VAYU

Aerospace & Defence Review

I/2022

Exercises and visits

DRDO in overdrive

Interview with CNS

Tejas Mk.2: an assessment

Army, Armour, Armata

Post CSG21 deployment

THE DEFEXPO 2022 ISSUE

MAKE IN INDIA

Strategic Partnership for a Secure Future

As a trusted strategic partner for 30 years, IAI is proud to implement the Government of India's 'Make in India' vision. We develop and produce innovative solutions with state-of-the-art technology, tailored to Indian needs, through joint ventures and close collaborations. We work hand in hand with our partners, harness Indian know-how, and utilize local technology, manufacturing excellence, and world-class skill-building. Reflecting the unique friendship between our nations, IAI is committed to lasting strategic cooperation with India to build a safe and secure future.

www.iai.co.il • corpmkg@iai.co.il

Meet us at
DEFEXPO 2022
Booth 11-12 (Hall 7)

30 Years of Friendship
IAI & INDIA

IAI
Where Courage Meets Technology

VAYU Aerospace & Defence Review

I/2022

Cover: Sukhoi Su-30MKI of the IAF (Photo: Simon Watson)

Regular features :
Opinion, Viewpoint, Aviation & Defence in India, World Aviation & Defence News, Ancient Aviator Anecdotes, Vayu 25 Years Back and Tale Spin.

Published By

Vayu Aerospace Pvt. Ltd.
E-52, Sujan Singh Park,
New Delhi 110 003 India
Tel: +91 11 24617234
Fax: +91 11 24628615
e-mail: vayuaerospace@lycos.com
e-mail: vayu@vayuaerospace.in

Printed at Aegean Offset Printers

Air Marshal Brijesh Jayal says...

Those who serve silently: Let us not forget the contribution and sacrifice of Mrs Madhulika Rawat

That veterans of varying expertise and colour of uniform volunteer to participate in such hollow and mindless debate from the comfort of their living rooms, is regrettable as such a speculative debate at a sensitive juncture can cast doubts in the mind of the public on the professionalism of those in uniform that were involved in this mission.

But this is not the subject of this column. Instead, it is something that strikes at the very heart of military purpose and ethos — the honour code that guides all those who choose military as their service to the nation. That of upholding the safety, honour and welfare of the country first followed by that of the men and women they command next, with their own last, always and every time.

Career progression in the armed forces brings with it added responsibilities and one such vital one is the welfare and morale of those one is privileged to command. Undoubtedly, it was towards this sacred duty that Mrs Madhulika Rawat was heading to Defence Services Staff College along with her husband, where one can guess her formal schedule towards welfare of service families, would perhaps have been as hectic as that of her husband. That she also gave her all in the line of duty along with all the others accompanying the CDS needs to be recorded for posterity. This would not only be a befitting tribute to her service to the nation, but also a tribute to all service families who stand silently in support of their loved ones in uniform. To borrow a quote from the English Poet John Milton, "They also serve who only stand and wait."

The recent IAF helicopter accident in Nilgiri Hills that has taken fourteen precious lives has cast a pall of gloom over the nation. The tragedy stands magnified as amongst those who lost their lives was the senior-most ranking military officer of the armed forces and the first Chief of Defence Staff, General Bipin Rawat along with his wife, Mrs Madhulika Rawat.

Not surprisingly, the electronic media has been awash with this coverage — even to the extent of attempting to analyse the possible causes of the mishap — when a formal Court of Inquiry should be the best platform for such investigation.

One such passenger on board the ill- fated Mi-17 was Mrs Madhulika Rawat, the only lady on board and also the only one not a government servant or in the pay of the state, who tragically also paid the ultimate price.

No media debate raised the basic issue of what circumstances led a non- government servant to be part of what was essentially a military entourage? In the process, it lost a valuable opportunity to sensitise us, the people, on the stellar role that families of uniformed men and women play towards national security of the nation; the sacrifices they make and the challenges they face, often living for long periods away from their spouses.

Always
Combat ready.

IAF has the challenge of a huge airspace to guard. Its fighters need to not only be available 24/7 but also be able to operate from forward operating bases and even roads. With high availability and ease of maintenance, unbeatable turnaround time and Short Take Off and Landing from any of airfield, Gripen will always have more fighters in the air than any other fighter.

Gripen E - The Game Changer

Learn more at https://www.saab.com/markets/india/gripen-for-india

SAAB TECHNOLOGIES

SAAB

Admiral Arun Prakash says...

A delayed tribute

The vociferous protests being heard from various quarters at the shifting of the Amar Jawan Jyoti — the eternal flame which honours India's "unknown soldier" — from its location under India Gate to the National War Memorial (NWM) not only represent an irony for India's military veterans, but also a deep schism in India's socio-political landscape.

Let us first address the "schism". Such is the level of suspicion and distrust in India's contemporary politics, and so heated is the environment, that every action by the government of the day is seen as a move to bolster the electoral prospects of the ruling party. Nowhere is this trend more perceptible than in the military sphere. Ever since the Prussian strategist Clausewitz classified "war as a continuation of politics…" politicians, worldwide — from Indira Gandhi to Margaret Thatcher — have unabashedly made political capital out of military achievements.

In India, however, given that elections are an endemic phenomenon, there is a need for governments to exercise prudence in this context and draw "red lines" for themselves. The concern here is not so much about the undue advantage accruing to parties as about the corrosive influence of excessive political posturing and exposure, which can undermine the integrity and cohesion of our — so far — apolitical military leadership as well as the rank and file. The political theatre about the shifting of the Amar Jawan Jyoti, being enacted live and on social media, is merely the latest manifestation of this schism.

As for the "irony", it requires us to take a look back at recent history. For as long as one can remember, India's servicemen had ruefully noted what seemed like not just a lack of gratitude, but also an acknowledgement, on the part of their compatriots of the sacrifices of their soldiers. Since 3 November 1947, when the gallant Major Somnath Sharma fell in the Battle of Badgam, earning India's first Param Vir Chakra, there has hardly been a day in the life of our embattled nation when some grieving family somewhere has not welcomed home a hero — someone's father, son or husband, brought to the doorstep in a tricolour-draped coffin.

For years, post-independence, while our wayward media took cursory note of such episodes, politicians studiously ignored the soldiers' sacrifices in upholding the nation's integrity. As the adventurism of

NAVAL GROUP

MAKING NAVAL HISTORY

SEE US AT DEFEXPO 2022
Hall No – 8
Booth No – 8R.10

NAVAL GROUP DESIGNS, BUILDS AND MAINTAINS SUBMARINES AND SURFACE SHIPS ALL AROUND THE WORLD.

Sovereignty, Innovation, Operational excellence: our common future will be made of challenges, passion & engagement.

Naval Group India (100% subsidiary of Naval Group) shares a continued commitment towards Indian Navy, Indian Shipyards and Industry in providing modern technologies through the creation of sustainable indigenous ecosystem while fostering "Aatmanirbhar Bharat" spirit.

POWER AT SEA

WWW.NAVAL-GROUP.COM

Flame merging ceremony at National War Memorial

The National War Memorial was inaugurated and dedicated to the Nation by the Prime Minister on 25 February 2019. The Memorial stands testimony to the sacrifices made by India's gallant soldiers since Independence. The Memorial houses the eternal flame which exemplifies the supreme sacrifice made by a soldier in the line of duty thus making him immortal. Since its inauguration, all homage ceremonies are being conducted only at the National War Memorial, including those on National Days.

On 21 January 2022, in a solemn ceremony, the flame at Amar Jawan Jyoti was merged with the eternal flame at National War Memorial with full military honours. The ceremony was presided over by Air Marshal BR Krishna, Chief of Integrated Defence Staff to the Chairman Chiefs of Staff Committee (CISC).

our neighbours led to conflicts in 1947, 1962, 1965 and 1971, pleas from veterans and citizens that the gallantry and sacrifice of our armed forces deserved recognition in the form of a war memorial continued to fall on deaf political ears.

This indifference was in stark contrast with the attitude of other nations. Whether it was the Arlington Memorial in Washington, the Cenotaph in London, the Arc de Triomphe in Paris or the Liberation War memorial in Dhaka, these magnificent monuments acknowledged the sacrifice of their warriors and enabled fellow citizens to pay homage. Finally, in recognition of the sacrifices of our soldiers, Prime Minister Indira Gandhi inaugurated the Amar Jawan Jyoti at India Gate on 26 January 1972. Such was the feeling of relief and elation at this belated gesture that most of us overlooked two glaring incongruities.

Firstly, the location chosen for the flame was not the most appropriate. India Gate, Edward Lutyen's half-hearted attempt to copy the magnificent French Arc de Triomphe was a war memorial erected by the British, in 1921 in memory of soldiers who died in World War I and the Third Anglo-Afghan War. While most of the names engraved on the granite walls are of Indian soldiers, a few British officers and soldiers find a place too. The monument does not celebrate a national war and could, at best, be an ad-hoc memorial for India's fallen.

Secondly, the cenotaph was surmounted with what is known as the "battlefield cross", consisting of an upright 7.62 mm rifle embedded by the barrel, with a steel helmet mounted on its butt. This symbology originated from an American Civil War custom, wherein it was used as a temporary marker for the location of a soldier's body on the battlefield till it was collected for permanent internment. It was expected that a suitable, stone monument would be erected in memory of India's "unknown warrior" but nothing of the sort happened and we retained the "battlefield cross" for 50 years.

There were other slights to soldiers too. The government's inexplicable refusal for many years to pay homage to fallen soldiers on the anniversaries of the Bangladesh and Kargil wars or the Sri Lanka Indian Peacekeeping Force (IPKF) operations on political grounds rankled. The crowning ignominy was the fact that the Sri Lankan government erected an impressive monument to the IPKF dead in 2008, while these brave soldiers remained unsung in their motherland.

Against this background, the BJP's 2014 election manifesto, which contained a pledge to "Build a War Memorial to recognise and honour the gallantry of our soldiers" brought hope to many veterans. Five years later, the pledge was redeemed with the inauguration of a 40-acre NWM complex in a central location in the Capital. This was seen by veterans not only as a belated mea culpa by the nation and its political establishment, but also a morale-booster for a million and a half men and women bearing arms. The NWM is now a place for citizens to pay homage to our fallen military heroes. Co-locating the Amar Jawan Jyoti with the NWM seems a logical step, and need not become a subject of political controversy.

National capitals, worldwide, are replete with memorials to wars and warriors, heroic statues of soldiers and squares and avenues named after generals, admirals and famous battles. In India, statues and street names focus mainly on politicians and, occasionally, on religious figures, business tycoons or scholars, with soldiers mostly forgotten. In this context, displaying the statue of Netaji Subhas Bose, a freedom-fighter and a quasi-military Indian icon, on his 125th birth anniversary, at India Gate canopy is to be welcomed.

A TRULY RELIABLE ADVANTAGE

Of all the things that can go wrong on a mission, your ammunition shouldn't be one of them.

From special forces to regular army, navy and air crews, Nammo provides the reliable advantage to those doing an important job, where and when they need it most. Our relentless focus on real-world operator challenges and constant drive to advance performance and reliability makes Nammo a trusted partner.
We provide the tools that get the job done, without fail.

- Ammunition
- Rocket Motors
- M72 Shoulder Fired Systems
- Demilitarization

U.S. Marine Corps photo by Sgt. Luke Kuennen

www.nammo.com

Nammo
SECURING THE FUTURE

OPINION

Air Marshal Brijesh Jayal says...

Theatre commands a borrowed concept; why is the politico-military establishment so determined on forging ahead with it?

Inaugurating a conference held to mark the 50th year of the 1971 India-Pakistan conflict held at IAF Training Command recently, the Raksha Mantri said, "It was the synergy and cooperation between the three services and the government that ensured our country's success in such a huge campaign. The congruence of our country's politico-military thoughts gave birth to a new nation in Asia, defeating exploitation and injustice, and proving once again that where there is righteousness, there is victory.' In a similar vein, the chief of defence staff (CDS), responding to a question on the subject of theatre commands during the recent Times Now Summit, explained at some length how when given a clear political direction in 1971, the three services together planned and executed very successful joint operations, leading not just to victory, but surrender of a large number of Pakistan military personnel. Judging by these views by the highest civil and military leaderships, one is at a loss to understand why then, the politico-military establishment is so determined on forging ahead with a borrowed concept of theatre commands, when our security is primarily limited to safeguarding our land, sea and air frontiers. The theatre command is primarily a US concept catering to their overseas strategic interests with the US Indo-Pacific Command headquarters, even including a foreign policy advisor of ambassador rank along with associated staff.

One task assigned to the newly-created post of CDS-DMA was to facilitate the restructuring of military commands for optimal utilisation of resources by bringing about jointness in operations, including through establishment of joint/theatre commands. That a subject as far reaching as restructuring of military commands and introduction of theatre commands was adopted by a mere administrative order, rather than having been arrived at through detailed studies by Service War Colleges and other specialists and ratified through war gaming tools, was only one surprise; the other being a deadline of hundred days announced by the then defence secretary, quoting the PM's desire for tangible outcomes. That there is much that needs to be done towards rationalising the number of single service commands in our country, their geographical areas of authority, co-location of their respective headquarters and ensuring that war plans are planned and executed jointly and not in single service silos, goes without saying. Indeed, significant reforms towards achieving a more cohesive, integrated and cost effective war fighting machine are long overdue. That this is being guided by pre-conceived notions of theatre commands, however, is to say the least perilous and perhaps being guided by vested institutional interests. It is evident that there are differing perceptions on this issue with the IAF clearly being singled out in the public domain, hence two historical instances bear repeating for the benefit of this discussion.

