lakh crore.

Fresh from a holy dip at the Mahakumbh in Prayagraj, Singh likened Aero India to the religious congregation. He said that while the Mahakumbh at Prayagraj is about inner strength, the one at Yelahanka is about outer strength. While the former leads to spiritual cleansing, the latter leads to physical resilience, and so on. Carried away by the comparison, Singh spent the next few minutes describing the two events in the most florid of metaphors.

Concluding his address, Singh alluded to India's non-aggressive past and the future peaceful rise. However, he qualified this with the assertion that peace can only be build on the foundation of strength. Hence, India needs to be militarily strong to enforce peace. And towards this end, his ministry has declared 2025 as the year of reform, for which both the DPSUs and the Services will work in close coordination.

Speaking before him, the deputy chief minister of Karnataka, D.K. Shivakumar, underscored the centrality of Bengaluru to India's defence and aerospace sector, to which his government continues to contribute. According to him, over 60 per cent of all aerospace and defence manufacturing happens in Karnataka, employing over 1,50,000 lakh people. Shivakumar added the make in Karnataka twist to the make in India pitch.

Whether made in Karnataka or made in India, Aero India continues to fail on administrative parameters with infrastructure unable to withstand even the first day of the show. More on this tomorrow. II

NEWS

HAL's Upgraded Hindustan Jet Trainer 36 Unveiled as 'Yashas'

The flagship jet training aircraft of Hindustan Aeronautics Limited (HAL), Hindustan Jet Trainer, HJT-36, is now renamed as 'Yashas' after extensive modifications to resolve departure characteristics and spin resistance throughout the aircraft envelope. Sanjeev Kumar, Secretary (DP) unveiled the new name in the presence of Dr D K Sunil, CMD, HAL and senior officers at the ongoing Aero India 2025.

"The large-scale changes to the baseline intermediate training platform has led to significant upheaval in its capabilities and hence provided an opportunity for a new name to be given in accordance with the aircraft's continued relevance as a training system for modern military aviation", said Dr D K Sunil.

For induction into service, the aircraft was recently upgraded with state-of-the-art avionics and an ultra-modern cockpit. These will enhance training effectiveness and operational efficiency.

Yashas is capable of Stage II pilot training, counter insurgency and counter surface force operations, armament training, aerobatics etc. It is powered by a FADEC controlled AL55I jet engine, providing best in class thrust to weight ratio, optimised thrust management and reliability. Stepped up rear cockpit with drooped nose provides excellent all-around vision and enhanced situational awareness. II

Thales at the AI Action Summit: Trusted AI can Change Society

A global leader in advanced technologies for the defence, aerospace, cybersecurity and digital identity sectors, Thales took part in the Artificial Intelligence Action Summit in Paris on 10 and 11 February 2025 to showcase its latest advances in the field of trusted AI for critical systems.

At a time when much is expected of AI and its contribution to the security and sovereignty of nations, Thales offers a hybrid, explainable, cybersafe and frugal AI, which is already incorporated into more than 100 of its products. This technology is already delivering significant advances in the protection of infrastructure, optimisation of energy consumption and defence systems.

"Thales is a key player in the field of trusted AI: our experts have developed a hybrid AI, which offers transparency, cybersecurity, energy efficiency and an ethical approach — unlike many AI systems that rely exclusively on large amounts of data and are particularly energy-intensive. Thales offers an augmented intelligence, which is capable of changing society," said Patrice Caine, Chairman and CEO of Thales.

Caine will take part in the dialogue between heads of state and government and business leaders at two round-table sessions on AI and national security and on Europe's AI champions.

On February 11, experts from cortAIx, Thales's AI accelerator, will conduct exclusive demonstrations of the practical impacts of AI in 15 critical fields for official French and international delegations at the Thales Digital Factory. These AI-enabled solutions are designed to boost the performance of the most advanced systems and help humans make better decisions in crisis situations and high-stakes environments where data security and sovereignty are critical.

These solutions are already available and show how AI can reduce the environmental footprint of air traffic, protect airports and major events, protect maritime traffic and infrastructure, and, in the defence sector, increase the effectiveness of operational assets/resources and accelerate the OODA (observe, orient, decide, act) loop.

On the same day, Thales's Friendly Hackers team will take part in the Cyber Crisis Management Exercise organised by ANSSI, France's national agency for information system security, at the Cyber Campus in Paris. Thales will also participate in two events, 'Empowering AI Ecosystems through Strategic Autonomy: Lessons from Finland and France' at Finnish Embassy in Paris and 'Building Trust: Anticipating and Managing AI Risks', organised by the HEC Hub Digital and Axys in Paris. II

MBDA Showcases Advanced Missiles Systems at Aero India

MBDA will be present at the Aero India 2025 in Bangalore to showcase its advanced missiles systems and highlight its strong commitment to 'Make in India'. Aero India will take place from February 10-14.

For over 50 years, MBDA has been delivering battle-winning capabilities to the Indian armed forces, closely collaborating with a wide Indian industrial ecosystem, including its joint venture L&T MBDA Missile Systems Ltd, India SMEs and Defence Public Sector Undertakings (DPSUs) such as Bharat Dynamics Limited (BDL).

Thanks to its unique DNA based on co-operation and key expertise, MBDA has a crucial advantage in developing and producing state-of-the-art products by encompassing the best skills and technologies from across borders. This DNA and track record of partnership also makes MBDA uniquely suited as a partner for India that can enhance Indian self-reliance and sovereignty –- as can be seen from the successful 'Make in India' of over 50,000 MBDA-designed missiles in partnership with Indian industry to date.

Several emblematic complex weapon systems will be showcased during this tradeshow. First, in the air domain MBDA will showcase different weapon systems that arm India's Dassault Rafale combat aircraft, especially the Meteor. Widely recognized as a game changer for air combat, this beyond visual range air-to-air missile (BVRAAM) is powered by a unique rocket-ramjet motor giving it far more engine power, for much longer than any other missile. In other words, its no-escape zone is many times greater than any other air-to-air missile. Also, in the air domain will be the ASRAAM air combat missile that is delivering India's Next Generation Close Combat Missile capability. The fastest close combat missile in the world, Indian Air Force's (IAF's) Jaguar and Tejas combat aircraft are the first to gain this vital system for ensuring India's dominance in air combat.

In the maritime domain will be Sea Ceptor naval air defence system that is being offered to the Indian Navy (IN) for its VL SRSAM requirement by MBDA's Indian joint venture. Visitors can see the futuristic technologies featured within Sea Ceptor and how they would provide Indian sailors with a 'Make in India' solution for the very best defence from air attack, providing robust protection of host platform and escorted shipping.

L&T MBDA Missile Systems Ltd, MBDA's joint venture with Larsen & Toubro, will also be exhibiting at the show, showcasing the work it performs in Coimbatore, delivering 'Make in India' projects in support of Atmanirbhar Bharat for the Indian Air Force (IAF). Besides VL SRSAM, there will also be the ATGM5 anti-tank missile, proposed as an Indian designed, developed and manufactured next generation battlefield missile to meet the needs of Indian operators. II

In the Blue Yonder

Boeing sees continuous growth of commercial aviation in India; demand for over 2,800 aircraft in 20 years

GHAZALA WAHAB | NEW DELHI

STATISTICS ARE LIKE A POND FULL of fish. You choose the ones you desire. And if you don't find the one you like, you can always add the spices while cooking it to suit your palate. That's the good thing about data. It can be used to induce optimism as well as despair.

Boeing chose optimism in its annual press conference to share its commercial market outlook (CMO) for India on February 6, four days before Aero India. Its optimism was built on the foundation of three presumptions about the Indian economy: four times growth in the GDP by 2050; rising disposable income; and increase in jobs in the manufacturing sector. Based on these, Boeing assessed that by 2031, India will be the third largest economy in the world. Given that even today, the aviation sector contributes USD 54 billion to the economy and has created 7.7 million jobs, it is only natural that as the economy expands, this sector will grow too.

Hence, by 2043, the South Asian region, led by India by a vast margin, would have the requirement of 2,835 aircraft, most of them single aisle. This will lead to the demand for nearly 129,000 pilots, technicians and cabin crew. The Boeing market analysts combined numbers with aspirational sentiments of India's growing middle class, comprising a huge youth population to arrive at this conclusion. According to the CMO, these numbers would be achieved by roughly 7.4 per cent growth in the aviation sector over the next 20 years.

Boeing's qualitative analysis depended upon two factors. First, the evidence that air traffic grows when the infrastructure expands. The Boeing spokesperson used the example of the opening of the second airport in Goa in December 2022, which led to 33 per cent increase in passenger traffic, to make the case that with the opening of the Jevar and Navi Mumbai airports, air traffic to both Delhi and Mumbai was likely to double. Add to this the fact that in addition to 138 currently operational airports, 162 are under development.

Second, the concurrent increase in disposable income and aspirations show that passengers who travel by air, seldom go back to other modes of transportation. Hence, if a rail passenger experiences air travel, she would always want to travel by air, instead of going back to the train. Given this, Boeing assesses that if there is even a two per cent shift from train to air in India, the air traffic would double.

Boeing's optimistic outlook also includes air cargo, which it expects to double in the next 15 to 20 years. And since Boeing is the global leader in freighters, this growth will automatically lead to the expansion of its fleet in India.

To balance the outlook with a bit of present reality, the Boeing presentation included a slide on the challenges. Top on the list was the cost of aircraft turbine fuel (ATF), which in India is amongst the highest in the world. This is one of the reasons air travel is expensive for the customers and unprofitable for the airlines. The last two decades have seen the emergence and collapse of several private airlines, both full fare and low cost. The other challenges included poor airport infrastructure and limited international routes for Indian carriers, putting them at a disadvantage vis a vis other global operators.

However, the biggest challenge that is overlooked by these numbers is the nature of the Indian economy, of which the GDP is not the correct marker. A more appropriate representation of the economy is the per capita income and per capita expenditure. It would be an interesting exercise to find out how much of India's aviation sector growth is fuelled by individual spenders and how much by the corporates. And how many of these corporate travellers choose to travel by air when they buy their own and their families' tickets for a holiday.

Also, the presence of airports does not automatically translate into air travel. If a sector is not profitable, the airlines will not fly that sector, rendering the airport under or even unutilised. This has been the fate of many airports in Tier II cities across India, especially if those cities are better connected through rail and road. Take for example Agra, which despite substantive tourism and export-oriented industry does not have a full operational civilian airport.

Optimism is good for health, both of individuals and companies. But unless it is tempered by a dose of realism, the possibility of future disappointment cannot be ruled out. II

BHARAT FORGE | KALYANI

BEYOND HORIZONS

BHARAT FORGE IS PROUD TO UNVEIL INDIA'S FIRST AND FULLY INTEGRATED LANDING GEAR MACHINING FACILITY

Manufacturers will benefit from a seamlessly integrated supply chain, encompassing everything from raw materials to forging, machining, and subsystems, all handled entirely in-house.

A Boost to the Global Aerospace Ecosystem	Game Changer for Global OEM's	Collaboration with one of the global leader in landing gear system	Advancing the Aerospace Manufacturing Ecosystem	Empowering **'MAKE IN INDIA'**

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

Defence Budget Enhanced

Over Rs 6.81 lakh crore allocated in Union budget 2025-26 for the MoD

THE UNION BUDGET HAS MADE A PROVISION OF Rs 6,81,210.27 crore for financial year (FY) 2025-26 for the ministry of defence (MoD). This allocation is 9.53 per cent more than the budgetary estimate (BE) of FY 2024-25 and stands at 13.45 per cent of the budget, which is highest among the ministries.

Out of this, Rs 1,80,000 crore i.e. 26.43 per cent of total allocation will be spent on capital outlay of defence services. On revenue head, allocation for the armed forces stands at Rs 3,11,732.30 crore which is 45.76 per cent of total allocation. Defence pension receives a share of Rs 1,60,795 crore i.e. 23.60 per cent and balance Rs 28,682.97 crore i.e. 4.21 per cent is for civil organisations under MoD. The ministry will observe 2025-26 as 'Year of Reforms' to strengthen the resolve of the government to modernise the armed forces and simplify the defence procurement procedure (DPP) to ensure optimum utilisation of the allocation.

Defence minister Rajnath Singh congratulated finance minister Nirmala Sitharaman for the budget, saying, "This budget will promote the development of youth, poor, farmers, women and all other sections of society. Recognising the contribution of the middle class, the budget has brought an unprecedented gift."

Capital Outlay: In the current geopolitical scenario, the Indian armed forces need to be equipped with state-of-the-art weapons and transformed into a technologically-advanced combat-ready force. Keeping this in view, Rs 1,80,000 crore has been allocated on capital outlay of the defence forces. This allocation is 4.65 per cent higher than the BE of FY 2024-25. Out of this, Rs 1,48,722.80 crore will be spent on capital acquisition, and remaining Rs 31,277.20 crore for capital expenditure on research and development and creation of infrastructural assets across the country.

Operational and Sustenance Budget of the Armed Forces: Rs 3,11,732.30 crore has been allocated for pay and allowances of the defence personnel, and for sustenance and operational preparedness. This is 10.24 per cent higher than budgetary allocation of FY 2024-25. Out of this, Rs 1,14,415.50 crore has been allocated on account of non-salary expenditure which will facilitate procurement of ration, fuel, ordnance stores and maintenance/repair of equipment etc.

Enhanced Allocation for DRDO: The budgetary allocation to Defence Research and Development Organisation (DRDO) has been increased to Rs 26,816.82 crore in FY 2025-26 from Rs 23,855.61 crore in FY 2024-25 which is

2025
AERO INDIA
The Runway to a Billion Opportunities

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

HAL
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

- Rs 1.80 lakh crore allocated under Capital Budget of Armed Forces;
- Rs 1.12 lakh crore earmarked for procurement from domestic industries;
- 14 per cent increase in allocation for Defence Pension;
- Rs 8,317 crore allocated for ECHS;
- 12 per cent hike for Defence R&D Budget;
- Significant jump of 43 per cent in Capital Budget of ICG;
- Rs 7,146 crore allocated to BRO under Capital Head

12.41 per cent higher than the BE of 2024-25. Out of this, a major share of Rs 14,923.82 crore has been allocated for capital expenditure and to fund the R&D projects. This will financially strengthen the DRDO in developing new technologies with special focus on fundamental research and hand-holding of the private parties through development-cum-production partner.

Encouraging Start-Up Ecosystem for Innovation in Defence: To encourage private players and strengthen the start-up ecosystem, Rs 449.62 crore has been allocated to iDEX scheme, including its sub scheme Acing Development of Innovative Technologies with iDEX (ADITI) to be utilised for funding projects taken up under this scheme.

Ex-Servicemen Welfare: The government has maintained the continuously higher allocation for providing best healthcare facilities to veterans and their families through dedicated Ex-Servicemen Contributory Health Scheme (ECHS). In the ensuing FY, Rs 8,317 crore has been allocated towards ECHS which is 19.38 per cent higher than BE of FY 2024-25. During the mid-year review in the current FY, additional allocation was made to meet the expenditure related to medical treatment.

Under defence pension, Rs 1.61 lakh crore has been allocated for FY 2025-26, which is 13.87 per cent higher than the allocation made during FY 2024-25. This will take care of inflationary trends and provide comfort to ex-servicemen and their dependents.

Capital Budget of ICG: Indian Coast Guard (ICG) has been allotted Rs 9,676.70 crore under Capital and Revenue Head which is 26.50 per cent more than the allocation for FY 2024-25 at BE stage. This increase is primarily in line with the focus of the government on capability development of ICG and equipping them with modern equipment.

A jump of 43 per cent in capital budget i.e. from Rs 3,500 crore for FY 2024-25 to Rs 5,000 crore for FY 2025-26 will provide adequate financial space for acquisition of Advanced Light Helicopters (ALH), Dornier Aircraft, Fast Patrol Vessels (FPVs), Training Ships, Interceptor Boats etc.

Strengthening Border Infrastructure: To further improve the border infrastructure and facilitate the movement of armed forces personnel through tough terrains, Rs 7,146.50 crore has been allocated to Border Roads Organisation (BRO) under capital head which is 9.74 per cent higher than the BE of 2024-25. The financial provision made for the FY 2025-26 for BRO will not only promote the strategic interest of the nation in border areas by constructing tunnels, bridges and roads but will also boost socio-economic development, provide employment opportunities and encourage tourism. II

NEWS

L&T Launches Second Multi-Purpose Vessel, INS Utkarsh, for Indian Navy

Larsen & Toubro (L&T) launched the second multi-purpose vessel (MPV) for the Indian Navy from its Kattupalli Shipyard near Chennai on January 13. The vessel, christened INS Utkarsh, was launched by Dr Sushmita Misra Singh, the wife of Union defence secretary Rajesh Kumar Singh. Singh, Vice Admiral B Sivakumar (Controller of Warship Production & Acquisition), Rear Admiral Vishal Bishnoi (Assistant Controller of Warship Production & Acquisition) and senior leaders of L&T were present.

Following an accelerated production schedule, the launch of INS Utkarsh comes within three months of the launch of the first MPV INS Samarthak. The first vessel is now being readied for undergoing tests and trials prior to its delivery to the Indian Navy.

The MPVs are highly specialised, and play multiple roles, including serving as trial platforms, for the development of next generation weapons and sensors. They will perform maritime surveillance, humanitarian assistance, combat sea pollution, besides taking up launch and recovery of surface and aerial assets, etc.

The MPVs are 107m long, 18.6m wide with a displacement over 3,750 tonnes. The design engineering of the MPVs was undertaken at L&T's in-house Warship Design Centre at Chennai and the construction was done at L&T's Kattupalli shipyard.

Commenting on the occasion, senior vice president & head, L&T Precision Engineering & Systems, A.T. Ramchandani said: "The successful launch of the second MPV ahead of schedule underscores L&T's unwavering commitment to bolster India's national security. With our unmatched in-house design expertise and execution prowess, we are committed to providing cutting-edge defence platforms to support Indian Navy's fleet expansion needs.

L&T's Kattupalli shipyard is one of the most advanced shipbuilding and ship repair facilities in India and is equipped with ship-lift, dry and wet berths to concurrently undertake new ship building and repairs.

Besides the two MPVs, L&T is also constructing three Cadet Training Ships and six other defence vessels for the Indian Navy on public-private-partnership model. This apart, the repair of the Indian naval ship INS Tir is also currently underway at the Kattupalli shipyard. II

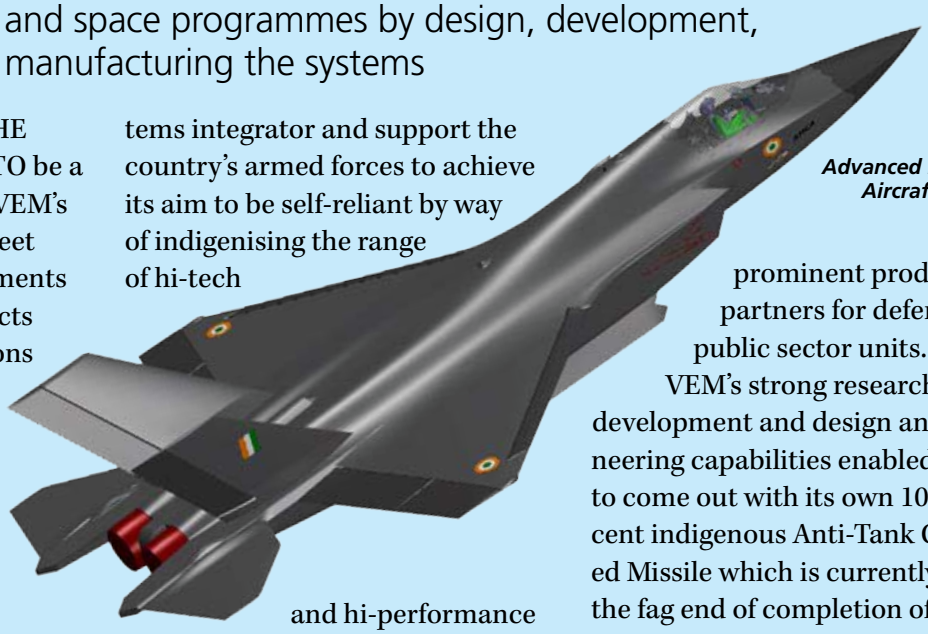
Towards Nation's *Aatmanirbharta*

VEM Technologies is one of the top renowned companies in India dealing with defence, aeronautics and space programmes by design, development, manufacturing the systems

VEM WAS FOUNDED IN THE YEAR 1988 WITH AN AIM TO be a 'Lockheed Martin of India'. VEM's mission is to consistently meet and excel customer requirements in providing superior products through proactive interactions and timely solutions. VEM is progressively working to realise its mission.