In a review of ACM Lal's book 'My Years with the IAF', Raminder Singh had in 1987 written: "Lal is sensitive about the way General Sam Maneckshaw went about making public statements about 'his air force', as if the IAF was a subordinate service. And in the chiefs of staff committee, Maneckshaw tended to ask for more information about the other two services than he gave out about the activities of the army…giving the impression that he was more concerned with 'using' the other services to his own ends rather than collaborating with them". Similarly, a review in the Firstpost of Shiv Kunal Verma's latest and very well-researched book '1965 A Western Sunrise', has this to say: "The disdain Chaudhuri (then Army Chief) had for the other two services was clear in his handling of affairs. Air Marshal PC Lal, who was at the helm of the IAF six years later, said that one had to only listen to Chaudhuri's comments to realise that he treated the whole business of fighting Pakistan or China as 'his personal affair', or at any rate that of the Army's alone, with the Air Force a passive spectator and the navy out of it altogether". One could have overlooked these historical institutional mindsets, had it not been for the recent public comment by the CDS: "Do not forget the IAF continues to remain a supporting arm just as artillery support or engineers support the combatant arm in the Army. They will be a supporting arm." In the age of Air Power defined in British doctrine as "the ability to project power from the air and space to influence the behaviour of people or the course of events", it is hence not surprising that the IAF has reservations on the issue of theatre commands.

Equally, archaic institutional mindsets are ill-suited to adapt to the ever changing dynamics of modern air and space warfare. The institution of each of the armed forces is unique for reasons too complex for this column to cover. Suffice it to say that this single service uniqueness is also reflected in the fact that personnel of each service are governed not only by laws of the land, but their respective Service Acts as well. Rushing through changes that affect inter-service, command and control and other relationships without weighing their impact on the motivation, morale and war fighting ethos of the soldier, sailor and airman, is a sure way of undermining the ethos of each arm and in turn of collective security of the nation. If the Raksha Mantri truly believes in upholding 'the synergy and cooperation between the three services and the government', that led to the victory in 1971, he owes it to the nation's security and well- being to seek from the PM and the Cabinet Committee on Security, a review of decision to move ahead with theatre commands.

(PS: This piece was written before the untimely demise of CDS General Bipin Rawat)

thalesgroup.com

THALES
Building a future we can all trust

50 countries
across the globe protect their populations **with Thales technologies**

Search: Thalesgroup

Admiral Arun Prakash says...

What India needs to address to achieve 'great power' status

As we finish celebrating the 50th anniversary of India's historic victory in the 1971 Bangladesh War, there is a strong urge to use this conflict as a benchmark for extrapolating India's future trajectory as a putative 'great-power.' A great power is, by definition, a sovereign state that possesses the ability to exert influence on a global or regional scale, by virtue of its economic, technological and military strengths, as well as its diplomatic adroitness and cultural (or soft) power.

Therefore, without detracting in any way from the brilliant success of Indian arms, and the gallantry of our soldiers, sailors and airmen in the 1971 war, we need to reflect whether a single military victory by itself is enough for a nation to anoint itself as a significant or great power.

While analysing this conflict, two factors need to be kept in mind. Firstly, it was the breathing spell, from March to September 1971, granted by then Prime Minister Indira Gandhi at Gen Sam Manekshaw's urging, that enabled the armed forces to remedy serious equipment voids through a massive airlift from the USSR. Secondly, even though 'jointness' as a concept had not been formally introduced, the tri-service military leadership of the day showed enormous sagacity, which enabled close cooperation and coordination and ensured success of operations. However, the military operations undertaken, with the exception of the navy's missile attack on Karachi, were rooted in WW II doctrines, and would have little relevance in the 21st century, high-tech battlespace.

Moving on from the triumphalism of this conflict, we also need to take note of the lack of doctrinal clarity, diffidence and self-imposed constraints, that have, traditionally, marked the manner in which the Indian state has wielded force. A few examples, before and after 1971, bear mention in this context.

The inconclusive 1947 Indo-Pak conflict and the disastrous 1962 encounter with the Chinese were a preview of what was to become a trademark of independent India's tentative approach to national security issues earning for it the pejorative label of a 'soft state.' In 1987, a large Indian Peace-keeping Force was hastily despatched to Sri Lanka without adequate forethought or planning, both at the political and military levels. The flawed political rationale that had underpinned 'Operation Pawan' collapsed with a Sri Lankan 'volte face' and the venture ended up as much a political disaster as a military failure with considerable loss of lives.

In more recent times, the Kargil conflict of 1999 brought us face to face with loss of vital territory, nuclear blackmail and national dishonour. This grave situation could only be retrieved by the sacrifices of our gallant soldiers in suicidal uphill assaults. Two years later, in 2001, India mobilised a million men in response to a terrorist attack on Parliament, only to de-mobilise them after 11 months, with significant loss of life, but without tangible gains, political or military.

The June 2020 border intrusions by the Chinese PLA, in eastern Ladakh again took us by surprise, and while the army responded with alacrity, there persists a complete lack of clarity in New Delhi about the nature about the nature and extent of Chinese incursions as well as the motives behind their actions. The story in the asymmetric-warfare domain is not much different. The poorly handled hijacking of IC-814 in 1999, the 2008 attack by seaborne terrorists who held Mumbai hostage for 96 hours, and the 2016 penetration of military units in Pathankot, Uri and Nagrota, exposed the lack of crisis-management expertise in India's security establishment.

The September 2016 cross-border commando raids and the 2019 post-Pulwama air raid, into Pakistan, marked a welcome change that would have conveyed strong signals of national resolve and retribution.

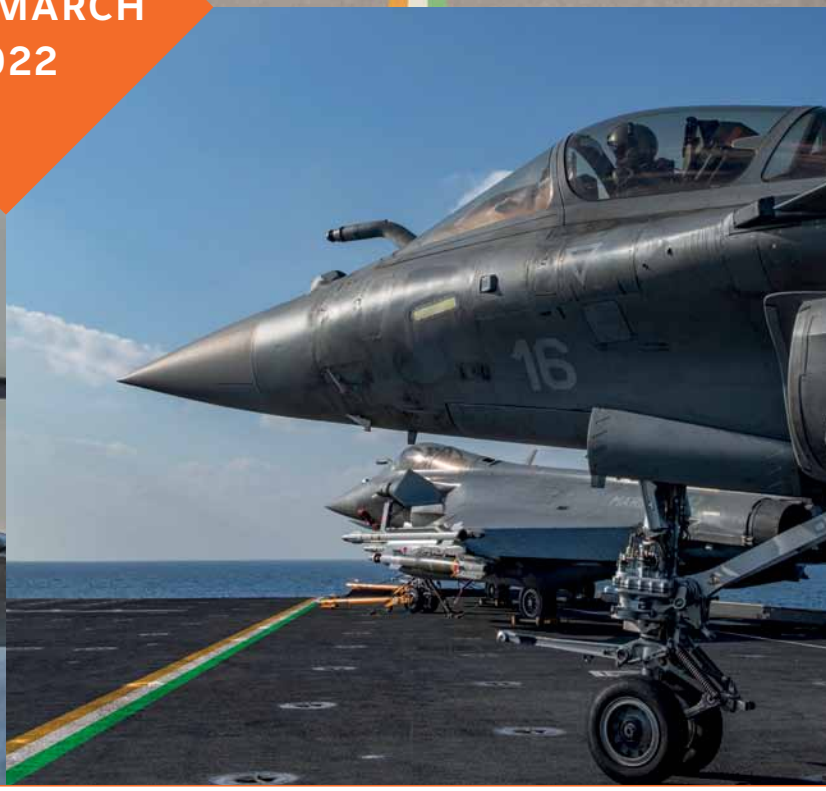
Regrettably, the absence of a policy underpinning, to these actions, and their exploitation for political gains, trivialised them, diluting their deterrent value.

Having undertaken this rapid scan of systemic security shortcomings, let me pinpoint four critical factors which need to be addressed by decision-makers before India can respond effectively to security challenges and stake a claim to great power status.

Firstly, it is the responsibility of statesmen and diplomats to ensure that nations resort to application of force, only as a measure of last resort, and after they have exhausted all other avenues of dispute-resolution. In this regard, India is in a most un-enviable situation being sandwiched between two hostile nuclear-armed neighbours with both of whom we have fought wars over territorial disputes. It should be a matter for reflection, for our diplomats, that they have failed, for

ALREADY IN INDIAN AIR FORCE, READY FOR INDIAN NAVY

DEFEXPO
10-13 MARCH
2022



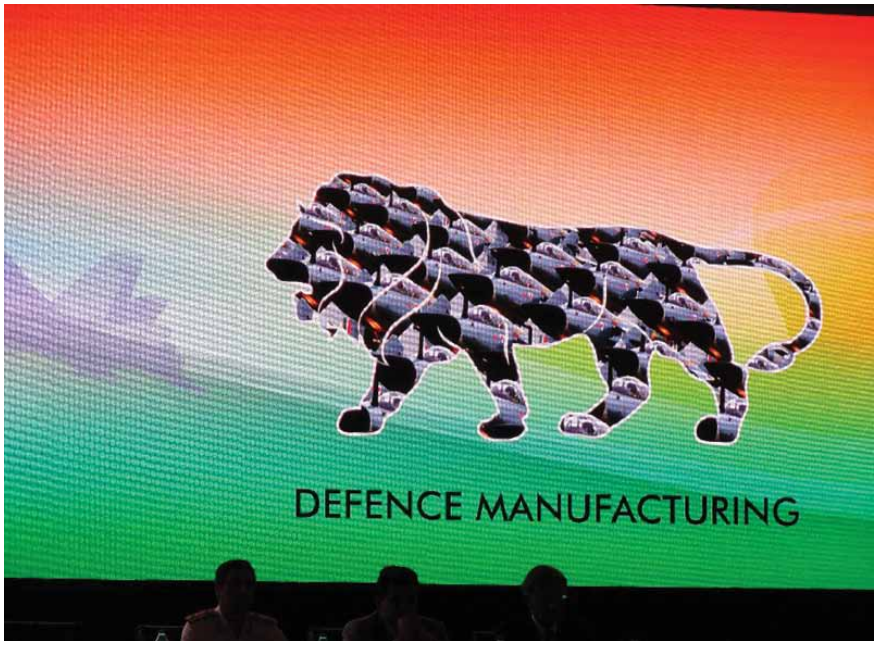
www.rafale.co.in

OVER 60 YEARS. 6 AIRCRAFT TYPES. 1 NATION

TOOFANI | MYSTERE IV | ALIZE | JAGUAR | MIRAGE 2000 | RAFALE

RAFALE INTERNATIONAL

DASSAULT AVIATION • SAFRAN • THALES



decades, 'post-bellum,' to negotiate adhoc boundaries into stable, mutually agreed upon international borders. They must also reflect on the fact that India has rarely been able to dissuade any neighbour – Pakistan, Bangladesh, Nepal Sri Lanka or even tiny Maldives – from undertaking actions inimical to Indian interests. The loss of all friends in our close neighbourhood should weigh, heavily, on the minds of our statesmen and diplomats.

Secondly, a term heard consistently in India's national security discourse is 'surprise,' used in the context of the 1947, 1962, 1965 and Kargil conflicts, as well as the latest Chinese incursions in Ladakh and episodes like the IC-814 hijacking and the 26/11 Mumbai terror strike. The phrase implies 'intelligence failures' on account of flaws in collection, collation and analysis as well as timely dissemination of crucial information.

Consequent to the 1999 Kargil Review Committee Report, India's intelligence system has been overhauled and received an infusion of technical wherewithal of great sophistication. However, if the armed forces are still not receiving timely and actionable inputs, there is need for government to exercise greater oversight in this domain.

Thirdly, we should be under no illusions that India's claim of 'strategic autonomy' will remain a meaningless slogan as long we are dependent on external sources for military hardware and systems. We must also be extremely wary of a false sense of confidence that can be induced by incorrect claims of 'indigenous production.' In their rush to seek credit for 'atma nirbharta,' organisations and individuals are not above passing off licence-produced and even assembled items as indigenous. Here again, oversight and close monitoring of scientific projects would yield better results.

While banning of imports may sound like a good idea, what we actually need is a '50-year technology roadmap for India's defence industry,' and a wholehearted embrace of the private sector.

Finally, two vital steps, on the path to great-power status, are: the conceptualisation of a vision for the nation, and the formulation of a Grand Strategy to attain it. Both lie in the purview of statesmen, but soldiers and diplomats can lend a hand.

Development of Kaveri engine: an update

India's Cabinet Committee on Security (CCS) sanctioned Kaveri Engine project in 1989. The following milestones were achieved: 9 full prototype engines and 4 core engines built, 3217 hours of engine testing conducted and Completed Altitude tests & Flying Test Bed (FTB) trials. This is the first time that an indigenously developed military gas turbine engine was flight tested. Kaveri engine project has achieved higher Technology Readiness Level (TRL) in many critical technology domains and those technologies are being used in the various engine development programmes of the country. Further the engines are used as test vehicles for validating next generation technologies. At present, the LCA Tejas is integrated with an imported engine. However, in future, it is proposed to develop indigenous engines for powering our own aircraft such as LCA variants and AMCA in association with an International Engine House. The technological capabilities built through the Kaveri engine project will be utilised.

MoD and MiG-21s

Photo of MiG-21 by Simon Watson

"Tejas is not being inducted as a replacement of MiG-21 fighter aircraft, but as a part of modernisation of IAF. Amount spent so far on the manufacture of 24 LCA Tejas delivered till 30 September 2021 is Rs 6,653 crore. Considering the contract with HAL by IAF, a total of 123 Tejas fighter aircraft are to be manufactured. Further production depends upon requirement for Indian Defence Services/export to customers".

MoD and Make in India scheme

Many significant projects including 155mm Artillery Gun system 'Dhanush', Bridge Laying Tank, Light Combat Aircraft 'Tejas', 'Akash' Surface to Air Missile system, Submarine 'INS Kalvari', Inshore Patrol Vessel, Offshore Surveillance Ship, 'INS Chennai', Anti-Submarine Warfare Corvette (ASWC), Arjun Armoured Repair and Recovery Vehicle, Landing Craft Utility, Bridge Laying Tank, Bi-Modular Charge System (BMCS) for 155mm Ammunition, Thermal Imaging Sight Mark-II for T-72 tank, 25 T Tugs, Water Jet Fast Attack Craft, Offshore Patrol Vessel, Fast Interceptor Boat, INS Kalvari, INS Khanderi, Medium Bullet Proof Vehicle (MBPV), Lakshya Parachute for Pilotless Target Aircraft, etc. have been produced in the country under 'Make in India' initiative of the Government in last few years.

Defence agreement with Russia on assault rifles

India's Defence Minister Rajnath Singh had a substantial bilateral discussion on defence cooperation with his Russian counterpart Gen Sergei Shoigu at the India-Russia Inter-Governmental Commission on Military & Military Technical Cooperation (IRIGC-M&MTC) at New Delhi on 6 December 2021. Plus both countries concluded Rs 5,100-cr deal for joint production of 6,01,427 AK-203 assault rifles.

A contract for procurement will be between Ministry of Defence and Indo-Russian Rifles Private Limited (IRRPL), a Joint Venture established between India, represented by the Defence PSUs Advanced Weapons & Equipment India Limited (AWEIL) & Munitions India Limited (MIL) and Russia, represented by Rosoboronexport (RoE) & Concern Kalashnikov (CK), in the shareholding of 50.5% and 49.5% respectively.

Airbus signs contract with BEL for C295 programme

As part of its offset commitments under the prestigious C295 aircraft programme of the Government of India, and in line with the 'Make in India' policy, Airbus Defence and Space has signed a contract with Bharat Electronics Limited (BEL) for the manufacture and supply of Radar Warning Receiver (RWR) and Missile Approach Warning System (MAWS). This export order, worth 93.15 M USD, is the biggest received till date by BEL.

BDL signs Rs 3131 Cr contract for Konkurs

The Indian Army has signed a contract with Bharat Dynamics Limited (BDL) for the manufacture and supply of Konkurs–M anti-tank guided missiles. The contract worth Rs 3,131.82 crore was signed on 2 February 2022 and will be executed in three years. Konkurs–M is a second generation, mechanised infantry anti-tank guided missile and can be launched either from a BMP-II or from a ground launcher. It has a range between 75 to 4,000 metres with a flight time of 19 secs. It is manufactured by BDL under a license agreement with a Russian OEM (Original Equipment Manufacturer) and the missile has been indigenised up to the maximum extent.

BEL receives Rs. 2400 crores avionics order for LCA

The LCA Tejas Mk1A programme has got a shot in the arm as Bharat Electronics Ltd (BEL) received an order worth Rs. 2,400 crores from Hindustan Aeronautics Limited (HAL) for the manufacture and supply of 20 types of airborne electronic systems to be fitted on the fighter aircraft. The order spanning five years from 2023 to 2028 involves supply of critical avionic Line Replaceable Units (LRUs) related to Digital Flight Control Computers, Air Data Computers, Weapon Computers, LRUs related to Radar Warning Receiver (RWR) and Head Up Display.

BEL's Armoured Engineer Reconnaissance Vehicle inducted

The first batch of next-generation Armoured Engineer Reconnaissance Vehicles (AERV), indigenously designed and developed by DRDO and manufactured by the Pune Unit of Bharat Electronics Limited (BEL), was formally inducted into Indian Army by Gen Manoj Mukund Naravane, Chief of Army Staff, on 21 December 2021. AERV is manufactured by BEL-Pune with more than 90 per cent indigenous content. It is a versatile BMP-IIK amphibious Infantry Combat Vehicle (ICV) fitted with instruments for water reconnaissance, land reconnaissance, navigation and data backup.

SAFRAN ELECTRONICS & DEFENSE, INTELLIGENCE ONBOARD

Day after day, you face critical challenges. The products and services developed by Safran Electronics & Defense, whether civil or military, deliver the technological superiority, effectiveness, reliability and competitiveness you expect. We're with you every step of the way, building in the intelligence that gives you a critical advantage in observation, decision-making and guidance. You can count on Safran Electronics & Defense, your strategic partner on land, at sea, in the air and in space.

safran-electronics-defense.com
: @SafranElecDef

SAFRAN

Odisha's Anadrone Systems in defence contract

In a landmark event under the Make in India scheme of the ministry of defence, Odisha based Anadrone System has bagged the contract to supply advanced defence equipment to the Indian Army and Air Force. The contract to supply 125 Manoeuvrable Expendable Aerial Targets (MEAT) and associated equipment worth Rs. 96 crores, under the Make in India II category. The Shikra MEAT system being manufactured by the company is a localised version of the Banshee Jet 40 system that has earlier been imported by the armed forces. The company has collaborated with a UK based defence tech company to build systems for air defence training from simple, low-performance model aeroplane targets through manoeuvrable targets to sophisticated high subsonic and supersonic systems.

First sea sortie of fifth scorpene submarine 'Vagir'

The fifth submarine of Project 75, Yard 11879, Indian Navy's Kalvari class commenced her sea trials on 1 February 2022. The submarine was launched in Nov 2020 from the Kanhoji Angre Wet Basin of Mazagon Dock Shipbuilders Limited (MDL). The submarine would be named Vagir, after commissioning. Despite the COVID-19 pandemic, MDL has 'delivered' two submarines

of the Project–75 in the year 2021 and the commencement of sea trials of the fifth submarine is a significant milestone. The submarine will now undergo intense trials of all its systems at sea, including propulsion systems, weapons and sensors. The submarine is scheduled for delivery to the Indian Navy in the year 2022 after completion of these trials.

Launch of 'Sandhayak' Survey Vessel

'Sandhayak', the first of the four Survey Vessels (Large) Project being built by Garden Reach Shipbuilders & Engineers (GRSE), Kolkata for Indian Navy was launched on 5 December 2021. The erstwhile Sandhayak incidentally was also launched at GRSE, Kolkata 44 years ago on 6 April 1977. The contract for building four survey ships was signed between MoD and GRSE on 30 October 2018 at a total cost of Rs 2435 Crs. As per build strategy adopted by GRSE, first ship is being built at GRSE Ltd and construction of balance three ships is envisaged at L&T Shipbuilding, Kattupalli.

आत्मनिर्भर भारत

बी ई एम एल

beml

NEW FRONTIERS. NEW DREAMS

75 Azadi Ka Amrit Mahotsav

MADE WITH PRIDE FOR THE NATION

Variants of High-mobility Vehicle & Platform for Varied Applications | Armoured Repair & Recovery Vehicles Bridging & De-Mining System | Tank Transportation Trailers & Aggregates | Crew Protection Vehicle Aerospace Aggregates

defexpo India : The Emerging Defence Manufacturing Hub

DEFEXPO 22 INDIA

Ministry of Defence

Visit: BEML Pavilion Hall No. 2, Stall No. 2R 5/13 and Outdoor Stall - OD16

BEML LIMITED

Defence & Aerospace | Mining & Construction | Rail & Metro

E-mail: mi@beml.co.in / asbd@beml.co.in

www.bemlindia.in

Keel laying of Diving Support Craft

Keel laying for the first ship of Diving Support Craft (DSC) project was held on 27 January 2022 in virtual presence of representatives from the Indian Navy, at Titagarh Wagons Ltd., Kolkata. The contract for procurement of five Diving Support Craft (Yards 325 to 329) for the Indian Navy was signed in February 2021 with Titagarh Wagons Ltd. The ships will be commissioned in the Indian Navy to provide diving assistance for ships inside and close to harbour, for underwater repairs, maintenance and salvage. The ships will be fitted with state-of-the-art diving equipment and tools for performing the diving operations.

More FBOPs delivered

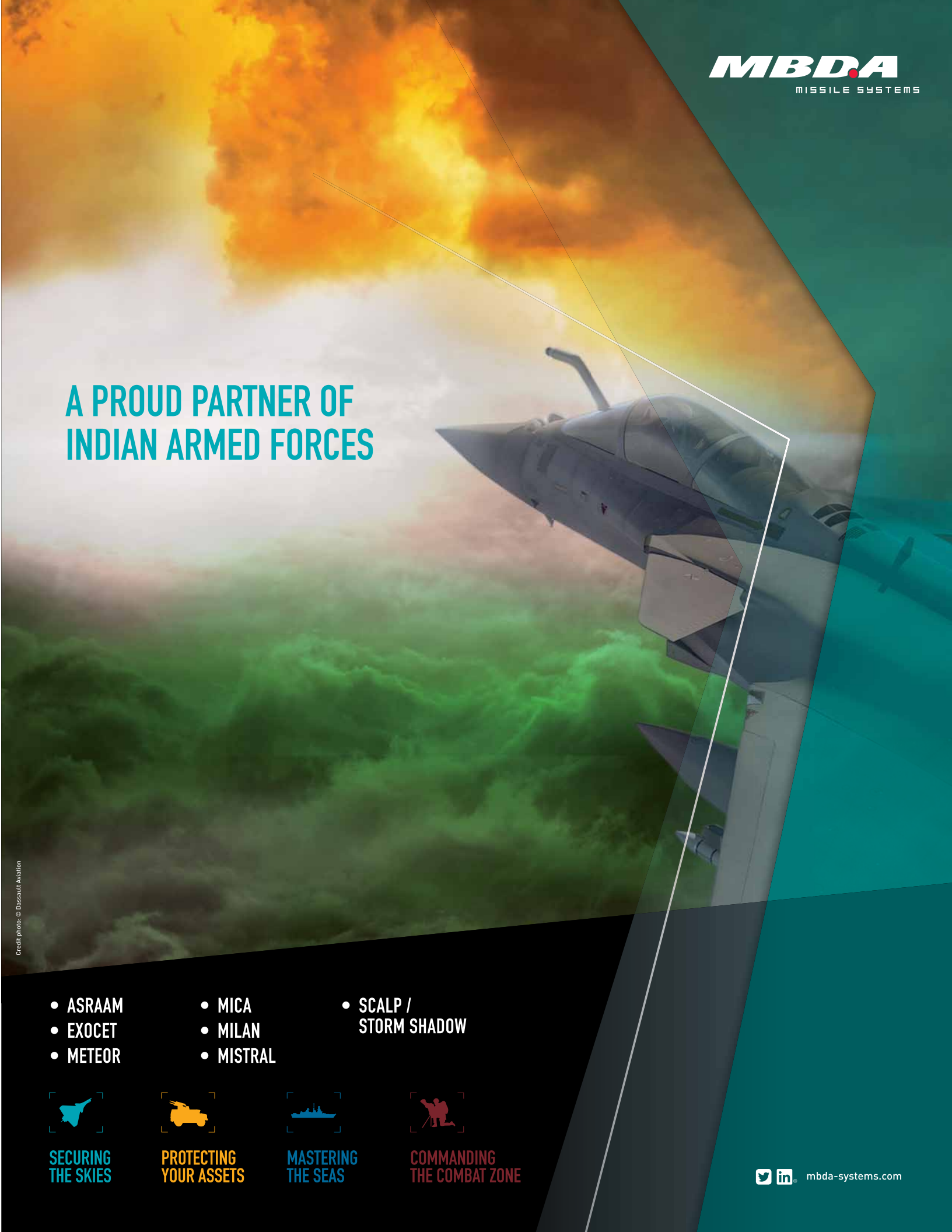
Cochin Shipyard Limited (CSL) delivered the second lot of three Floating Border Out-Post (FBOPs) vessels being built for the BSF to protect India's borders.

GSL delivers to ICG

India's Goa Shipyard Ltd has delivered 5th and final vessel of the 5 CG-OPV Project ahead of contractual schedule. All 5 vessels have been delivered before time to Coast Guard.

P-8I's commence operations from INS Hansa

The Indian Navy's Boeing P-8I aircraft commenced operations from INS Hansa, Goa with two aircraft arriving on 30 December 2021. The aircraft were inducted after fitment of indigenous equipment and Flight Acceptance Trials. On arrival, the aircraft were welcomed by a MiG-29K formation. The Indian Navy had acquired the first batch of eight P-8I aircraft in 2013 that are stationed at INS Rajali, Arakkonam. The second batch of four additional aircraft will be based at Indian Naval Air Squadron 316, to be commissioned at INS Hansa.



MBDA
MISSILE SYSTEMS

A PROUD PARTNER OF INDIAN ARMED FORCES

Credit photo: © Dassault Aviation

- ASRAAM
- EXOCET
- METEOR
- MICA
- MILAN
- MISTRAL
- SCALP / STORM SHADOW

SECURING THE SKIES

PROTECTING YOUR ASSETS

MASTERING THE SEAS

COMMANDING THE COMBAT ZONE

mbda-systems.com

Ulan-Ude Aviation to train pilots on Mi-171A2

A second crew of Indian company Sky One Airways LTD started an advanced professional retraining programme for a new type of Mi-171A2 helicopter. The course takes place at the aviation training centre of Ulan-Ude Aviation Plant, part of Russian Helicopters Holding Company, Rostec State Corporation. The programme for Indian pilots involves theoretical training as well as a simulator and flight training on the Mi-171A2 helicopter. In early 2021, experts from India's Directorate General of Civil Aviation conducted a preliminary inspection of the training centre for verification purposes.