The core strength of VEM is its highly committed work force. VEM is motivated and guided by its values, employees' health and morale, safety and integrity, trust, respect, team spirit, intuitiveness and innovation.

Venkata Raju, the founder, chairman and managing director is committed to make VEM as a systems integrator and support the country's armed forces to achieve its aim to be self-reliant by way of indigenising the range of hi-tech and hi-performance weapon systems.

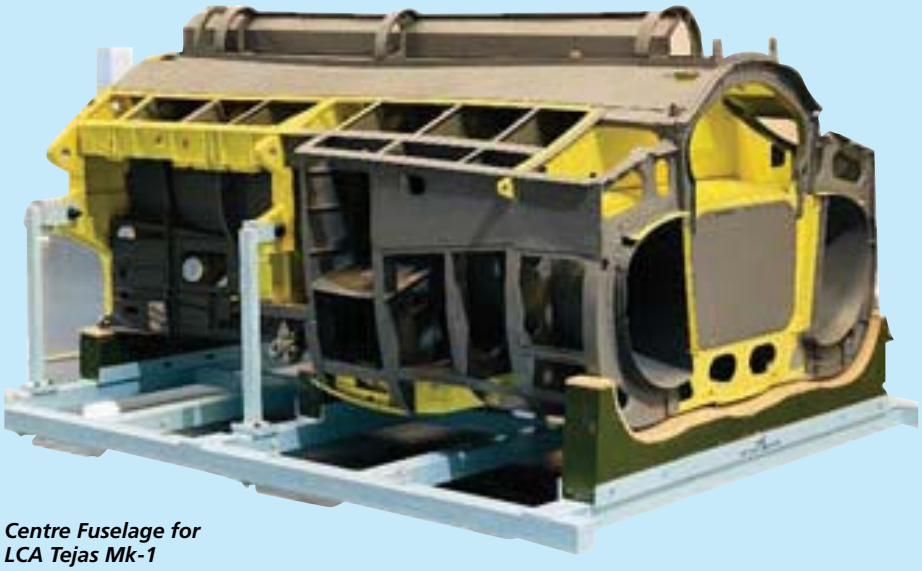


Advanced Fighter Aircraft (AFA)

VEM has been into the design, develop and manufacturing the systems and sub-systems for the nose to tail of most of the Indian missiles by working for DRDO and subsequently being one of the prominent production partners for defence public sector units.

VEM's strong research and development and design and engineering capabilities enabled VEM to come out with its own 100 per cent indigenous Anti-Tank Guided Missile which is currently at the fag end of completion of field trails. Parallelly, VEM is working on the range of tactical missile systems, Ajita, Vismai to cater to land and air version missile requirements for the armed forces. Vidhwansh is one such lethal weapon system being developed by VEM to meet the Long Range Guided Rocket requirements. Anti-drones with soft and hard kill capable weapon system is in development and will be offered to the Indian armed forces soon.

As part of its capacity and capability augmentation, VEM is building the 'Integrated Defence Systems Facility' near Hyderabad in a sprawling 511 acres of land. IDS is one of its kind of facility in the private defence industries as it has all the state-of-the-art facilities that would meet end to end weapon systems integrations apart



Centre Fuselage for LCA Tejas Mk-1

RAVIR - Family of EO systems

Generators for LCA Mk -1 and for AMCA

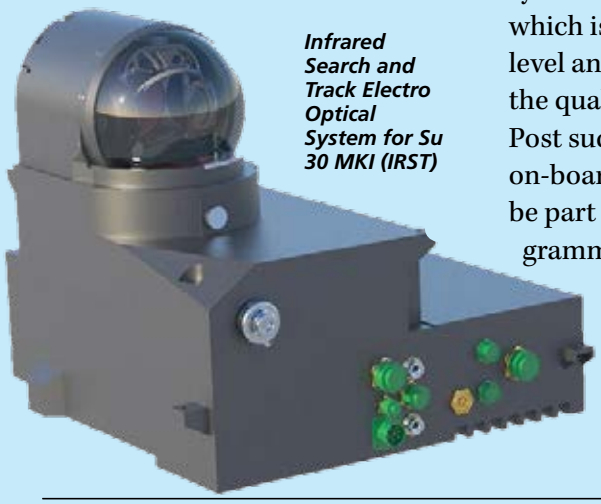
from aero structures, UAS and anti-drones, radars, sensors etc. It will cater to the requirements of NADCAP approved electro-plating and heat treatment to ensure the critical processes are carried out in house to ensure the quality all through. IDS is also intended to cater to assembly integration and testing of space programmes also.

VEM is an established aeronautics company dealing with fighters, LCA Mk-1, where it is currently supplying the centre fuselage and beginning to supply the generators soon. Pylon assembly and fuel drop tanks are in the development and will commence the supplies upon complying with the qualification parameters.

VEM is the proud partner in advanced fighter aircraft programme and privileged to associate in the manufacturing all the modules based on composite and metallic aero structures and carried out the assembly and integration of the 1:1 AMCA Model at VEM which is in display in Aero India 2025.

5 KVA Generator

Infra-Red Search and Tracker system is one such hi-tech system which is at the functional model level and will be getting through the qualification parameters. Post successful qualifications and on-board trails, VEM's IRST will be part of Indian fighters' programmes.



Infrared Search and Track Electro Optical System for Su 30 MKI (IRST)

Similarly, VEM is actively contributing to the indigenisation of several on-board import substitute systems, Helmet Mounting Systems, IRSS, Actuation Systems, EO Systems, Vibration Control Systems etc. Qualified to bid the end-to-end structural assemblies for the HAL helicopter programmes, VEM is confident to raise the levels to be one of the top production partners of HAL's Helicopters division supplying the most complex and critical to technologies.

Venkata Raju says, "We are focussing on becoming a systems company. Our self-sustained 'IDDM' defence programmes, our upcoming 'Integrated Defence Systems' facilities and all our actions are in line with realising our vision to be a leading global player by innovating sustainable advanced technologies, systems and services to support our customers' mission."

VEM is at the threshold of transforming its organisation to a Systems integrator and offering the range of systems for defence and aeronautics segment both in the domestic and international markets. II

Going Gets Tough

IAF's war preparedness caught between *aatmanirbharta* and modernisation

AT A SEMINAR ORGANISED BY Centre for Air Power Studies (CAPS) last year, the Vice Chief of Air Staff Air Marshal A.P. Singh opined to the audience that *aatmanirbharta* cannot be achieved at the cost of India's national security and pointed out that geopolitics had thrown up a lesson of being self-reliant which ought to be pursued holistically in letter and spirit.

The Air Marshal has since taken over as the Chief of Air Staff (CAS) and his utterances are significant, coming as they do against the backdrop of Chinese belligerence in the north/ north-east and Pakistani machinations in the West. War preparedness should be a paramount national security consideration at the moment, but it is becoming apparent that as the tug of war between defence needs (for warfighting) and political wants (*aatmanirbhar* sloganeering) gains intensity, the former may be losing ground. This article looks at the IAF's critical need for modern aircraft, the lack of indigenous, *aatmanirbhar* aircraft to gratify that need, and the resultant unremitting decline in the IAF's capability.

Aatmanirbhar: Cart Before the Horse?

On 12 May 2020 Modi launched the *Aatmanirbhar* Bharat *Abhiyan*. Since then, his visible and audible personal crusade for Aatmanirbhar has had the effect of an eager to please bureaucracy towing the line and reacting to the pressure by producing figures that have the right optics but lack real substance. Five Positive Indigenous Lists have been promulgated by the ministry of defence (MoD) to conjure up an apparition of huge and continual progress in indigenisation.

The five lists have 2,851, 107, 780, 928 and 346 items listed. However, their facetiousness is evident to any incisive reader caring to visit that page on the MoD website. The page displays the first list of 2,500 items which have been 'indigenised' (and another list of 351 items which would be procured only from Indian industry after time periods which are stipulated in the list). A closer look at the indigenised list reveals that a huge proportion of the items are mundane and belong to the domain of the micro industry segment. Of these, the indigenisation of 1,837 items is attributed to HAL, raising the question as to why a *navaratna* company which has parasitically devoured enormous amount of public money ever since its management passed on to an independent Indian government (i.e. the public) was being tasked to produce commonplace items like nuts, bolts, bushes, screws and so on. More important is the question as to why were we waiting all these years to indigenise these nuts and bolts? Somebody had gone to great trouble to stretch the list to the smooth and round figure of 2,500; the clever itemiser has listed more than 70 types of screws as uniquely numbered items!

The Negative Import Lists represent another similar self-adulation exercise. Many of the items on these lists are already being produced in India—naval warships, towed artillery guns, Multi Barrel Rocket Launchers (MBRLS) and towed artillery guns, just to name some of them. A cursory look at the defence export items also shows that albeit the total export sales having gone up and the current statistics show high fig-

Su-30MKI

ures (in contrast to the starting point which was abysmally low), major pieces of equipment are not visible in India's repertoire. There is also the easily overlooked nuance that some equipment being 'produced' in India lacks indigenous technological base and is either entirely or majorly dependent haplessly on foreign knowhow. Nonetheless, these products are touted as examples of self-reliance, or *aatmanirbhar* if you will, thus adding to the subterfuge.

As a result, in aerospace and defence sectors which are critical for developing and producing military ware, India remains the world's largest arms importer. And yet its defence forces are constantly clamouring for higher levels of modernisation. The worst hit is the technology intensive India Air Force (IAF).

A Squeeze Is On

Much has been written and spoken about the IAF's shortfall. Its squadron strength is down to 31 (including two squadrons of non-fighting Tejas Mk1 'fighters'!) against a sanctioned figure of 42. Moreover, this figure looks doomed to dip further before moving northwards. To cap the sordid saga, every few days speculative print (or YouTube) news announces the impending demise of the quest for acquisition of 114 Multi Role Fighter Aircraft (MRFA) for the IAF. The need for the MRFA (and before that the Medium Multi Role Combat Aircraft or MMRCA) has been felt for more than two decades but successive governments have been tardy over actually sanctioning the purchase despite due diligence by the IAF spewing forth a decisively clear winner out of the contenders. If not wholly, at least partly, the underlying motivation appears to be that persistent postponement (of a foreign aircraft purchase) may continue for such a long time that an indigenous fighter may be ready to step in. This pipe dream of the government is leading to nightmares for the IAF.