BEL drone delivery mailboxes for DRONEDEK

DRONEDEK Corporation of the USA, one of the first companies in the world to patent a smart mailbox designed for secure drone delivery has announced that it has entered into a formal agreement with Bharat Electronics Limited (BEL) to design, develop and produce DRONEDEK smart mailbox units for worldwide distribution.

Combined Graduation Parade held at Air Force Academy

To mark the successful culmination of Training for 175 Flight Cadets of Flying and Ground Duty branches in the Indian Air Force, a Combined Graduation Parade was held at the Air Force Academy, Dundigal on 18 December 2021. Air Chief Marshal VR Chaudhari, Chief of the Air Staff was the Reviewing Officer (RO) of the Passing out Parade, where he conferred the 'President's Commission' on the graduating Flight Cadets who successfully completed their professional training. The graduating officers also included 28 women who joined the growing number of women officers in the IAF. On this occasion, two officers from the Indian Navy, nine officers from the Indian Coast Guard and three Cadets from Vietnam were also awarded Wings on successful completion of flying training.

AFTC Graduation

Graduation Parade of Permanent Commission & Short Service Commission of Aeronautical Engineering Course was held at the Air Force Technical College (AFTC) in Bengaluru on 18 December 2021. It marks the culmination of 74 weeks of training (22 at Air Force Academy, Hyderabad and 52 at AFTC).

81 Gentleman Cadets pass out from Officers' Training Academy, Gaya

The Officers' Training Academy (OTA), Gaya wore a traditional military look on the occasion of 20th Passing Out Parade. Recently, 81 officers of the Technical Entry Scheme (TES)-38 including 9 officers from Friendly Foreign Countries and 18 officers of Special Commissioned Officers Course (SCO)-47 passed out of OTA, Gaya. The SCO Course also included 14 Gentleman Cadets who were commissioned as officers in Assam Rifles. In addition, 60 Gentlemen Cadets of TES-44 Course proceeded to various Army Cadet Training Wings to pursue a degree in Engineering at Military College of Electronics and Mechanical Engineering, Secunderabad, Military College of Telecommunication Engineering, Mhow and College of Military Engineering, Pune.

INS Khukri decommissioned after 32 years

INS Khukri, the first of the indigenously built Missile Corvettes, was decommissioned after 32 years of service on 23 December 2021. The corvette was built by the Mazagaon Dock Shipbuilders on 23 August 1989 and had the distinction of being part of both the Western and Eastern Fleets. During her service, the ship was commanded by 28 Commanding Officers and traversed a distance of over 6,44,897 nautical miles, which is equivalent to navigating around the world 30 times or 3 times the distance between the Earth and the Moon.

Decommissioned Khukri handed over to Diu Administration

INS Khukri (P49) was handed over to the Dadra & Nagar Haveli and Daman & Diu (DNHDD) Administration on 26 January 2022. In an elegantly conducted but solemn ceremony held at the INS Khukri Memorial, Diu, Rear Admiral Ajay Vinay Bhave, Flag Officer Doctrine and Concepts, handed over the decommissioned ship formally to Praful Patel, Administrator of the Union Territory of DNHDD & Lakshadweep. Khukri is planned to be converted into a museum by the Diu Administration for public visits. The museum will be co-located with the existing Khukri Memorial, where the scaled-down version of the first INS Khukri (F149), a Blackwood class anti-submarine frigate, is also placed.

Vistara turns seven

Vistara, India's full-service carrier and a joint venture of Tata group and Singapore Airlines, celebrated its seventh anniversary on 9 January 2022 and announced key milestones of having flown 30 million passengers since inception. Vistara has a fleet of 51 aircraft, including 40 Airbus A320, four Airbus A321neo, five Boeing 737-800NG, and two Boeing 787-9 Dreamliner aircraft, and has flown more than 30 million customers since starting operations.

BLR Airport to commission Rosenbauer Firefighting Simulator

Bangalore International Airport Limited (BIAL), operator of Kempegowda International Airport Bengaluru (BLR Airport), has become the first Airport in South Asia to commission a Rosenbauer Tactical Simulator, further strengthening its firefighting capabilities. With this simulator, firefighters can train in a realistic environment, master the tactical use of Rosenbauer Panther trucks as well as operate High Reach Extendable Turrets (HRET) for extreme aircraft fire emergencies. The state-of-the-art facility will be open for firefighters from other airports (in India and abroad), State Fire Departments and Defence Forces.

IndiGo in delivery of 2000th A320neo family aircraft built

IndiGo airline took the delivery of the 2000th A320neo family aircraft in December 2021, which follows two years after the airline also received the 1000th A320neo aircraft in 2019, despite the challenges posed by the pandemic. The IndiGo aircraft MSN10654, an A321neo, produced and delivered in Hamburg, Germany. IndiGo is the world's largest customer for the A320neo Family with orders totalling 730 aircraft. Since its first NEO was delivered in March 2016, its fleet of A320neo Family has grown into the world's largest with 187 aircraft operating alongside 61 A320s and 34 ATRs.

SpiceJet starts operating Boeing 737 MAX again

SpiceJet has 'welcomed back' into operations its Boeing 737 MAX aircraft late 2021, the backbone of its passenger aircraft fleet, after a gap of around two-and-a-half years. SpiceJet, the only operator of the 737 MAX in the country, had signed a $22 billion deal with Boeing for up to 205 aircraft in 2017 and has 13 of these planes in its fleet at present.

IGRUA sets a new record in 2021

During the year 2021, Indira Gandhi Rashtriya Uran Akademi (IGRUA) piled up 19,000 hours of flying as against an average yearly flying output of 15,000 per year during the previous five years while it was 11641 hours in 2020. IGRUA achieved this milestone of 19000 hours despite continued effect of pandemic and inclement weather conditions due to *Tauktae* Cyclone in 2021. During the concurrent period, 66 cadets have graduated as against 43 during the previous year. The achievement becomes more significant when it is done with a reduced fleet strength of 18 aircraft as against 24 during the previous years. IGRUA has already set foundation to hit a target of 25,000 flying hours in 2022 by inducting a record 121 cadets in 2021 and expanding the fleet strength in 2022.

Co-creating for a Self-Reliant India

Advantage where it counts

Helping our customers to stay a step ahead when protecting people and national security, critical infrastructure and vital information.

Visit us at DefExpo 2022
Stand R.22b, Hall 8

baesystems.com

BAE SYSTEMS

APPOINTMENTS

Admiral R Hari Kumar is new Chief of the Naval Staff

Admiral R Hari Kumar assumed command of the Indian Navy on 30 November 2021 as the 25th Chief of the Naval Staff. He succeeds Admiral Karambir Singh who retired upon superannuation, after an illustrious career, spanning over forty one years, in the Indian Navy.

Admiral R Hari Kumar is an alumnus of the prestigious National Defence Academy, Khadakwasla. He was commissioned into the Indian Navy on 1 January 1983. He was the Flag Officer Commanding-in-Chief, Western Naval Command at Mumbai, prior taking over helm as Chief of the Naval Staff.

Lt Gen Manoj Pande is VCAS

Lt Gen Manoj Pande took over as the Vice Chief of the Army Staff on 1 February 2022. In his 39 years of distinguished military career, he has tenanted important and challenging command and staff. Lt Gen Manoj Pande took over the appointment of the Vice Chief of the Army Staff from Lt Gen CP Mohanty who superannuated on 31 January 2022 after completing four decades of illustrious career in the Army.

Vice Admiral Ajendra Bahadur Singh is new FOC-in-C

Vice Admiral Ajendra Bahadur Singh took over as the Flag Officer Commanding–in-Chief (FOC-in-C), Western Naval Command (WNC) from Vice Admiral R Hari Kumar at a Ceremonial Parade held at INS Shikra. Prior to taking over as the Flag Officer Commanding-in-Chief of the WNC, Vice Admiral AB Singh served as the Flag Officer Commanding-in-Chief of the Eastern Naval Command. Commissioned into the Navy on 1 July 1983, Vice Admiral AB Singh is a specialist in Navigation and Direction.

Vice Admiral MA Hampiholi assumes command of SNC

Vice Admiral MA Hampiholi, took over the reins of the Southern Naval Command (SNC) as its 29th Flag Officer Commanding- in-Chief on 30 November 2021. The Admiral replaced Vice Admiral Anil Kumar Chawla who retired after close to four decades of yeoman service. Vice Admiral MA Hampiholi was the Commandant of the Indian Naval Academy, Kannur, Kerala prior to taking over this appointment.

Vice Admiral Biswajit Dasgupta takes over as FOC-in-C ENC

Vice Admiral Biswajit Dasgupta assumed charge as the Flag Officer Commanding-in-Chief (FOC-in-C), Eastern Naval Command (ENC) at a Ceremonial Parade held at the Naval Base on 1 December 2021. Vice Adm Dasgupta inspected the Ceremonial Guard and reviewed platoons of naval personnel drawn from various ships and establishments of the ENC. The ceremony was attended by

Azadi Ka Amrit Mahotsav

HAL

एरोस्पेस एवं रक्षा में उत्कृष्टता के साथ अग्रसर
Driving Excellence in Aerospace and Defence

HAL's proven expertise, indigenous programs and thrust on excellence are redefining the Indian defence and aerospace industry. HAL is nurturing a competitive aerospace and defence ecosystem in India by partnering with private industries and MSMEs.

FOR INFO. SCAN QR CODE

Visit us at Hall 2

defexpo 2022 DEFEXPO22 INDIA Ministry of Defence

www.hal-india.co.in | @HALHQBLR

all Flag Officers and Commanding Officers of ships, submarines and establishments. Vice Adm Dasgupta was the Chief of Staff, Eastern Naval Command since June 2020 prior to being elevated as the Commander-in-Chief.

Rear Admiral Sanjay Bhalla takes over as Eastern Fleet Commander

Rear Adm Sanjay Bhalla (L) taking over as Eastern Fleet Commander from Rear Adm Tarun Sobti (R)

Rear Admiral Sanjay Bhalla took over the Command of the Eastern Fleet, the Sword Arm of the Eastern Naval Command, from Rear Admiral Tarun Sobti on 20 December 2021. Rear Admiral Sanjay Bhalla was commissioned into the Indian Navy on 1 January 1989 and is a specialist in Communication and Electronic Warfare. The Flag Officer is an alumnus of the Defence Services Staff College, Wellington; College of Naval Warfare, Mumbai and Royal College of Defence Studies, London.

Rear Admiral Sameer Saxena takes over as Fleet Commander of Sword Arm

The Western Fleet, known as the 'Sword Arm' of the Indian Navy, witnessed a change of helm on 27 December 2021 as Rear Admiral Ajay Kochhar handed over the baton to Rear Admiral Sameer Saxena. Rear Admiral Saxena was commissioned into the Indian Navy on 1 July 1989. He is an alumnus of the National Defence Academy, Khadakwasla; Defence Services Staff College, Wellington and the Naval War College, Newport, USA.

Director General VS Pathania is Chief of Indian Coast Guard

Director General VS Pathania took over as the 24th Chief of Indian Coast Guard on 31 December 21. The Flag Officer is an alumni of the Defence Services Staff College, Wellington and National Defence College, New Delhi. The Flag Officer is a qualified helicopter pilot and holds a Master's Degree in Defence and Strategic Studies from the University of Madras. He has also undergone specialisation in Search and Rescue and port operations with the US Coast Guard.

Boeing names Alain Garcia as VP of Business Development in India

Boeing has appointed of Alain Garcia as the Vice President of business development for its defence and services business in India. Garcia will be based in New Delhi and will build on Boeing's presence in the country, leading business growth, strengthening customer relationships and pursuing new defence and services opportunities. He will report to Maria Laine, VP, international business development at Boeing Defence, Space & Security and Government Services. Garcia succeeds Michael Koch, who has moved to another role with Boeing Defence, Space and Security in the United States.

Obituary

India's first Chief of Defence Staff General Bipin Rawat is no more. He along with his wife and 12 others were onboard an Mi-17V-5 helicopter that crashed on 8 December 2021. The helicopter went down in the southern state of Tamil Nadu.

गार्डन रीच शिपबिल्डर्स एण्ड इंजीनियर्स लिमिटेड
Garden Reach Shipbuilders & Engineers Ltd.

Builders of 100 Warships

INFINITE PASSION MEETS UNWAVERING COMMITMENT

(A Govt. of India Undertaking)

61, Garden Reach Road, Kolkata-700 024

Tel: +91-33-2469 8100 to 8113, Fax: +91-33-2469 8150

India : The Emerging Defence Manufacturing Hub

DEFEXPO 22 INDIA

10 -14 MARCH 2022, GANDHINAGAR

Ministry of Defence

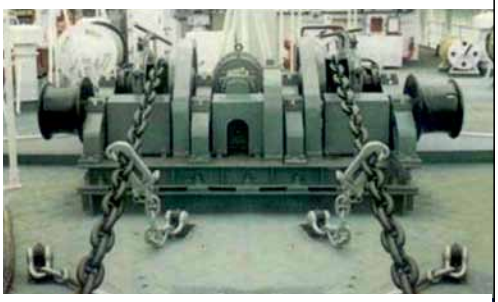
VISIT GRSE STALL

2R-27, HALL NO. 2

HELIPAD EXHIBITION CENTER

Delivered 107 Warships to Armed Forces of India & Friendly Foreign Countries

WARSHIPS Frigates I ASW Corvettes I Missile Corvettes I Landing Ship Tanks (Large) I Survey Vessels I Landing Craft Utility Ships I Offshore Patrol Vessels I ASWSWCs I FAC



ENGINEERING PRODUCTS Pre-Fabricated Steel Bridges I Railless Helo Traversing System I Deck Machinery Items I Assembly/Testing/Overhauling of Diesel Engine

Supplied Over 5300 Portable Steel Bridges to Indian Army, Border Road Organisation, State PWDs, Central Government & Friendly Foreign Countries

Scan the QR Code for Corporate Video

हर काम देश के नाम

MAKE IN INDIA

For any query please contact:

marketing@grse.co.in

Follow us : grsekolkata | officialgrse | OfficialGRSE | garden-reach-shipbuilders-&-engineers | www.grse.in

In Pursuit of Excellence & Quality in Shipbuilding

Union Budget for Defence 2022-23

The Union Budget for Financial Year 2022-23, presented by the Finance Minister on 1 February 2022, has given further impetus to modernisation of Defence Services and Defence Security Infrastructure development, including the Border Road Infrastructure and Coastal Security Infrastructure.