The IAF's need, as iterated loud and clear by its chiefs is five to six squadrons (100 plus fighters) of 4½th generation fighters in the immediate future. Indigenous fighters are yet to become effective enough to stand and be counted. IAF's two squadrons of the Light Combat Aircraft (LCA) Tejas Mk1 are not really meant for frontline operations; the Mk1 is essentially a testbed for the Mk1A which is a slight improvement over the Mk1. In June 2021, the IAF ordered 73 Mk1As and 10 Mk1 trainers (which had not been developed alongside the Mk1).

***TOP AND ABOVE** LCA Tejas and Jaguar*

Since then, several induction dates for the Mk1A have been announced, only to be trampled over; the latest date now being projected by HAL is October this year. HAL is expected to deliver 16 (of these 83) every year for the next five years but, given its track record and the ongoing delay in delivery of even the first Mk1A, there is a dark cloud of gloom over this timetable.

The problem is compounded by delay in supply of GE 404 engines by GE over the last few months because of 'supply chain issues.' But there are other issues too. A simple component called an 'engine charge amplifier', which was being supplied so far by a Danish firm has been put on the export blacklist by Denmark. HAL has now contracted a Bangalore company to produce the component indigenously. An interrogation mark looms over why the component was not indigenised earlier (instead of the aforementioned nuts and bolts) if that was possible technologically? Was it HAL's intent to keep private indigenous industry out of play?

Even when the Mk1A is inducted, it does not meet the '4½th generation' requirement. It is the Mk2 which may pass muster as a 4½th fighter. While the Mk1A is an improvement over the Mk1, the Mk2 is a different class of fighter altogether. Unlike the Mk1/Mk1A which are LCA, the Mk2 is a 'medium weight' aircraft with a Maximum Take Off Weight (MTOW) of 17.5 tons compared to Mk1A's 13.5 tons. So, the delay in its debut can be expected to be much longer than that for the Mk1A.

For the sake of completion, one could mention the Advanced Medium Combat Aircraft (AMCA) which is planned to be a twin engine, 5th generation aircraft in contrast to the Tejas Mk1/Mk1A LCA and the Tejas Mk2 MWF, both of which are single engine, 4th to 4½th generation fighters. However, it is even further on the time horizon than the Mk2 with a most optimistic projected date for a first flight some time at the end of this decade.

To summarise, an indigenous 4½th generation aircraft that meets IAF's needs is unlikely to be inducted into the IAF before 2032. That brings us to the option of the MRFA which, as experts point out, is not waiting in the wings to be called upon to join the IAF. It may be recalled that when Modi signed the deal in September 2016 for 36 Rafales to be bought directly from the OEM, the first Rafale was inducted in September 2020—four years later. One can draw one's own deductions about the time frame if a much larger number (i.e., 114) was to be produced indigenously and that too with HAL as the Indian partner. This author feels that from the time an RFP is issued, it will take at least six years before the first MRFA is ready and a decade for the new inductee to become an effective instrument of war with the IAF.

Technology, The Key Element

India's defence exports have touched INR 16,000 crores. The defence minister avers that it will touch INR 50,000 crores by FY 2028-29. However, to put this figure into a correct perspective, the value of the 114 MRFA deal in 2019 was stated to be USD 18 billion i.e., around 1,60,000 crores (and has gone up considerably since then). Despite the rising defence export figures, leading edge aerospace technologies are out of our reach. It is time to stop patting ourselves on the back over the misleading statistics on our Indigenisation Lists and look at the areas where we have failed to produce.

Introspection (and punitive action) is needed over why a nation which is at leading edge of space technology cannot produce an aeroengine for its indigenous fighters. Our entire research and development machinery and huge investment into Gas Turbine Research Establishment (GTRE) have not been able to develop the Kaveri engine for LCA in decades. Who is accountable? Or responsible? We are now forced to be at the mercy of a US entity (GE) for the GE 404 engine for our Tejas Mk1/Mk1As and GE F414 engines for Mk2 and AMCA.

However, recent news have cast a shadow over the delivery schedules of GE engines. Last year, an MoU was signed for co-production of GE engines in India. The GE 404 engine has a 84 kN thrust and is being used for Mk1/Mk1As while GE 414 (thrust 98 kN) is slated for Mk2 and 99 have been promised by GE. Another version, GE 414-INS6, with a

***CLOCKWISE FROM TOP LEFT** Mirage-2000; a model of AMCA and Rafale*

thrust of 110-120 kN is being developed for the AMCA. Meanwhile co-production of GE engines with Hindustan Aeronautics Limited (HAL) for the GE 414 is expected to eventually embrace an 80 per cent technology transfer to HAL. That statistic may sound impressive but the remaining 20 per cent technologies—which are the heart of the engines—remain elusive. Neither forthcoming from GTRE nor available for procurement, even as a part of a deal for huge engine purchases.

Interestingly, the defence ministry has signed a contract with HAL for production of 240 AL-31FP engines for IAF's Su-30MKI aircraft at a cost of more than INR 26,000 crores. According to HAL itself, even at the end of the production of these 240 engines, the total transfer of technology would only reach 63 per cent with critical, niche technologies being denied. Thus, there is a crying need for engine industry to wake up.

That is where Aatmanirbhar needs to be pushed. And shoved.

Concluding Remarks

Not a day passes when one does not come across at least one intonation of the *aatmanirbhar mantra* on media. The peril in this state of affairs is obvious. While the needs of the military should have been driving what indigenous industry (*aatmanirbhar*) ought to have developed, what *aatmanirbhar* is capable of producing is being considered as what the services can be given. The defence ministry, which is responsible for defence R&D, production and procurement needs to be made accountable for results, not cheery statistics.

According to media reports, a request for proposal (RFP) is expected to be issued for the 114 MRFAs by mid-2025 but, as the past has shown, where the Indian government is concerned, there is many a slip between the proverbial cup and the lip. One shudders to think of a day when an over enthusiastic collective wisdom of the government decides to shelve the MRFA programme in favour of an indigenous fighter.

A former CDS had indeed implied such a possibility in one of his public addresses. It is important to reiterate here that the IAF's need for a hundred odd 4½th generation fighters is urgent and critical and cannot wait for the areas of uncertainty that attend indigenous fighter programmes. Until a deal is signed for 114 MRFAs, *aatmanirbharta* hovers over the IAF's combat capability like Damocles' sword. One hopes that good sense will prevail over our decision makers and national security will not be forsaken simply because an '*aatmanirbhar* fighter' looks good on paper. II

Packed to the Hilt

Thales brings its best for India at the show

SYNAPS-A, airborne member of SYNAPS Family

Available in a standard ARINC 600 housing qualified for operation in the most demanding airborne environments, and with its extended multi-band/multi-mode capabilities, SYNAPS-A is the ideal building brick for the flexible multi-channel V/UHF communication system required by all types of aircraft, whatever their missions and context of operation.

SYNAPS-A provides the high RF performance levels required in the field, including high output power, high sensitivity and SIMO (Dual Rx/Antenna diversity) to extend communication range and spatial coverage. Embedded agile co-site filters facilitate EMC integration and allow simultaneous multi-channel operation.

Crypto capabilities can be provided by the optional NATO Secret Crypto Appliqué (CA) or an external crypto device, the MCA, which is half the size of the legacy KY100. SYNAPS-A is also compatible with standard NATO crypto devices such as KY-100/M or equivalent.

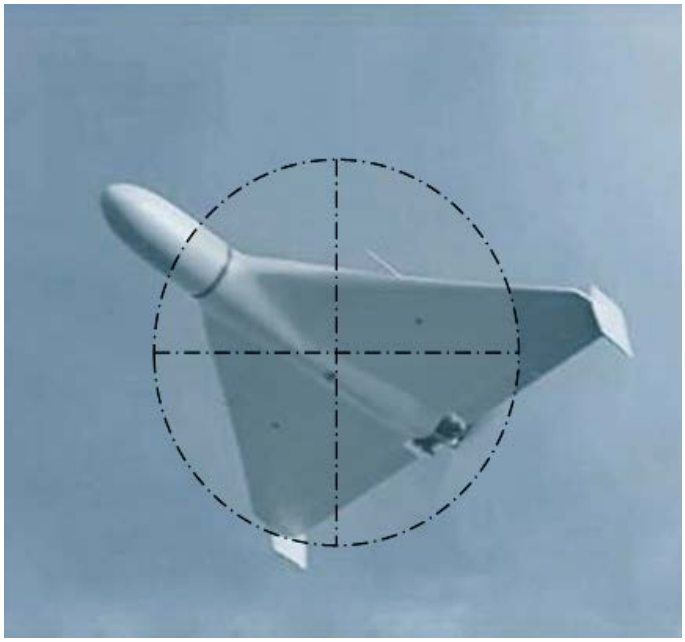
SYNAPS-A features an ATC capability developed in accordance with DO178C/DO254 DAL C to facilitate aircraft safety certification for flying in general aviation airspace.

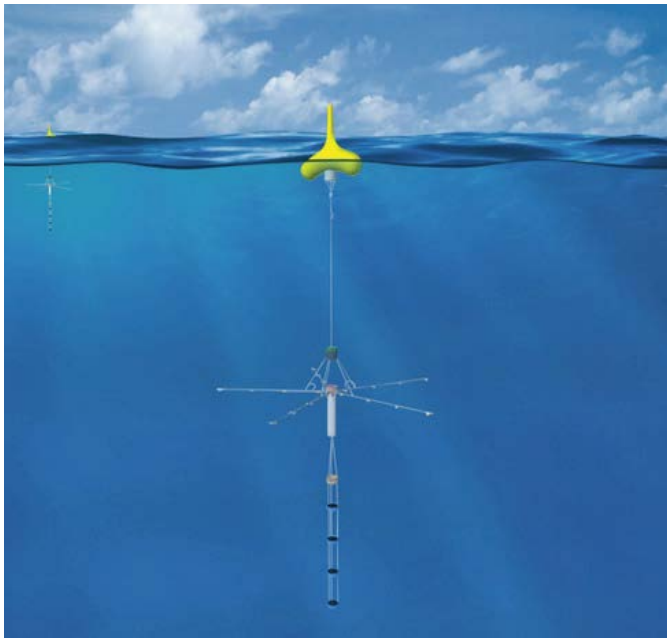
Main Features:

- Frequency range: V/UHF 30-600 MHz
- RF output power: 20 W AM/30 W FM
- Channelisation: 8.33 kHz, 12.5 kHz, 25 kHz, 250 kHz, 500 kHz, 1.25 MHz (others on request)
- SIMO UHF feature
- Embedded multi-guard receiver
- Embedded agile co-site filters
- NATO RESTRICTED embedded programmable crypto
- Optional NATO SECRET programmable Crypto Appliqué (CA)
- Weight and format < 7.5 kg, ARINC 600/3MCU

Supported waveforms (SYNAPS waveform library)

- Advanced national networking waveforms
  - ❖ AirPower
  - ❖ UHF-Command
  - ❖ UHF-Combat
- PR4G Fastnet & NextW@ve native interoperability: Including GeoMux, GeoMux HD and UHF-FFH (Secure Voice or Data Link)
- International and NATO waveforms
  - ❖ VHF ATC iaw ICAO regulations/ED23C





- VHF Maritime iaw IMO regulations
- Tactical VHF and UHF-MIL iaw STANAG 4204 and 4205
- EPM Have Quick I/II and SATURN, SEDR (future)
- L11 and L22 compatible (external modem)
- ESSOR HDR
- NBWF (future), WBWF (future)

SonoFlash: High-performance active/ passive sonobuoy for Anti-Submarine Warfare (ASW) missions

As Anti-Submarine Warfare is a collective endeavour, Thales SonoFlash is a perfect force multiplier for collaborative operations between maritime patrol aircraft, helicopters, surface ships and drones.