The Union Budget 2022-23 envisages a total outlay of Rs 39.45 lakh crore. Out of this, Ministry of Defence has been allocated a total budget of Rs 5.25 lakh crore, which is 13.31% of the total budget. This includes an amount of Rs 1.19 lakh crore for Defence Pensions. The total Defence Budget represents an enhancement of Rs 46,970 crore (9.82%) over Budget Estimates 2021-22.

Through enhanced budgetary support over the years, the Government has placed modernisation and infrastructure development of the Armed Forces at the centre stage of the National Security and Defence Planning process. The total allocation under Capital Outlay of the Defence Services has been increased from Rs 86,740 crore in 2013-14 to 1.52 lakh crore in 2022-23. There is an enhancement of 76% over a period of nine years. Further, during this period, the total Defence Budget including Defence Pensions has increased by 107.29%, from Rs 2.53 lakh crore in 2013-14 to Rs 5.25 lakh crore in 2022-23.

Sustained thrust on Modernisation and Infrastructure Development: In the Union Budget 2022-23, the Capital Allocations pertaining to modernisation and infrastructure development of Armed Forces has been significantly increased to Rs 1.52 lakh crore. This represents an increase of Rs 17,308 crore (12.82%) over FY 2021-22. Further, cumulative increase in the Capital Budget since 2019-20 has been Rs 48,975 crore (47.37%).

The increase in the overall Capital Budget reflects the Government's resolve towards sustainable enhancement in the modernisation and infrastructure development and also towards achieving the objectives of 'Aatmanirbhar Bharat'.

In order to give push to indigenous Domestic Enterprises under the

ALPHA DESIGN TECHNOLOGIES

- Technology Focus
- Joint Venture and Collaboration Approach
- Local Production and Offsets
- Indigenous R&D and Co-development
- System Integration
- Technical / Warranty Support

Serving Indian Frontiers and beyond.....

Visit us at

defexpo INDIA 2022

India : The Emerging Defence Manufacturing Hub

DEFEXPO 22 INDIA

10th-13th MARCH, 2022 | GANDHINAGAR

Ministry of Defence

HALL | 12

STALL | 8, 9, 17, 18
15, 16, 22, 23

10th-14th March 2022
Gandhinagar,Gujarat, India

Alpha Design Technologies Pvt Ltd

09, Service Road, HAL II Stage, Indiranagar, Bangalore - 560008
Tel: +91-80-4255 6909 Fax: +91-80-2521 6541
E mail: alphacorp@adtl.co.in **Website: www.adtl.co.in**

Mr. Baba N. Kalyani, CMD Bharat Forge on the Union Budget

I would like to congratulate the FM for a growth propelling budget with significant thrust on enhancing competitiveness, infrastructure development, holistic digital drive and promoting financial inclusion. The proposed New legislation for SEZs with states as partners coupled with heightened emphasis on the seven engines under PM Gati Shakti initiative should pave way for a New India that is recognised for its Speed, Productivity and Scale; thus, boosting the country's overall investment attractiveness and export competitiveness.

Aligned with the Prime Minister's AatmaNirbhar Bharat agenda, the Government's commitment to promote self-reliance and indigenisation by leveraging Indian Industry is once again reinforced with the 68% (enhanced) domestic allocation for defence capital procurement. Earmarking 25% of Defence R&D budget for Industry, Start-ups and Academia is a forward looking measure that will pave way for investments in frontier technologies and capability development. Industry in partnership with DRDO through SPV mode for development of critical weapon systems and military platforms is a path-breaking reform that will significantly transform the Indian defence eco-system and lead India to being a net-exporter of defence equipment/platforms.

'Aatmanirbhar Bharat', the share of domestic capital procurement, which was earmarked at 64% in 2021-22, has been enhanced to 68% of the Capital Acquisition Budget of the Defence Services (Rs 1.24 lakh crore) for the FY 2022-23, which would be Rs 84,598 crore.

The Capital segment of the MoD (Civil) budget catering to organisations such as Indian Coast Guard (ICG), Border Roads Organisation (BRO) and Directorate General Defence Estates (DGDE) etc has also seen a notable jump of 55.60%. In absolute terms, this amount is Rs 8,050 crore in FY 2022-23 against Rs 5,173 crore in FY 2021-22.

The Capital Budget of Border Roads Organisation (BRO) has been increased by 40% to Rs 3,500 crore in FY 2022-23 vis-à-vis Rs 2,500 crore in FY 2021-22. This will expedite the progress of creation of border infrastructure including important tunnels (Sela and Naechiphu tunnel) and bridges on major river gaps.

Underlining the importance of overall maritime security, the Capital Budget of the Indian Navy has been enhanced by 44.53%, with a total allocation of Rs 46,323 crore in FY 2022-23. This increase is aimed at acquisition of new platforms, creation of Operational and Strategic Infrastructure, bridging of critical capability gaps and building a credible maritime force for the future.

Additionally, to boost the Coastal Security, the Capital budget of Indian Coast Guard has been enhanced by 60.24% to Rs 4,246 crore in FY 2022-23 vis-à-vis Rs 2,650 crore in FY 2021-22. This enhancement is aimed at building up of assets such as acquisition of ships and aircraft, augmentation of infrastructure, establishment of coastal security network and building up technical and administrative support structures.

Rs 173.03 crore and Rs 131.08 crore have been provisioned under DGDEs Capital Budget for BE 2022-23 and

Ashish Saraf, VP and Country Director for Thales in India

"Thales welcomes the forward looking statements by the Union Finance Minister that seek to strengthen the vision of Aatmanirbhar Bharat. The allocation of 68 percent of the defence procurement budget for domestic equipment in FY23 is a positive step towards self-reliance. Moreover, efforts to foster innovation by earmarking 25% of Defence R&D budget to private firms, start-ups, and academia bode well for all stakeholders and will allow international OEMs to bring more technology into India. We also appreciate the budget's emphasis on collaboration between government and industry, with private companies urged to take on the design and development of military platforms in collaboration with DRDO. These steps will enhance local capabilities and build our expertise at a world class level. We, at Thales, remain committed to strengthen our industrial footprint in India by developing our local teams, futuristic technologies and partnerships in line with the 'Make in India' initiative."


Radars


Military Communications


Weapon Systems


Space Electronics


Satcom for Digital Mobile Radio Relay


Electronic Warfare


Avionics


Electro Optics


Tank Upgrade


Coastal Surveillance System


EVM & VVPAT


Homeland Security & Smart Cities

VISIT US AT HALL 2
DEFEXPO 2022
GANDHINAGAR, 10 - 14 MARCH 2022
PATH TO PRIDE

Military Communications • Radars • Naval Systems • C4I Systems
• Weapon Systems • Electronic Warfare • Avionics • Tank Electronics
• Gun Upgrades • Homeland Security & Smart Cities

BHARAT ELECTRONICS LIMITED
Registered & Corporate Office, Outer Ring Road,
Nagavara, Bengaluru - 560 045. Tel: +91 80 25039300.
Fax: +91 80 25039291. Toll free: 1800 425 0433.
CIN: L32309KA1954GOI000787 www.bel-india.in

भारत इलेक्ट्रॉनिक्स
BHARAT ELECTRONICS
QUALITY, TECHNOLOGY, INNOVATION

Empowering the Nation's Defence Forces

RE 2021-22, respectively, mainly for construction of boundary posts/pillars and perimeter fencing of Defence Land. This is directed towards preventing encroachment on Defence Land.

Towards hand holding of the newly created seven Defence Public Sector Undertakings (DPSUs), Rs 1,665 crore in RE 2021-22 and Rs 1,310 crore in BE 2022-23 has been earmarked for their planned modernisation. Additionally, Rs 2,500 crore in BE 2022-23 and also in RE 2021-22 has been set aside as Emergency Authorisation Fund

Further, for enabling the Defence Industrial eco-system in the country, iDEX and DTIS has been allocated Rs 60 crore and Rs 23 crore respectively in the FY 2022-23. Under the iDEX (Innovations for Defence Excellence) Scheme, MoD aims to create an environment which fosters innovation and encourages technology development in Defence by engaging R&D institutes, academia, industries, start- ups and even individual innovators. Defence Testing Infrastructure Scheme (DTIS) envisages the creation of state-of-the-art testing infrastructure in partnership with the private industry thereby boosting domestic defence and aerospace manufacturing.

Budget Announcement 2022-23: Aatmanirbharta in Defence

- Government is committed to reducing imports and promoting AtmaNirbharta in equipment for the Armed Forces. 68 per cent of the capital procurement budget will be earmarked for domestic industry in 2022-23, up from 58 per cent in 2021-22.
- Defence R&D will be opened up for industry, startups and academia with 25 per cent of defence R&D budget earmarked. Private industry will be encouraged to take up design and development of military platforms and equipment in collaboration with DRDO and other organisations through SPV model.
- An independent nodal umbrella body will be set up for meeting wide ranging testing and certification requirements.

In a series of tweets, Raksha Mantri Mr. Rajnath Singh congratulated the Finance Minister on presenting an excellent Union Budget 2022-23. He said, the Budget would give fillip to 'Make in India', boost demand and build capacities for a stronger, prosperous and confident India.

Ashmita Sethi, President & Country Head for India, Pratt & Whitney

We congratulate the government on a strong, inclusive and growth focused budget in 2022. We believe that the far-sighted measures for energy transition, climate action, and advancing defence R&D with the private sector will be crucial towards securing India's bright future. We would have liked to see additional aviation specific reforms this year, as the sector battles the significant impact of the pandemic.

Azadi Ka Amrit Mahotsav

Showcasing
Defence R&D Ecosphere in India

DRDO participates in

defexpo 2022
India : The Emerging Defence Manufacturing Hub
DEFEXPO 22 INDIA
10th-14th MARCH, 2022 | GANDHINAGAR
Ministry of Defence

Date: *10-14 Mar 2022* | ***Visit us*** *at Hall-10*

Defining India's Future in Advanced Defence Technologies

@DPIDRDO @DRDO_India @dpi.drdo www.drdo.gov.in

From Dubai Airshow'21 to Singapore Airshow'22

LCA Tejas participates at Singapore Airshow

A 44 member contingent of Indian Air Force reached Changi International Airport in Singapore on 12 February to participate in the Singapore Air Show 2022 which was held 15-18 February 2022. The airshow is a biennial event which provides a platform for the global aviation industry to showcase their products.

IAF pitched the indigenous Tejas MK-I alongside participants from across the world. The Tejas aircraft enthralled the audience with its display of low level aerobatics displaying its superior handling characteristics and maneuverability. The participation of Indian Air Force in the airshow provided India with the opportunity to showcase the Tejas and to interact with counterparts from RSAF (Royal Singapore Air Force) and other participating contingents.

In the past, Indian Air Force had participated in similar airshows like LIMA 2019 in Malaysia and Dubai Air Show 2021 to exhibit indigenous aircraft and formation aerobatic teams.

(All photos: IAF)

A Joint Venture of
DRDO, India & NPOM, Russia

Hall 10
R-27

16, Cariappa Marg, Kirby Place, Delhi Cantt.,
New Delhi - 110010 INDIA
Tel.: +91-11-4228 5000 Fax: Tel.: +91-11- 2568 4827
Website: www.brahmos.com Mail: mail@brahmos.com

Bharat Forge unveils multi-terrain artillery gun (MArG) 155-BR

Pune based Indian company Bharat Forge Ltd. launched one of its kind indigenous Multi-terrain Artillery Gun (MArG) 155 – BR at the hands of Defence Minister of India, Mr. Rajnath Singh in the presence of Indian Army Chief General Manoj Mukund Naravane on 21 December 2021. In line with the Government's Make-in-India and Atmanibhar Bharat Mission, Bharat Forge has been making great strides to create defence solutions with high-end technology and advanced manufacturing techniques with the objective to design, develop and manufacture state-of-the-art weapon systems for the Indian Defence Forces.

The Made-In-India Multi-terrain Artillery Gun (MArG) 155 - BR is the only 155mm 39 caliber gun system mounted on 4x4 HMV in the world. The vehicle weighs 18 ton and has the capability to be deployed even in mountain regions. The gun system is equipped with shoot and scoot capability, providing advanced technical performance and high integration.

Speaking on the occasion, Baba N. Kalyani, Chairman and Managing Director, Bharat Forge Ltd. stated, "The path breaking vision of the Prime Minister to make India a self-reliant nation has awakened the spirits and highlighted the importance of the indigenous capabilities of the Indian defence industry. MArG 155 - BR is our endeavour to develop advanced artillery gun defence systems in India. We are grateful for the cooperation, guidance and inspiration provided to us by the Indian Defence Forces to create best-in-class defence solutions made to face futuristic challenges. We are committed to the government's vision of Atmanirbhar Bharat and will continue to help India become a global defence hub by developing defence capabilities not just for our nation but for the world."

With decades of metallurgical know how, manufacturing prowess and innovation driven solution providing capability, Bharat Forge has aggressively scaled up its role during the last two decades in strategic sectors of defence, aerospace and nuclear. Under Make-in India, the organisation has partnered with leading defence companies all over the world to address, design and cater to the requirements of the Indian defence sector. The company is set to take giant leaps and make significant contributions to indigenise the Indian defence sector while helping India achieve the dream of self-reliance.

About MArG 155 - BR:

Only 155mm 39 caliber gun system mounted on 4x4 HMV in the world
Gradient negotiation: 30 (go anywhere gun)
Shoot and scoot capability
All up weight: 18 ton
Capable of firing complete NATO standard and in service ammunition
On board ammunition carrying capacity: 18 rounds with Zone 5
Coming into action time: 1.5 minute in day and 2 minute in night
Elevation: -2 to + 72
Traverse: 25 to Right & Left
Burst Rate: 3 rounds in 30 sec
Intense Rate: 12 rounds in 3 min
Sustained Rate: 42 rounds in 60 min

Defence Minister Rajnath Singh unveils Indigenous Multi-terrain Artillery Gun (MArG) 155 – BR designed and developed by Bharat Forge with Mr. Baba N. Kalyani, CMD Bharat Forge

Indian Army Chief M. M Naravane present at the unveiling ceremony of Artillery Gun (MArG) 155 – BR with Mr. Rajinder Bhatia CEO Bharat Forge Defence and Aerospace and Mr. Baba N. Kalyani, CMD Bharat Forge

‘Beating Retreat’ Ceremony 2022

1000 ‘Make in India’ drones enthral audience

A novel drone show was one of the major attractions of this year’s ‘Beating Retreat’ ceremony, that was graced by President and Supreme Commander of the Armed Forces Mr. Ram Nath Kovind, at the historic Vijay Chowk in the heart of New Delhi on 29 January 2022.

For the first time, the show had been made a part of the ceremony to commemorate 75 years of Independence, being celebrated as ‘Azadi ka Amrit Mahotsav’. Other dignitaries, including Prime Minister Mr. Narendra Modi and Raksha Mantri Mr. Rajnath Singh, witnessed the show, which was conceptualised, designed, produced and choreographed under the ‘Make in India’ initiative.

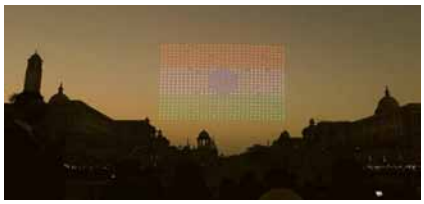
President and Supreme Commander of the Armed Forces Mr. Ram Nath Kovind

Martial musical tunes with Indian fervour were flavour of the ceremony this year. A total of 26 performances enthralled the spectators with foot-tapping music played by the bands of Indian Army, Navy, Air Force and Central Armed Police Forces (CAPF). The entry band was Massed Band playing the ‘*Veer Sainik*’ tune. This was followed by Pipes & Drums Band, CAPF Band, Air Force Band, Naval Band, Army Military Band and Massed Bands. The principal conductor of the ceremony was Commander Vijay Charles D’Cruz.

A number of new tunes were added to the ceremony to celebrate ‘Azadi ka Amrit Mahotsav’. These included ‘*Kerala*’, ‘*Hind ki Sena*’ and ‘*Ae Mere WatanKe Logon*’. The event closed with the ever-popular tune of ‘*Sare Jahan se Acha*’.

The drone show was organised by a startup ‘Botlab Dynamics’ and supported by Indian Institute of Technology (IIT) Delhi and Department of Science & Technology. The show was of 10 minutes duration involving around 1,000 drones fabricated through indigenous technology. Synchronised background music played during the drone show.

Another attraction was a projection mapping show to commemorate 75 years of independence. The show of around 3-4

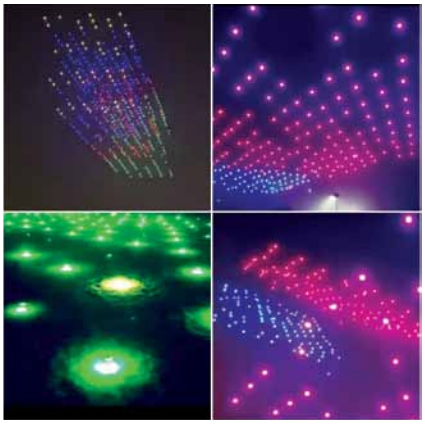


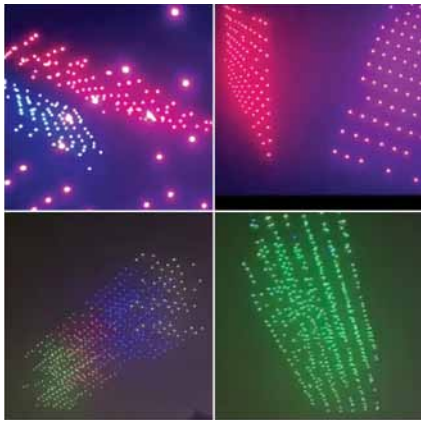
minutes duration was showcased on the walls of North and South Block before the end of the ceremony.

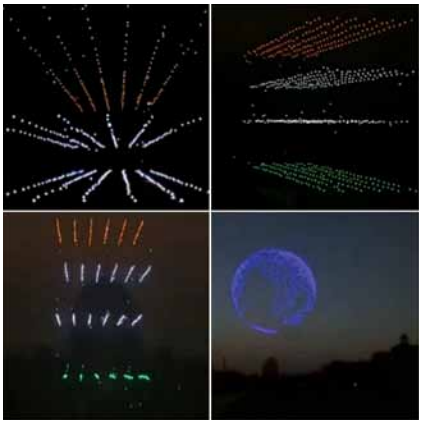
Similar to the Republic Day Parade, eco-friendly invitation cards had been prepared for the 'Beating Retreat' ceremony relevant to the COVID-19 times. The cards were prepared with the seeds of medicinal plants of Ashwagandha, Aloe Vera and Amla embedded in it. People are being encouraged to plant it in their gardens/ flower pots and reap the age-old medicinal benefits.

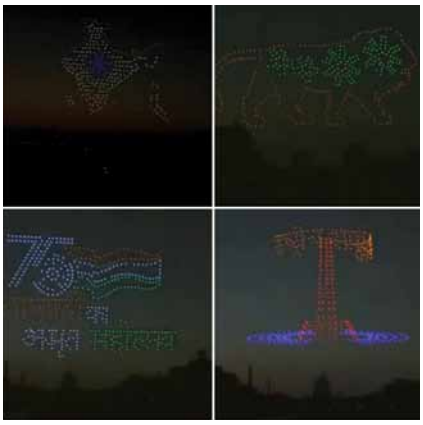
'Beating Retreat' is a centuries-old military tradition dating from the days when troops disengaged from battle at sunset. As soon as the buglers sounded the retreat, the troops ceased fighting, sheathed their arms and withdrew from the battlefield. It is for this reason that the custom of standing still during the sounding of retreat has been retained to this day. Colours and standards are cased and flags lowered at retreats.

Drumbeats recall the days when troops, billeted in towns and cities, were recalled to their quarters at an appointed time in the evening. Based on these military traditions, 'Beating Retreat' ceremony creates a mood of nostalgia of the times gone by.









Indian Army celebrates 74th Army Day

The Indian Army celebrated its 74th Army Day on 15 January 2022. Every year, 15 January is commemorated as "Army Day" to remember the occasion when General (later Field Marshal) KM Cariappa took over the command of the Indian Army from General Sir FRR Bucher, the last British Commander-in-Chief in 1949 and became the first Indian Commander-in-Chief of Independent India.

The new uniform!

Troops in their new combat dress

The Indian Army's theme for the year 2022, "In Stride with the Future", is an acknowledgement of the increasingly critical role played by niche and disruptive technologies in modern warfare. The Indian Army confronts a plethora of security challenges, conventional and non-traditional, and is looking at Artificial Intelligence (AI), 5G, Robotics and Quantum Technology to find innovative solutions to these emerging challenges.

The Army Day celebrations commenced with the Wreath Laying ceremony at the National War Memorial where the three Service Chiefs paid homage to the bravehearts. In his message to all ranks of the Indian Army, the Chief of the Army Staff, General MM Naravane saluted the supreme sacrifice of all personnel who laid down their lives in the line of duty,

On the occasion of Army Day, General MM Naravane, COAS released a Commemorative Postage Stamp, "Permanent Commission to Women Officers in the Indian Army."

The Indian Army also unveiled the latest pattern of its combat dress during the parade

reiterating his unstinted support to the Veer Naris and Next of Kin of the fallen soldiers. He assured the Nation that the Indian Army was operationally ready to deal with any adverse situation.

The Chief of the Army Staff reviewed the Army Day Parade at the Cariappa Parade Ground, Delhi Cantonment and awarded 15 Sena Medals (including five posthumously) for individual acts of gallantry and 23 COAS Unit Citations to units for their commendable performance. The Army Day Parade this year showcased the evolution of various weapon systems held in the Indian Army's inventory. New and modern weapon systems and platforms were displayed alongside their old counterparts. Centurion tanks were followed by Arjun Main Battle Tanks and TOPAS was succeeded by the BMP-II. Similarly pairs of the 75/24 Indian Field Gun and Dhanush, PMP/PMS and Sarvatra bridges and Tiger Cat and Akash surface to air missiles were also on display.

Indian Army unveils monumental National Flag at Jaisalmer

On the occasion of Army Day, on 15 January 2022, the Indian Army unveiled a Monumental National Flag of size 225 feet by 150 feet at Jaisalmer Military Station. This flag is a befitting tribute to the Indian heritage, as it is made of hundred percent Khadi material. The hoisting of flag also commemorates the 75th year of India's Independence being celebrated as Azadi Ka Amrit Mahotsav. In an event organised under strict protocols, GOC of the Battle Axe Division unveiled the National Flag amidst select dignitaries who were amongst those present.

This National Flag, which is clearly visible from a distance of several kilometers, truly 'showcases the pride, aspirations and spirit of nationalism of our citizens'. The flag hoisting was followed by national anthem and a military band display.

The parade also included International Sports awardees and seven marching contingents, including mounted horse cavalry. A song titled 'Maati', sung by famed singer Hariharan, dedicated to the Army and the Nation, was exclusively released during the event.

Indian Army and Exercise TOPCHI

Exercise TOPCHI, the annual firepower demonstration and training exercise of Regiment of Artillery was conducted by School of Artillery, Devlali. The Exercise is testimony to the professionalism of Gunners and evolving Sensor-to-Shooter capabilities of the Indian Army.

Indian Army conducts Airborne Assault Manoeuvres

Indian Army's Specialised Troops conducted Airborne Assault Manoeuvres in the Eastern Theatre to validate Rapid Response Capabilities. The Exercise entailed Multi-Modal Insertion using Static line and Combat Free Fall, precision stand-off drops, rapid grouping and capture of objectives.

Integration with Apache's

Some brigades of the Indian Army successfully conducted integrated training exercise with an IAF Apache gunship squadron. The operational parameters of joint manoeuvres and communication between Apache attack helicopters, AFVs and infantry was successfully validated.

President's Standard awarded to 22nd Missile Vessel Squadron

Mr. Ram Nath Kovind, President of India, awarded the President's Standard to the 22nd Missile Vessel Squadron, also known as the Killers Squadron of the Indian Navy, at an impressive ceremonial parade held at Naval Dockyard, Mumbai on 8 December 2021. A special day cover and a commemorative stamp produced by the postal department were released to mark the occasion. The ceremony was attended by Bhagat Singh Koshyari, Governor of Maharashtra, Admiral R Hari Kumar, Chief of the Naval Staff, Vice Admiral Ajendra Bahadur Singh, Flag Officer Commanding-in-Chief, Western Naval Command and several other civilian and military dignitaries.

The President's Standard is laid on the drums prior to the consecration ceremony

Ram Nath Kovind, President of India awards the President's Standard to 22nd Missile Vessel Squadron in presence of CNS Adm R Hari Kumar, FOC-in-C West VAdm Ajendra Bahadur Singh and Captain K22 Commodore Dalip Singh

Ram Nath Kovind, President of India addresses the gathering during the award of President's Standard to 22nd Missile Vessel Squadron

Continuity drill in progress by the sailors of 22nd Missile Vessel Squadron

An ALH demonstrates winch operations for SAR demo in the naval dockyard during the ceremony

The 22nd Missile Vessel Squadron is based at Mumbai and comprises missile vessels Prabal, Pralaya, Nashak, Nishank, Vipul, Vibhuti, Vinash and Vidyut. The Killers Squadron traces its genesis to the 1971 War when Osa I class missile boats, newly inducted into the Indian Navy from the erstwhile USSR, participated in Operations Trident and Python that were decisive in enabling the Indian Navy dominate operations in the Arabian Sea. The attacks on Pakistan naval units and Karachi harbour during the two operations effectively nullified the Pakistan Navy's war-waging potential and earned these missile vessels the sobriquet 'Killers'.

The year 2021 marked 50th anniversary of the victory in 1971 War and is also the 50th year of the Killers Squadron. The Squadron remains at the forefront of India's seaward defence on the Western seaboard. The President's Standard ceremony witnessed an immaculately conducted ceremonial parade that began with the naval armed guard presenting a salute of arms to the President and was followed by the presentation of the Standard. The ceremony concluded with a Continuity Drill performance by naval personnel and an operational demonstration by MARCOS and naval helicopters.