Thanks to its active and passive modes, SonoFlash enables multistatic scenarios that increase significantly the coverage area of the other ASW systems. It provides unrivalled performance, combining active capabilities together with wideband reception when operated in passive. The digital datalink and the optimised communication range enable all surface ships and aircraft or acoustic support centres, equipped with a sonobuoy processing system, to access SonoFlash data. This unique capability can be deployed from fixed or rotary-wing aircraft, as well as from surface vessels, manned or unmanned.

Main Features: SonoFlash delivers monostatic and multistatic capabilities for detecting, classifying and localizing submarines in up to sea state 5. This GPS/GALILEO enabled sonobuoy is capable of providing both range and bearing of the target for accurate position fixing.

SonoFlash utilises a high source level active transmission vertical array of multiple transducers and high gain receive array.

In monostatic mode, the SonoFlash frequency is similar to the FLASH dipping sonar, providing the same acoustic advantage and maximising the operational performance, when integrated into a multistatic network. In passive only mode, SonoFlash has a low frequency reception capability and a 4kHz frequency bandwidth.

The sonobuoy is programmed prior to launch. A downlink digital command allows the operator to modify the sonobuoy's mode of operation once deployed.

2D AESA Airborne Surveillance Radar, AirMaster C

Setting a new standard in radar capability: Increasing complex environments in which armed forces carry out their operations, combined with the growing challenge to train qualified personnel, have put significant strains on airborne surveillance crew. Demand across the world, for multi-role helicopters, light ISR aircraft and unmanned platforms, has increased and broadened the workload among crews.

Integration: AirMaster C is designed to minimise its footprint onboard platforms. A true single unit design, AirMaster C is 30 per cent lower in size, weight and power requirements compared to other market offers today. The fixed panel design includes both the antenna and data processing to deliver a simple to integrate, simple to install radar. When connecting multiple panels to achieve surveillance capability beyond 120 degree, standard optical cabling is used to simplify routing. Optical cabling contributes to minimising weight and simplify maintenance.

Usage: AirMaster C is developed as a smart radar to take the burden away from the crew. '4P Polarisation' automatically delivers improved clarity of image and 'Dual-Range' allows the operator to see targets at long range and very close, simultaneously. Sensor autonomy, self-learning and the capability to analyse and classify large volumes of data, all work to increase the radar ability to perform a high number of detection, identification and surveillance tasks. Operators can focus on the outcomes for faster, more accurate decision-making.

Predictive maintenance, combined with AESA technology, ensures high mean time between failure and critical failure. The health and usage monitoring system supports maintainers in determining where the next issues are likely to occur and fix them before they do. Should the radar experience a failure during a mission it is designed to continue functioning with a minor performance reduction thanks to a graceful degradation mechanism.

Master Series Radar: Thales has built on the successfully proven experience of the AirMaster Series radar—I-Master and Searchmaster—to deliver a more compact 2D AESA fixed-panel radar with state-of-the-art enhancements. II

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

'The Company's Order Book Position as on 1 January 2025, Stands at Around Rs 71,000 Crore, Giving it Stable Revenue Visibility'

— Chairman and managing director, Bharat Electronics Ltd, Manoj Jain

Can you tell us how BEL is helping the government realise the dream of an* Aatmanirbhar *Bharat?

BEL, since inception, has been working towards achieving self-reliance. Responding to the clarion call by the Prime Minister of India, BEL has recalibrated its efforts and is strongly promoting the government's make in India initiative by laying strong thrust on in-house R&D and indigenisation, public-private partnerships, joint ventures, capacity expansion and modernisation.

The Akash air defence weapon system of BEL is a great success story and shining example of BEL's indigenous design, development and manufacturing drive. The coastal surveillance system developed by BEL for the Indian Coast Guard is now being offered to other friendly countries as well as for generating export business. The weapon locating radar, developed indigenously by BEL and DRDO laboratory LRDE, and its lighter version designed for surveillance in mountainous and high-altitude terrains are proving to be gamechangers for India's military.

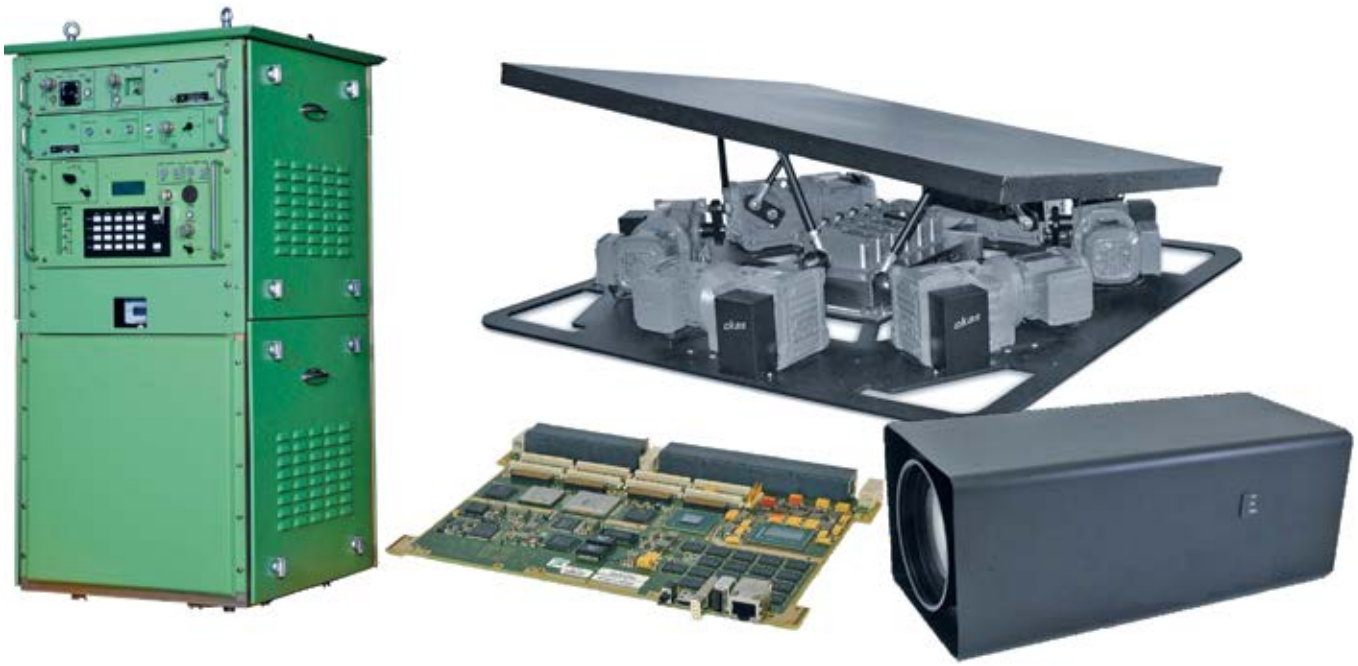
To ensure that we stay at the forefront of innovation, we invested 6.24 per cent of our turnover in R&D last year and, as a result, achieved 77 per cent of our turnover in FY 2023-24 from indigenous products. Increasing the level of indigenisation of its products and systems has not only given BEL long-term competitive advantage but also helped in aligning itself with the country's dream of achieving aatmanirbharta (self-reliance) in defence.

How do you see BEL making an impact in the domestic defence and non-defence markets in the coming years and what are your strategies to retain leadership position in these sectors?

BEL has maintained a decent mix of defence and non-defence business in its overall business portfolio. In the Indian defence electronics segment, we continue to hold a significant market share based on our deep understanding of customer's needs and our ability to fulfil it. As the technology landscape continues to evolve in the defence sector, our concerted efforts in building state-of-the-art, innovative products and solutions have helped us in being the preferred partner of our armed forces.

BEL is actively participating in the MoD's Make-I, Make-II and Make-III projects involving indigenous solution development with emphasis on sub-systems, systems and services for which capabilities and competencies already exist. Further, BEL is also actively investing to develop new capabilities as needed. Opportunities are being explored to build long-term relationships with defence industry participants.

Diversification across products, segments, customers, industries and geographies remains an important focus area to unlock new opportunities and scale growth. This includes growing the non-defence business where we see significant prospects, especially in metro, civil aviation and cyber security areas. We will continue to build on our existing competencies and diversify to newer areas. Additionally, we are pursuing opportunities to expand our customer base in the existing and new geographies.



Though competition continues to intensify in our major business segments, our laser sharp focus in delivering our brand promise of quality, technology & innovation to our customers gives us a distinct competitive advantage. This will continue to remain our guiding business mantra for retaining leadership in our core business segments.

Please tell us about your company's financial performance, turnover and 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. Headed into FY 2024-25, we expect order acquisition in the range of Rs 25,000 crores. The company's order book position as on 1 January 2025, stands at around Rs 71,000 crore, giving it stable revenue visibility. While we participate in new orders, we will be sharply focussed on the timely execution of the existing order book. Our near-term aim is to get an entry into the Maharatna club of PSUs. Towards this, we are targeting a healthy revenue growth of double digits driven by the expansion of both defence and non-defence businesses.