Indian Navy joins Goa Liberation Diamond Jubilee Celebrations

The state of Goa celebrates 19 December every year as its Liberation Day. To mark 60 years of Goa's liberation, Diamond Jubilee celebrations were held at Panaji on 19 December 2021. To commemorate the occasion, Mr. Narendra Modi, Prime Minister laid a wreath at the martyr's memorial, Azad Maidan. A 100 men tri-service Guard of Honour was presented during the ceremony and buglers played 'The Last Post'. The Prime Minister also witnessed a Parade of Sails by boats of the Indian Navy, Coast Guard and civil agencies; and a flypast by aircraft of the Indian Navy, from the Miramar beach. The Diamond Jubilee events were coordinated by the Indian Navy in the presence of Vice Admiral Ajendra Bahadur Singh, Flag Officer Commanding-in-Chief, Western Naval Command and Rear Admiral Philipose G Pynumootil, Flag Officer Commanding Goa Area.

Mormugao, IN's 2nd ship of Project 15B in maiden sea trials on Goa Liberation Day

Mormugao, Indian Navy's second indigenous stealth destroyer of the P15B class, planned to be commissioned in mid-2022, proceeded on her maiden sea sortie; 19th December is perhaps the most befitting date for the ship to put to sea as this was the day the Nation celebrates 60 years of Goa's liberation from Portuguese rule.

The Indian Navy played a pivotal role in the liberation and dedicating the ship's name to the maritime state of Goa will not just enhance the bonding between the Indian Navy and the people of Goa, but also link the ship's identity permanently to the crucial role the Navy played in nation-building. Mormugao is being built at Mazagon Dock Shipbuilders Ltd (MDSL) as part of the Project 15B destroyers. The ship incorporates several niche indigenous technologies and is a shining example of Atma Nirbhar Bharat. She has provided thrust and impetus to the 'Make in India' initiative. Mormugao will add significantly to the Indian Navy's combat capabilities. With the recent commissioning in November 2021 of INS Visakhapatnam and the fourth P75 submarine INS Vela, commencement of sea trials of Mormugao is "testimony to the cutting-edge capabilities of MDSL and the strong indigenous shipbuilding tradition of a modern and vibrant India".

Indian Coast Guard's 46th Raising Day

Indian Coast Guard celebrated its 46th Raising Day on 1 Feb 2022. From a modest beginning with just 7 surface platforms in 1978, ICG has grown into a formidable force with 158 ships and 70 aircraft in its inventory and is likely to achieve targeted force levels of 200 surface platforms and 80 aircraft by 2025.

As the fourth largest Coast Guard in the world, Indian Coast Guard has played a significant role in securing the Indian Coasts and enforcing regulations in the Maritime Zones of India. To its credit, the force has saved 1226 lives at sea in last one year and 11,082 lives since inception which translates into saving of one precious life at sea every second day. In addition, ICG also saved 339 people in last one year and overall 12,934 personnel have been rescued till date by the service during various 'Aid to Civil Authority' operations viz., assistance provided to civil authorities during floods, cyclones and other natural calamities; most recently during the recent floods in Maharashtra, Karnataka and Goa._

In keeping with the nation's vision of 'SAGAR' & 'Neighbourhood First', ICG has nurtured professional relationships across oceans and established meaningful ties with countries in the Indian Ocean Region for Ocean Peacekeeping. ICG has successfully averted major ecological disasters and emerged as the 'First Responder' in the region by undertaking major firefighting and pollution response operation off Sri Lanka coast, the most recent being onboard Chemical carrier MV X-Press Pearl, namely Sagar Aaraksha-II. Such actions of ICG have garnered immense goodwill and trust of India's littoral friends, as also reflected India's international stature as a strong maritime nation.

Exercises and visits

32nd Indo-Thai Coordinated Patrol (CORPAT)

The 32nd edition of India-Thailand Coordinated Patrol (Indo-Thai CORPAT) between the Indian Navy and the Royal Thai Navy was conducted from 12–14 November 2021. Indian Naval Ship (INS) Karmuk, an indigenously built Missile Corvette and His Majesty's Thailand Ship (HTMS) Tayanchon, a Khamrosin Class Anti-submarine Patrol Craft, along with Maritime Patrol Aircraft from both navies participated in the CORPAT.

Towards reinforcing maritime links between the two countries and with an aim of keeping this vital part of the Indian Ocean safe and secure for international trade, the two navies have been undertaking CORPAT bi-annually since 2005 along their International Maritime Boundary Line (IMBL). CORPAT builds up understanding and interoperability between navies and facilitates institution of measures to prevent and suppress unlawful activities like Illegal Unreported Unregulated (IUU) fishing, drug trafficking, maritime terrorism, armed robbery and piracy. It further helps enhance the operational synergy by exchange of information for prevention of smuggling, illegal immigration and for conduct of search and rescue (SAR) operations at sea.

Indian Navy participates in 'SITMEX'

Indian Naval Ship (INS) Karmuk, an indigenously built missile corvette participated in the 3rd edition of India, Singapore and Thailand Trilateral Maritime Exercise SITMEX–21, from 15 to 16 November 2021 in Andaman Sea. Republic of Singapore Navy (RSN) was represented by RSS Tenacious, a Formidable Class Frigate and Royal Thai Navy (RTN) by His Majesty's Thailand Ship (HTMS) Thayanchon, a Khamrosin Class Anti-submarine Patrol Craft.

SITMEX is being conducted annually since 2019 with an aim to enhance mutual inter-operability and imbibing best practices between Indian Navy (IN), RSN and RTN. The maiden edition of SITMEX was hosted by IN off Port Blair in September 2019. RSN hosted the second edition of the exercise in November 2020. The 2021 edition of the exercise was hosted by RTN in Andaman Sea. The exercise was conducted as a ‹non-contact, at sea only› exercise in view of COVID-19 restrictions and highlighted growing synergy, coordination and cooperation in the maritime domain between the three friendly navies. The two days of maritime drills witnessed the three navies engaged in a various tactical exercises including naval manoeuvres and surface warfare drills.

6th Indo-France "EX SHAKTI 2021"

The Sixth Edition of Indo-France joint military exercise "Ex SHAKTI 2021" commenced at the Military School of Draguignan, France with an opening ceremony on 15 November 2021. The Indian Army contingent was represented by a composite team of three Officers, three Junior Commissioned Officers and 37 soldiers from a battalion of Gorkha Rifles and support Arms.

The training focused on aspects of joint planning, mutual understanding of conduct of operations and identification of




coordination aspects required for jointly operating in a Counter Terrorism environment under United Nations mandate. The participating contingents were also put through paces of combat conditioning and tactical training which included firing drills and 'battle hardening' work sessions. The exercise was conducted in two phases which culminated with a grueling 36 hours exercise to validate the standards achieved during the two phases.

The contingent apart from joint training went to visit MAzargues War Cemetery in Marseilles where 1,002 Indian soldiers of the First World War have been cremated. The Indian and French contingents together presented a Guard of Honour and paid their homage to commemorate the valour of the fallen bravehearts.

French Navy's Chevalier Paul calls at Mumbai port

To demonstrate the strength of Indo-French naval cooperation in the Indo-Pacific, a French air defence destroyer called at Mumbai naval port after taking part in a large-scale air and naval joint exercise off the coast of Maharashtra.

FNS Chevalier Paul, a Horizon-class air defence destroyer is currently deployed in the Indian Ocean as part of France's permanent military presence in the region. As part of this deployment, it made a port call at Mumbai on 18 November 2021, and later at Kochi, marking Indo-French naval cooperation and the central role that India plays in France's naval presence and strategy in the Indian Ocean.




Ahead of its port call in Mumbai, the Chevalier Paul took part in a large-scale Indo-French air and naval exercise on 16-17 November off the coast of Maharashtra. This exercise brought together 16 Indian and French aircraft, including French Mirage 2000 and Rafale's from the Abu Dhabi airbase, as well as the Chevalier Paul destroyer. It aimed to simulate a highly complex air attack and defence scenario. It pitted two teams – each comprising both French and Indian pilots – against each other, in a demonstration of the high level of interoperability achieved by the French and Indian forces.

11th Indo-Maldives 'Ex Ekuverin'

The 11th Edition of Exercise Ekuverin between India and Maldives was conducted at Kadhdhoo Island, Maldives from 6 to 19 December 2021. The exercise is meant to enhance synergy and inter-operability between Armed Forces of both the Nations in terms of understanding transnational terrorism both on land and at sea, conducting Counter Terrorism & Counter Insurgency Operations and sharing best military practices and experiences. Besides rigorous training, the joint military exercise also included cultural and sports activities to enhance defence cooperation and bilateral relations. The exercise "will go a long way in strengthening India's relations with Maldives amidst emerging security dynamics in the Indian Ocean Region".

Mission SAGAR

As part of yet another deployment undertaken by Indian Navy since May 2020 under Mission SAGAR, Indian Naval Ship Kesari entered Port of Maputo, Mozambique on 25 December 2021. This was the eighth such deployment in consonance with the Indian Prime Ministers vision of Security and Growth for All in the Region and was conducted

in close coordination with the Ministry of External Affairs, and other agencies of the Government of India.

These deployments were conducted in solidarity with India›s extended maritime neighbourhood and highlights the importance accorded by India to these special relationships. 500 tonnes of food aid has been shipped by INS Kesari to support the efforts of Government of Mozambique to cope with ongoing drought and concurrent challenges of pandemic. India also remains committed to supporting the capacity building efforts of the Armed Forces of Mozambique. To this end INS Kesari carried two Fast Interceptor Craft and self defence equipment which was handed over to the Armed Forces of Mozambique.

INS Kesari, a Landing Ship Tank (Large) had undertaken similar mission in May/June 2020 to provide humanitarian and medical assistance to Maldives, Mauritius, Seychelles, Madagascar and Comoros, including deployment of Medical Assistance Teams of the Indian Navy in multiple locations.

Since May 2020, the Indian Navy has deployed ships to 15 Friendly Foreign Countries under SAGAR missions. These deployments spanned over 215 days at sea have delivered a cumulative assistance of more than 3,000 MT of food aid, over 300 MT LMO, 900 Oxygen Concentrators and 20 ISO containers. Whilst undertaking, these missions Indian Naval Ships have traversed a cumulative distance of close to 40,000 nm which is nearly twice the circumference of earth. With a steadfast intent of making such high quantum of humanitarian assistance reach its destination in time, personnel from ships and shore organisations of Indian Navy have "invested close to a million man-hours to deliver succour to our friends overseas".

Maritime exercise between Indian Navy and JMSDF

Indian Naval Ships Shivalik and Kadmatt undertook Maritime Partnership Exercise with Japan Maritime Self-Defence Force (JMSDF) Ships Uraga and Hirado in the Bay of Bengal on 13 January 2022. Both JMSDF ships were part of Minesweeper Division One and are on deployment to Indian Ocean Region with Captain Noguchi Yasushi, Commander Minesweeper Division One embarked onboard JS Uraga. The exercise was aimed at strengthening bilateral relations, promoting defence cooperation, enhancing mutual understanding and inter-operability between the two navies and sharing best practices.

Indian Navy PASSEX with Russian Navy

Indian Navy's indigenously designed and built guided missile destroyer, INS Kochi, exercised with Russian Federation Navy's RFS Admiral Tributs on 14 January 2022 in the Arabian Sea. The exercise showcased cohesiveness and interoperability between the two navies and included tactical manoeuvres, cross-deck helicopter operations and seamanship activities.

Western Naval Command conducts Exercise Paschim Lehar

A joint maritime exercise Paschim Lehar (XPL-2022) conducted by the Indian Navy off the West Coast concluded on 25 January 2022. The exercise was conducted over a duration of 20 days with an objective to validate operational plans of the Western Naval Command and enhance Inter-Service synergy among the Indian Navy, IAF, Indian Army and Coast Guard. The exercise was conducted under the aegis of FOC-in-C, Western Naval Command.

The intra-theatre exercise included mobilisation and participation of over 40 ships and submarines of the Indian Navy. In addition, the IAF deployed Su-30 MKI and Jaguar maritime strike aircraft, Flight refuelling aircraft and AWACS, alongside the Indian Navy's maritime reconnaissance aircraft P8I, Dorniers, Il-38SD, unmanned aerial systems and MiG-29K strike aircraft. Various elements of the Indian Army including air defence batteries were also mobilised for the exercise. After a long gap, many OPVs, FPVs and Air Cushion Vessels of the Coast Guard also participated in exercise Paschim Lehar.

A variety of weapon firings in a realistic tactical scenario, besides validation of operational missions and tasks under varying settings, were undertaken during the exercise.






The Opening Ceremony of the biennial Multilateral Naval Exercise, MILAN 22 was held on 26 February 2022. The eleventh edition of MILAN is being hosted by the Eastern Naval Command at the City of Destiny, Vishakhapatnam for the first time. All previous editions have been held at Port Blair under the aegis of the Tri-Service Andaman and Nicobar Command. The participation from Friendly Foreign Countries a 13 ships, 39 delegations and one Maritime Patrol Aircraft. This edition of MILAN is larger and more complex than all previous ones, reflecting India›s "growing stature as a responsible and reliable partner in the maritime domain, underscoring the Indian Navy›s commitment to maritime security across the global commons".

DRDO in overdrive!

New generation ballistic missile 'Agni P' successfully tested

Defence Research and Development Organisation (DRDO) successfully tested the new generation nuclear capable ballistic missile 'Agni P' from Dr APJ Abdul Kalam island off the coast of Odisha at 1106 hrs on 18 December 2021. Various telemetry, radar, electro-optical stations and down range ships positioned along the eastern coast tracked and monitored the missile trajectory and parameters. The missile followed text book trajectory meeting all mission objectives with high level of accuracy.