BEL won many noteworthy awards and recognitions for its multidimensional excellence, including the prestigious 'CII EXIM Bank Award for Business Excellence (2023)' for Hyderabad Unit, 'Karnataka State Export Excellence Award', Economic Times 'Iconic Brand of the Year Award-2023', 'Employee Excellence Award' from Times Group, Institution of Engineers (India) 'Industry Excellence (Gold) Award for Business Excellence', 'Project of the Year-Large Category (Runner Up) Award' from Project Management Institute, Indian Chamber of Commerce 'PSE Excellence Awards', Governance Now PSU Awards, National Export Excellence Award, etc.

What is your vision for taking BEL on a fast-track growth path in coming years?

It is well-acknowledged that fast track growth is basically the outcome of super synchronised functioning of various key business functions including R&D, marketing, operations, HR, finance, etc. Our concerted focus has been towards streamlining each of these business functions to set a strong foundation for BEL to deliver fast track growth. Alongside our existing business segments, various high growth areas (like arms & ammunitions, AI, cyber security, unmanned systems, rail & metro) have been identified and a resilient business model is being worked upon to deliver sustained growth in these emerging segments.

Innovation has been the cornerstone of our success, and our customers can rest assured that BEL will continue to develop innovative and quality products for them through collaborations with DRDO labs, research & premier academic institutions, and niche technology players. We will continue to build on our existing competencies and diversify into newer areas. Opportunities abound, we also remain watchful of the challenges brought by geopolitical situations, emerging technologies, regulatory changes and evolving customer expectations. We will remain agile to effectively navigate them and ensure steady growth path.

Roadmaps have been created for the development of future products and technologies, creation of IPRs and acquisition of key technologies. This will enable us to stay at the cutting-edge of technology and meet our customer's evolving requirements with cost-effective and innovative solutions. II

Lest We Forget

How air operations unfolded during the Kargil conflict in 1999

IN JULY 2024, INDIA CELEBRATED the silver jubilee of the Kargil conflict. A lot of water has flown through Jhelum since 1999. There have been insightful interventions, both educating and impressive, to bring out just about everything perceivable related to the conflict. Be it intelligence issues, tactical wisdom, inter service cooperation, role of air power and so on, more than enough has been documented, discussed, analysed and dissected.

While no discussion or analysis is really enough in learning about warfare, repetitive recall of statistics and the obvious tends to become boring. Having taken active part in the conflict, the endeavour here is to reflect on certain personal memories and thoughts that shaped the events during the conflict and had significant influence on the outcomes—in my opinion. The whole account is presented in first person and spares the reader any statistical data, hence is devoid of any references too.

The silver jubilee of Kargil is being celebrated, and rightly so because it was a hard win. All is well that ends well, and of course beyond any doubt it ended well. However, invariably in the euphoria of celebrating the end state, what gets ignored or overshadowed is how it all began. More often than not, pertinent lessons lie more so in how it all began than how it ended. So, to begin with, let's see here how it all began.

The Story

It was a normal day in the month of May 1999 in Srinagar where I was posted as the Flight Commander of the resident 51 Squadron. Sometime in the afternoon, the Chief Operations Officer (COO) of the base called the squadron to Base Operations Centre for a briefing where the Colonel (General Staff) from the 15 Corps was present with maps rolled in a bundle to tell us something. He began by saying that there were reports of some intrusions in one of the sectors and while it would take a few days to clear them off, the squadron should standby for air support if necessary. There was no panic or concern in his voice, not that he was hiding it or putting up a show but because, as it became clear later, the extent of intrusions had actually not dawned on anyone yet. The Colonel left and so did we to get on with the next flying detail. It was business as usual. Very soon the reality started to show and when the action began it sucked everything around like a whirlwind.

Srinagar and its satellite base Awantipore became the major launch bases owing to their proximity to the area of action and 15 Corps was responsible for operations. The first hurdle was to identify the peaks where the intruders had dug in. The Ground Liaison Officer put in lot of hard work in conjunction with the staff at Corps and briefed the pilots on various peaks of interest, mostly naming them by their trigonometric heights above sea level in metres, like 4590, 5353, 5770 etc. The famous names like Tiger Hill, Tololing emerged somewhat later. These peaks looked magnificent even on the map and each one could be easily differentiated from the others in their surroundings.

While on the ground, it seemed like a very easy task to locate these peaks from the air. However, it was a different story altogether when one looked at them from 25,000 feet in the air. They all looked the same—one no different from the one next to it, hence with no way to mark them individually as expected. It took considerable effort, time and improvisation to identify the targets of interest. From hand-held video cameras to the laser designated pods of Mirage 2000, it took everything at the disposal of the Indian Air Force (IAF) to finally locate the targets precisely.

While the efforts to locate the targets were underway, the other challenge that surfaced was how to address these targets at such altitude with the initially inducted aircraft MiG 21/23/27 at the bases mentioned above. The firing solutions offered by these aircraft did not cater for release of weapons for a target located mid-air. To paraphrase this expression, invariably the legacy aircraft's firing system caters to two kinds of heights, one its height above mean sea level—that is altitude to calculate the kinetics of its own and that of the weapon system, and the other its height above the ground where the target is located, to calculate the forward throw.

The problem here was that there was a third variable. The height of the aircraft above the ground where it's flying and that above the target where the weapon impact is expected were different, rendering the integral firing solutions ineffective. Advanced aircraft with precision attack capabilities could overcome these limitations but they had not yet arrived on the scene. On the spot calculations of delivery parameters to suit the conditions in the war zone and improvisation to use handheld navigation devices to effect deliveries based on the freshly calculated forward throws, followed by trials at high altitude range close by started providing some clue. Air to ground weapon delivery after all is just science based on the laws of physics, the right application is the art of war. There is no doubt that the effect achieved by the Precision Guided Munitions (PGMs) delivered by Mirage 2000 and Jaguars had a much more devastating effect than the dumb bombs delivered by MiG 21/23/27 but the latter's contribution cannot be completely wished away. They may not have busted many bunkers directly leading to the elimination of the enemy. The relentless round the clock delivery of arsenal, even in close vicinity of the targets, forced the intruders to stay inside their bunkers or keep their head down for prolonged periods, helping the ground forces' advance to an extent. The campaign did prove the saying that quantity has a quality of its own. But it wasn't that straight either, just when the pilots had settled down with new attack parameters, another evil raised its head—not necessarily unknown but definitely ignored.

Unfortunately, the presence of shoulder fired missiles at those peaks was somewhat ignored. The reason I say ignored is that even when a Canberra aircraft had landed at Srinagar with telltale signs of being hit by a Stinger missile, the attack patterns adopted by the fighter aircraft over the occupied peaks did not keep them outside their envelop, resulting in the loss of a MiG-21 and one Mi-17 to the missile fire, while a MiG-27 was lost owing to engine failure. Unfortunately, the pilots of both the fighter aircraft had to eject in enemy territory and were taken as prisoners of war (POW)—Sqn Ldr Ajay Ahuja sadly fell to the atrocities of his captors. Salute to the valiant air warrior and all those who made the supreme sacrifice to safeguard the honour of our motherland.

This tragic loss pushed the envelope upwards to keep the fighter aircraft safe from this threat, which meant that the lowest height that the aircraft should come to over an occupied peak would be in the region of two to three kilometres. Considering the average altitude of peaks as 4.5 kilometres, the lowest an aircraft could touch on altimeter would be about seven kilometres. Taking into account the safe pull out, almost astronomical commencement height for a safe dive attack, and the accuracy achieved thereof, made them impractical. The problem with accuracy was not only that you would miss the target and waste a bomb, it was much more serious. On plain ground if the firing error is, say 50 metres, then the weapon misses the target by just 50 metres. In a warlike situation where the collateral damage is really not an issue, it can be overlooked.

However, the rules of the game change completely while firing on targets over steep hills, with one's own troops in close proximity. In this case, since the attacks had to be undertaken from our side of the territory, if the bomb undershot it might land up on our own troops scaling the mountain face. On the other hand, if it overshot, it would cross the Line of Control (LoC), which clearly was not an option. Therefore, if reasonable accuracy was to be achieved by the MiG class, the firing height had to be lower, which attracted targeting by shoulder fired missiles. But a way had to be found and the decision was taken to carry out night attacks, which kindles another fond memory.

One of the squadrons to induct in Srinagar was 17 Sqn, then commanded by Wing Commander B.S. Dhanoa, later chief of the air staff. Sqn Ldr Ajay Ahuja was from the same squadron. As the orders were passed to switch to night attacks, a lot of professional debates started over their feasibility and efficacy. To present it linearly, flying itself is a challenge, flying in hills is a bigger challenge, and carrying out attacks in hills is a different game altogether. In another dimension, flying itself is a challenge, flying at night is a bigger challenge, and carrying out night attacks is a different game altogether. Deducing from the above two statements, carrying out night attacks in the hills was certainly not a case of plug and play. The IAF wouldn't have liked to lose any aircraft to complexities of execution. Now, maintaining one's bearings and situational awareness in hills takes more than a compass. The bends in the valleys and twisting ridgelines can easily confuse a pilot with respect to where the aircraft is heading. Therefore, the positional awareness in such areas has to be supplemented by general awareness as well.

As the flight commander of the resident squadron, I clearly remember training young pilots on this aspect by corelating the appearance of certain prominent features with the clock codes to make out general direction, in addition to the compass or any other direction indicating device. For example, while coming back from Kargil or Dras sector towards Srinagar, if the clock code of Nanga Parbat was anything less than 1.30, you would be heading into danger and needed to change course immediately to get it beyond 2 o'clock. It was one of the many tips that experience taught you. To draw an analogy, as the resident squadron in Srinagar we were like locals in the area who knew a little more than the tourists who landed with a map there. This local wisdom was acknowledged by the Commanding Officer of 17 Squadron, Wing Commander Dhanoa, who asked me to fly a night familiarisation sortie with him in a MiG 21 trainer. Frankly, I flew that sortie

like any other dual sortie, one amongst many that I had flown with my own young pilots, dutifully telling him the nuisances of flying in that area at night, little realising that this would be etched in my memory forever. My second pilot in that sortie, later as Air Chief Marshal Dhanoa, very fondly recalled that experience in a television interview. His maturity and approach of doing things in the right way have always been a lesson in aviation and an inspiration in life.

What Does It Tell You?

Every story must have an aim in its telling and the listener must feel a bit wiser after hearing it, otherwise it wouldn't really serve any meaningful purpose. This one is no different. While training together in various exercises, individually or collectively, we get so used to Blue winning over Red every time, even if it has to be engineered by the White Force, that we mostly practise addressing the targets in enemy territory. Seldom would exercise setting paint large scale occupation of our own area by the enemy which might have to be vacated, necessitating air support.

High emphasis is laid on familiarising oneself with the enemy area because that is where we expect the battle to take place, with the result that familiarity with one's own areas takes a back seat. Since we don't expect to address the enemy on our soil, we mostly shy away from even planning that. What else would be the reason otherwise, that in the beginning of the conflict we were struggling to identify the peaks that were very much our own? Having firing solutions for specific peaks, rather than for general high altitude terrain, would have emerged if their occupation was ever envisaged.

Indeed, offence is the best form of defence, but we must remember that it's a form of defence and not its substitute. Offensive action alone does not assure security; it must be matched by an adequate defensive posture to absorb the ricochet of that offence. Laying emphasis on defence is not being pessimistic, and in any case, wars are not won by optimism alone but by sound planning, training and tactical wisdom of the leadership.

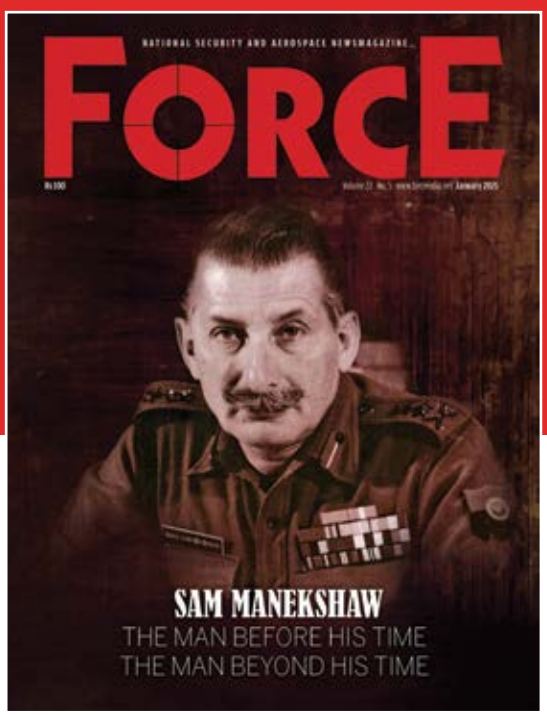
To Cross Or Not To Cross

Arguably air power was not used to its full potential as it was not allowed to cross the LC. Interdicting communication lines leading to the survival of intruders would have been easier and more justified for the use of air power. However, you can't always wait for someone to just die of starvation or run out of ammunition to recapture your own post, especially when the occupants are inflicting unacceptable damage from there. Active intervention at the spot of interest may become necessary in certain situations like it was in this case. Also, no one can really say, even in hindsight, what shape the battle would have taken had our own aircraft crossed the LC. It did confine the action up to the LC but the larger aim that the decision served, in my opinion, was to restrict the battle in that sector. The battle does not start or progress as per your plan. It takes its own shape, and one has to be ready for every situation to end it with an advantage. It was a battle fought with very clear objectives and throughout there was no digression from that.

All Is Well That Ends Well

Like I said in the beginning, all is well that ends well and the Kargil story indeed ended well. The conflict lasted over two months and it took more than standard warfighting skills to overcome initial setbacks and regain composure to achieve the desired end state. Having flown 25 live missions in the conflict and seen the whole battle unfold in front of my eyes, this indeed is a short story dedicated to the valiant soldiers who made the victory in Kargil possible. II

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.

NATIONAL SECURITY AND DEFENCE NEWSMAGAZINE
FORCE

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 atwww.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 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 ❑ Rs 1,000 for 1 year ❑ Rs 3,000 for 3 year ❑ Rs 5,000 for 5 year

*Phone Number _____ Mobile_____

*Email address _____

** Mandatory Information*

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

New Opportunities

IAI to showcase cutting-edge defenc`e technologies at Aero India 2025

ISRAEL AEROSPACE INDUSTRIES (IAI) is honoured to participate in the prestigious Aero India 2025 exhibition in Bengaluru. IAI will showcase its latest advancements in defence technology, demonstrating its commitment to India as a strategic partner and a key market in the defence sector. The company's presence at the exhibition highlights its nearly 40 years of collaboration with India and its dedication to strengthening defence cooperation between the two nations.

IAI's participation in Aero India 2025 underscores its long-standing relationship with India, reinforcing its deep-rooted collaboration with the country's defence sector and the Indian armed forces. Over the past year, IAI has made several additional investments in the Indian market, including with its subsidiary AeroSpace Services India (ASI); its partnership with IIT Delhi, demonstrating its commitment to the next generation in India; the launch of its NeuSPHERE Innovation Acceleration Programme, enabling collaboration with Indian deep-tech startups and most recently; and the opening of its new HELA Systems facility in Hyderabad, enhancing localised maintenance, repair, and overhaul (MRO) capabilities for advanced radar systems and reducing turnaround times for India's defence forces. These reflect IAI's ongoing commitment to India's self-reliance goals under the 'Make in India' vision.

At Aero India 2025, IAI will exhibit a diverse portfolio of state-of-the-art defence solutions tailored to meet the evolving challenges of modern warfare. Among the key systems on display are:

- **OptSAR 550:** A dual-payload electro-optical and synthetic aperture radar (EO/SAR) tactical observation system designed for real-time intelligence and reconnaissance missions
- **MCS:** A cost-effective digital communication satellite offering robust and secure connectivity for military and government operations
- **Heron TP:** A multi-role, medium-altitude long-endurance (MALE) remotely piloted aerial system (RPAS) providing superior intelligence, surveillance, and reconnaissance (ISR) capabilities
- **B767 FRA:** A strategic flight refueller aircraft capable of extending the operational range of combat aircraft and enhancing air superiority
- **APUS:** A long-endurance quadcopter designed for persistent surveillance, border security, and tactical reconnaissance missions
- **MRSAM:** An integrated air and missile defence system providing advanced protection against aerial threats, including missiles, aircraft, and UAVs
- **Oron Aircraft (ELI-3150):** A multi-mission airborne reconnaissance and surveillance system designed for persistent intelligence gathering and situational awareness
- **Eitam Aircraft (ELW-2085):** A conformal airborne early warning and control (AEW&C) system equipped with state-of-the-art radar and battle management capabilities

President & CEO of IAI, Boaz Levy said, "India is a long-term strategic partner for Israel Aerospace Industries, and our presence at Aero India 2025 emphasizes our dedication to strengthen this relationship. IAI is proud to partner with India's defence forces, offering state-of-the-art solutions tailored to meet their operational needs. We are committed to further collaboration with the Indian defence industry and government agencies to further enhance its technological security capabilities."

"We look forward to meeting with key stakeholders in India's defence ecosystem, exploring new partnerships, and presenting our latest technological innovations at the exhibition. We remain steadfast in our mission to provide reliable, cutting-edge defence solutions that address the complex challenges of modern warfare," he added. ||

Damen delivers FCS 3307 Patrol to Homeland Integrated Offshore Services in Nigeria

Damen Shipyards Cape Town recently delivered an FCS 3307 patrol vessel to Homeland Integrated Offshore Services Ltd (Homeland IOSL) in Nigeria. This vessel, on charter with an international energy company, will perform offshore patrol duties to enhance the security of personnel, assets, and the environment in Nigerian maritime territories.

This delivery marks the tenth Damen vessel to join the Homeland fleet, reflecting ongoing fleet expansion efforts. Homeland IOSL reaffirmed its confidence in Damen by signing a contract for this vessel last year. Damen's approach of building vessels in series and keeping them in stock allows for rapid delivery of proven products to its clients.

The FCS 3307 Patrol is equipped with Damen's advanced Sea Axe hull technology, which allows it to cut through water at remarkably high speeds, ensuring safety, stability, and comfort for the crew, alongside enhanced manoeuvrability, and fuel efficiency. The vessel also features a spacious aft deck, facilitating the transfer of cargo to offshore facilities.

CEO of Homeland IOSL, Dr Louis Ekere said, "Together with Damen as a strategic partner, Homeland IOSL is dedicated to surpassing client expectations through stringent regulatory compliance and adherence to original equipment manufacturer (OEM) guidelines. We also employ top-tier personnel to support our operations while maintaining the highest QHSE standards."

The recently delivered vessel includes custom features such as ballistic protection in the wheelhouse and messroom area. It also features an electronic fuel monitoring system (EFMS), to allow the operators to monitor fuel use in real time, taking steps to address inefficiencies and reduce fuel consumption and emissions. Homeland IOSL's FCS 3307 Patrol comes equipped with a night vision camera and a daughter craft to enhance its operational capabilities around the clock.

French DGAMPA Order an OPV with Hybrid, Wind-Assisted Propulsion System

The French Directorate General for Maritime Affairs, Fisheries and Aquaculture (DGAMPA), commissioned the shipbuilding consortium Socarenam-Mauric to design and build an innovative offshore patrol vessel (PAMNG), combining hybrid propulsion and wind assistance, marking a significant step in reducing the environmental footprint of maritime surveillance vessels. The contract was announced on January 10 in the presence of French minister of ecological transition, biodiversity, forests, sea and fisheries, Agnès Pannier Runacher.

On December 5, DGAMPA officially awarded the Socarenam-Mauric consortium the contract for the design and construction of this PAMNG with reduced environmental footprint. This order is part of a dual strategic approach, modernising the fleet dedicated to the control and surveillance system and the commitment towards environmental exemplarity of DGAMPA vessels.

The new patrol vessel features an innovative wind-assisted propulsion solution, specifically designed to significantly reduce fuel consumption and atmospheric exhaust gas emissions. This technology, combined with diesel-electric hybrid propulsion and IMO Tier III compliant engines, positions this vessel at the forefront of maritime ecological transition. In addition to its wind-assisted and advanced hybrid propulsion, the patrol vessel incorporates several technological innovations: a hull optimised through computational fluid dynamics, enhanced insulation with optimised energy management, photovoltaic panels, and an active trim control system.

With a length of 54 metres, this offshore patrol vessel is designed for extended 12-day missions with a crew of 20 persons. It is equipped with two launch and recovery systems for 6.50-metre fast semi-rigid inflatable boats capable to intercept at a speed up to 35 kts, essential for its offshore missions. The vessel's design with a steel hull and an aluminium superstructure places paramount importance on seakeeping and crew comfort, notably through the integration of an anti-roll stabilisation combining active fins and passive free surface tank, ensuring optimal operability in all sea states. Her propulsion configuration allows a maximum speed of 17 kts and a range exceeding 3,600 nautical miles at a cruising speed of 12 kts.

Construction will be carried out entirely at Socarenam's shipyard in Boulogne-Sur-Mer, with delivery scheduled for the second half of 2027. The main missions of the OPV will be protection of national interests, maritime fisheries surveillance and control, environmental regulations compliance, pollution and navigation monitoring, assistance to persons, public service missions and representation of French maritime affairs administration. II

Safran Displays Cutting Edge Innovations

Safran, a global leader in aerospace, defense, and space technology, will exhibit its advanced solutions and innovations at its booth at the Aero India 2025, showcasing its commitment to driving technological excellence and fostering partnerships in India's aerospace and defense ecosystem.

Safran's comprehensive portfolio of products and solutions will include advanced jet and turboshaft engine technologies, avionics and Automated Test Equipment, landing gear systems, and more.

With a rich legacy of engineering excellence, Safran operates across 30 countries and is a leader in designing, developing, and manufacturing state-of-the-art aircraft engines, equipment, and defense solutions. Safran powers both military and civil aviation with its technologies, including LEAP engines developed by CFM International, a joint venture 50/50 between Safran Aircraft Engines and GE Aerospace.

In India, Safran has established itself as a key partner in supporting national security and driving civil aviation growth. The group has a robust footprint with 17 facilities, over 2,400 employees, and significant partnerships with Indian defense and aerospace organizations. Safran has been

instrumental in developing and supplying critical technologies for military platforms and has contributed to India's civil aviation sector by collaborating with Indian industries. The company has been the pioneer of engine MRO in India both for helicopter engines and commercial LEAP engines. II

Rolls-Royce and Triveni Engineering ink MoU for 4MW Marine Gas Turbine Generators

Rolls-Royce Marine North America Inc. and Triveni Engineering and Industries Limited have signed a Memorandum of Understanding (MoU) to explore opportunities to collaborate on programmes for 4MW marine gas turbine generators (GTG) for Indian customers. This would include several key areas including design, development and manufacturing of the marine GTGs, and comprehensive sales and support activities.

John Shade, EVP for US Business Development and Future Programmes, Rolls-Royce Defence, said, "Rolls-Royce has a proven track record of powering some of the world's most advanced naval platforms, including the US Navy's DDG-51 destroyer. India is a key strategic growth market for Rolls-Royce and we are confident that our industry-leading marine gas turbine generators are an ideal choice to power the Indian Navy's future fleet."

Abhishek Singh, SVP of Business Development and Future Programmes for India and Southeast Asia, Rolls-Royce, added, "This MoU with Triveni is part of our efforts to bring the combined strengths of our naval marine products and services to the customer here. This is significant, given the potential to establish end-to-end support for our marine gas turbine generator in India, from installation and testing to after-market support. Rolls-Royce has proudly supported India's defence forces for several decades, and over the years, we have continued to build strategic partnerships in-country to enable the localisation and production of our products."

Tarun Sawhney, vice chairman and managing director, Triveni Engineering & Industries Ltd. (Triveni) said, "We are excited with this technology collaboration with Rolls-Royce for indigenously manufacturing their cutting-edge proven marine gas turbine generators in India. Such a partnership can not only help us bring advanced technology to power India's naval defence requirements, but also help enhance the capability of indigenous naval defence ecosystem in the country. Our expertise lends the versatility needed to take on the development of a range of engineered equipment and systems for different applications. We are setting up a new multi-modal defence facility with large-scale infrastructure for manufacture, integration and testing of various naval marine equipment."

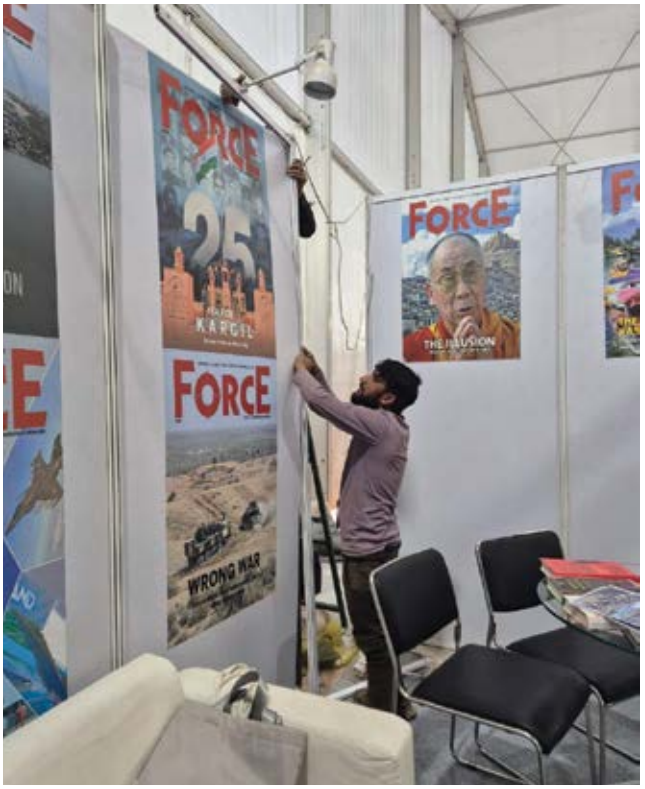
With over 80 years of experience in naval markets, Rolls-Royce is a leading provider of power and propulsion solutions on major global programmes. Since the birth of the Allison 501-K17 in 1972, Rolls-Royce has led the marine gas turbine generator market.

The US Navy's DDG-51-class, the longest production program for surface warships in the history of the US Navy, has received over 200 Rolls-Royce AG9140 generator sets (three sets per ship, each delivering 3MW of power). The AG9140s are powered by the 501-K34 engine, an upgrade of the original 501-K17 model delivered to the Spruance-class. As the DDG-51 program has evolved and the demand for more electrical power has intensified, Rolls-Royce has responded by developing next generation capability such as the AG9160 generator set developed to deliver even greater controls, reliability and packaging enhancements. Each AG9160 will deliver 4MW at 4160V, 60Hz of electrical power – a 33 percent increase on its predecessor, the AG9140. II

Show Business

The highs and lows of Aero India 2025 in pictures

Defence minister Rajnath Singh with CMD, VEM, V Venkata Raju at the VEM stall



Tata Boeing Aerospace Delivers 300 AH-64 Apache Fuselages, Manufactured in India

Tata Boeing Aerospace Limited (TBAL) has delivered the 300th fuselage for the AH-64 Apache attack helicopter from its state-of-the-art facility in Hyderabad. These fuselages are manufactured for customers around the world, including the US Army, including the six on order with the Indian Army. The Indian Air Force (IAF) operates a fleet of 22 AH-64E Apache attack helicopters. This milestone reflects TBAL's continuous dedication to bolstering India's defence capabilities and advancing the nation's indigenous manufacturing prowess.

The joint venture between Boeing and Tata Advanced Systems Limited (TASL) employs over 900 engineers and technicians, leveraging cutting-edge robotics, automation, and advanced aerospace concepts in its manufacturing processes.

TBAL's 14,000 sqm facility serves as a global sole source supplier for Apache fuselages, with over 90 per cent of the parts

used in the Apache aerostructure assemblies manufactured in India through more than 100 micro, small, and medium enterprises (MSME) suppliers. II

RTX Showcases Advanced Aerospace, Engineering, and Integrated Defence Systems

At Aero India 2025, RTX, world's largest aerospace and defence company, will showcase its advanced aviation, engineering, integrated defence systems, next[1]generation technology solutions, and manufacturing capabilities that help global customers address their most critical challenges.

RTX's three business units — Collins Aerospace, Pratt & Whitney, and Raytheon — have partnered with India for over seven decades across commercial, defence, regional, and general aviation sectors. With nearly 7,000 employees and one of the largest sourcing of services and components from India, RTX is one of the largest multinational aerospace and defence original equipment manufacturers (OEMs) in India.

RTX has produced a wide range of propulsion systems and products for global warfighters and aircraft programs for decades, including systems for the latest 6th Gen aircraft in development. RTX products and solutions are found on the Indian Air Force (IAF), Indian Navy, and Indian Army's most modern platforms. Various global and India platforms showcased at Aero India 2025 — that are powered by RTX — include:

F-35: Powered by Pratt & Whitney F135 engines, with products and systems from Collins Aerospace and Raytheon. F135 is the most powerful and most advanced fighter engine ever produced, it's also the most dependable. The F135 delivers unrivalled performance to the warfighter, enabling operations in the most advanced threat environments.

C-390: RTX has significant content on most western transport aircraft in service today. Collins' high-performance solutions operational on the C-390 include aerostructures, crew seating, electric systems, avionics, oxygen systems, communication and navigation systems. The C-390 is also powered by the V2500-E5 from IAE -- a multinational consortium of which Pratt & Whitney is a part. Delivering 31,000 pounds of reliable, efficient, and clean thrust, the V2500 enables the C-390 to conduct cargo and troop transport, aerial refueling, and disaster relief missions.

C-17 Globemaster: Powered by Pratt & Whitney's dependable F117 that engines generate 40,400 pounds of thrust, with products and systems from Collins Aerospace.

C-295: Powered by twin Pratt & Whitney's PW127G engines, and with a suite of products from Collins Aerospace.

F-16: The F-16 has a suite of mission systems and defensive capabilities from Collins Aerospace and Raytheon, and Pratt & Whitney's F100 engine has powered the F-15 and F-16 since their respective first flights in the early Seventies. The F100 is the only 4th gen engine that offers operationally proven 5th generation technologies, such as thermal coatings, improved turbine cooling capabilities, and prognostics.

As India embarks on its next phase of modernization and indigenization, RTX's advanced products and solutions will provide the technological edge and mission-readiness required for the Indian armed forces' various next-generation programs, such as the Advanced Medium Combat Aircraft (AMCA), the Indian Multi Role Helicopter (IMRH) and the Medium Transport Aircraft (MTA). These include propulsion (with the F100 and V2500), power systems, avionics, aerostructures, systems, and more — across Collins Aerospace, Pratt & Whitney, and Raytheon. II

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

BOEING

RNI No. Deleng/2003/12712

‘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