The Agni P is a two-stage canisterised solid propellant ballistic missile with dual redundant navigation and guidance system. This second flight-test has proven the reliable performance of all the advanced technologies integrated into the system. Raksha Mantri Rajnath Singh congratulated DRDO for the successful flight test and expressed his happiness for the excellent performance of the system. Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy appreciated the efforts of the team to have done the second development flight trial with many additional features and congratulated for the consecutive success within the same calendar year.

Flight test of Vertical Launch Short Range Surface to Air Missile

The Vertical Launch Short Range Surface to Air Missile was successfully flight tested on 7 December 2021 by Defence Research & Development Organisation (DRDO) from Integrated Test Range, Chandipur, off the coast of Odisha. The launch was conducted from a vertical launcher against an electronic target at a very low altitude. The flight path of the vehicle along with health parameters were monitored using a number of tracking instruments deployed by ITR, Chandipur. All sub-systems performed as per expectation. This launch of the system was conducted to validate integrated operation of all weapon system components including the vertical launcher unit with controller, canisterised flight vehicle, weapon control system etc. required for future launches of the missile from Indian naval ships. The test launch was monitored by senior officials from DRDO and Indian Navy. The first trial was conducted on 22 February 2021 and this was a confirmatory trial to prove the consistent performance of the configuration and integrated operation.

Secretary Department of Defence Research & Development & Chairman DRDO, Dr G Satheesh Reddy complemented the teams involved in the successful flight test and said that this paved the way for integration of weapon system onboard Indian naval ships.

Air version of BrahMos test-fired from IAF Sukhoi Su-30MKI

Air version of BrahMos supersonic cruise missile was successfully test fired from an IAF Sukhoi Su-30MKI at 1030 hrs from Integrated Test Range, Chandipur off the coast of Odisha on 8 December

2021. In this copy book flight, the missile launched from the aircraft followed the pre-planned trajectory meeting all mission objectives. The launch was a major milestone in the BrahMos development. It clears the system for the serial production of air-version BrahMos missiles within the country and major airframe assemblies which form the integral part of the ramjet engine are indigenously developed by Indian industry. These include metallic and non-metallic air frame sections comprising ramjet fuel tank and pneumatic fuel supply system. During the test, the structural integrity and functional performance were proven. The air version of BrahMos was last flight tested in July 2021.

Successful tests for Pinaka Extended Range System

Successful tests of Pinaka Extended Range (Pinaka-ER), Area Denial Munitions (ADM) and indigenously developed fuzes were carried out at various test ranges on 11 December 2021. The Pinaka-ER Multi Barrel Rocket Launcher System was successfully tested at Pokharan range. The system is jointly designed by laboratories of Defence Research and Development Organisation (DRDO) - Armament Research & Development Establishment (ARDE), Pune and High Energy Materials Research Laboratory (HEMRL), Pune.

A total of 24 rockets were fired for different ranges and warhead capabilities to meet the objectives of accuracy and consistency. With this, the initial phase of technology absorption of Pinaka-ER by the industry partner has successfully been completed making the industry partner ready for series production of the rocket system. The Pinaka-ER is the upgraded version of earlier Pinaka version which has been in service with the Indian Army for the last decade. The system has been designed in the light of emerging requirements with advanced technologies enhancing the range.

DRDO and IAF test Stand-Off Anti-Tank Missile

Defence Research and Development Organisation (DRDO) and Indian Air Force (IAF) flight-tested the indigenously designed and developed helicopter launched Stand-off Anti-tank (SANT) Missile from Pokhran ranges on 11 December 2021. The flight-test was successful in meeting all its mission objectives. The release mechanism, advanced guidance and tracking algorithms, all avionics with integrated software, performed satisfactorily and tracking systems monitored all mission events. The missile is equipped with a state-of-the-art MMW seeker which provides high precision strike capability from a safe distance. The weapon can neutralise targets in a range up to 10 kms.

The SANT missile has been designed and developed by Research Centre Imarat (RCI), Hyderabad in coordination with other DRDO labs and participation from industries. This is the third in the series of indigenous stand-off weapons to be tested in recent times after long range bomb and smart anti airfield weapon for strengthening the arsenal of IAF.

Supersonic missile assisted torpedo system (SMART) successfully launched

DRDO developed supersonic missile assisted torpedo system SMART was successfully launched from Wheeler Island in Odisha on 13 December 2021. The system is a next generation missile-based standoff torpedo delivery system. During the mission, full range capability of the missile was successfully demonstrated. The system has been designed to enhance anti-submarine warfare capability far

beyond the conventional range of the torpedo. This was a text book launch, where the entire trajectory was monitored by the electro optic telemetry system, various range radars, including the down range instrumentation and down range ships. The missile carried a torpedo, parachute delivery system and release mechanisms.

This canister-based missile system consists of advanced technologies via a two stage solid propulsion, electro-mechanical actuators and precision inertial navigation. The missile is launched from ground mobile launcher and it can cover a range of distances. A number of DRDO laboratories developed various technologies for this advanced missile system. Industry participated in the development and production of various sub-systems.

Flight demonstration of Controlled Aerial Delivery System

Aerial Delivery Research and Development Establishment (ADRDE), Agra conducted a flight demonstration of Controlled Aerial Delivery System of 500 kg capacity (CADS-500) on 18 December 2021. ADRDE, Agra is an R&D laboratory of Defence Research and Development Organisation (DRDO) and the flight demonstration was part of a series of activities organised towards celebrating 'Azadi Ka Amrit Mahotsav', commemorating 75 years of Independence.

The CADS-500 is used for precise delivery of payload upto 500 kgs at predetermined location by making use of manoeuvrable capabilities of Ram Air Parachute (RAP). It uses Global Positioning System for the coordinates, altitude and heading sensors for the heading information during its flight. The CADS, with its onboard electronics unit, autonomously steers its flight path using waypoint navigation towards target location by operating controls. System performance was demonstrated at Drop Zone, Malpura from an altitude of 5000m. The system was para-dropped from an An-32 aircraft and then steered to the predesignated landing point in autonomous mode. Eleven paratroopers of Indian Army and Indian Air Force chased the CADS-500 in air and landed simultaneously.

Flight-test of indigenous aerial target 'Abhyas'

DRDO successfully conducted the indigenously developed High-speed Expendable Aerial Target (HEAT) Abhyas on 23 December 2021 from Integrated Test Range (ITR), Chandipur off the coast, Odisha. During the flight trial, high subsonic speed trajectory at a very low altitude with high endurance was demonstrated. Two boosters provided initial acceleration during launch and a small turbo jet engine is used to sustain high subsonic speed with long endurance. The indigenous data link designed by Bengaluru based industry partner was successfully flown and tested during the flight.

The performance of the system during the entire flight duration was confirmed from the data captured by various Range instruments deployed.

Aeronautical Development Establishment (ADE), Bengaluru based DRDO laboratory along with other DRDO laboratories developed this indigenous unmanned aerial target system to meet the requirement of aerial targets of Indian Armed Forces. The aircraft is controlled from a ground based controller and an indigenously developed MEMS based Inertial Navigation System along with the Flight Control Computer which helps it to follow the pre-designated path in a fully autonomous mode.

Maiden launch of new generation surface-to-surface missile 'Pralay'

Defence Research and Development Organisation successfully conducted maiden flight test of indigenously developed surface-to-surface missile 'Pralay', from Dr A P J Abdul Kalam Island off the coast of Odisha on 22 December 2021. The mission met all its objectives. The new missile followed the desired quasi ballistic

trajectory and reached the designated target with high degree accuracy, validating the control, guidance and mission algorithms. All the sub-systems performed satisfactorily. All the sensors deployed near the impact point across the eastern coast, including the down range ships, tracked the missile trajectory and captured all the events.

The missile is powered with solid propellant rocket motor and many new technologies. The missile has a range of 150-500 kms and can be launched from a mobile launcher and the missile guidance system includes state-of-the-art navigation system and integrated avionics.

Second flight-test of conventional SSM 'Pralay'

DRDO successfully conducted a second flight-test of indigenously developed conventional surface-to-surface missile 'Pralay' from Dr APJ Abdul Kalam Island off the coast of Odisha on 23 December 2021. For the first time, two consecutive flight tests of a ballistic missile were conducted successfully on two consecutive days. The flight test met all the mission objectives. This launch proved the system in both the configurations of the missile. In this launch, the 'Pralay' missile was tested for heavier payload and different range to prove the precision and lethality of the weapon. This launch was monitored by all the range sensors and instruments, including telemetry, radar and electro-optic tracking system deployed across the eastern coast and the down range ships positioned near the impact point.

MPATGM in final deliverable configuration flight test

DRDO successfully flight tested the final deliverable configuration of Man Portable Anti-Tank Guided Missile (MPATGM) on 11 January 2022. The indigenously developed anti-tank missile is a low weight, fire and forget missile and is launched from a man portable launcher, integrated with thermal sight. The missile impacted the designated target and destroyed it. The final impact event was captured on camera and the test has validated the minimum range successfully.

The present test was to prove the consistent performance for the minimum range. All the mission objectives were met. The missile has miniaturised infrared imaging seeker and advanced avionics for on-board control and guidance. The missile performance has been proven for the maximum range in earlier test trials.

Update on IAC-1: sails for 3rd set of sea trials

After two successive high profile visits – the President and Vice President of India – within a span of less than two weeks, IAC Vikrant headed out for the next set of sea trials on 9 January 2022.

Both dignitaries, having reviewed the progress had conveyed their satisfaction and expressed their best wishes to all the stakeholders involved in project. While the maiden sea trials in August last year were to establish propulsion, navigational suite and basic operations, the second sea trial later in October-November witnessed the ship being put through its paces in terms of various machinery trials and flight trials. The ship in fact was out for 10 days proving its sustenance in the very second sortie. Various seamanship evolutions were also successfully cleared during the second sortie. Having gained adequate confidence in the ship's abilities, the IAC now sails to undertake complex manoeuvres to establish specific readings of how the ship performs in various conditions. In addition, various sensor suites of the ship would also be tested.

The IAC has been a success story on numerous counts. Be it the case of Atmanirbharta wherein 76% of the equipment is indigenously sourced or the close engagement between the Design teams of the Indian Navy and Cochin Shipyard Limited – a high-point in the largest and most complex warship ever to be built in the country. That the ship has been able to carry out basic flying operations from its very first sortie itself is a landmark in Indian warship construction history. Despite surging COVID cases in the country and the resultant challenges, the combined teams from multiple organisations associated with the project, are upbeat and committed to meet the timeliness. On successful completion of a series of progressive sea trials, the ship is scheduled to be commissioned as INS Vikrant later in 2022, as the nation commemorates 'Azadi ka Amrit Mahotsav'.

Vice President of India visits IAC/Vikrant

M. Venkaiah Naidu, Vice President, India visited the Indigenous Aircraft Carrier (IAC) 'Vikrant' under advanced stage of construction at Cochin Shipyard Ltd at Kochi, on 2 January 2022. The Vice President of India was briefed on the uniqueness of the project and progress of construction during the visit. He was also briefed about efforts being made towards ship's delivery and commissioning prior August 2022 to commemorate 'Azadi Ka Amrit Mahotsav'. Vice President was appreciative of the Nation's capability in designing and constructing an Aircraft Carrier and lauded it as a shining example of our quest for 'Atma Nirbharta' or self-reliant India. Indian Navy is a formidable resident maritime power in the Indian Ocean Region; and the Aircraft Carrier Battle Group remains central to its concept of operations. Vikrant will provide the Indian Navy with the requisite flexibility, mobility, reach and combat power in pursuance of our national interests and also serve as a strong catalyst for peace and stability in the Indian Ocean Region.

VAYU Interview with

Admiral R Hari Kumar, Chief of the Naval Staff, Indian Navy

VAYU: On the eve of Navy Day 2021, please give us an overview in context to the Indian Navy's modernisation efforts and progress.

CNS: The Indian Navy's modernisation and expansion follows a long-term perspective plan, focused on being a future-ready force, with the capability and capacity to meet evolving challenges. We currently have 39 ships and submarines under construction, with Indian shipyards building 37 of these, contributing significantly to the Government's AatmaNirbhar Bharat initiative.

One of our key projects is the first Indigenous Aircraft Carrier being built at CSL, Kochi. The ship has undergone extensive sea-trials, and is scheduled to be commissioned in mid-2022, giving a major fillip to the Navy's ability to protect, preserve and promote our national interests.

Among other major projects, MDL are building four Project 15B destroyers, of which, the first ship viz. INS *Visakhapatnam* was commissioned on 21 Nov'21. Seven frigates of Project 17A Class, scheduled for induction from 2022 onwards, are also under construction at MDL and GRSE. Further, sixteen Anti-Submarine Warfare Shallow Water Craft have also been contracted. Among submarine projects, the fourth submarine of six under Project 75 viz. INS *Vela* was commissioned on 25 Nov'21.

Apart from vessels under construction, 'Acceptance of Necessity' has also been accorded for another 43 ships and six Project 75 (I) Submarines to be built in India. In the aerospace domain, HAL has been awarded a contract to deliver 12 Dornier 228s, 16 ALH and eight Chetaks. Further, AoN also exist for procurement of 111 Naval Utility Helicopters under the Strategic Partnership Model.

The Indian Navy is working closely with DRDO and the Indian industry to enhance the technological base in the country. Concurrently, there is also a need to enhance the capacity and expertise of our public sector shipyards to reduce build-times, and also involve the private sector to make good current short-falls in our force levels. Naval force modernisation and force accretion is a slow and deliberate process, and the Indian Navy has continued to focus on self-reliance and indigenous solutions in its endeavours.

VAYU: UAV procurements and upgrades for the Indian Navy have been buzzwords for some time now. Where does the Indian Navy stand with regard to some upcoming strategic imports as well as supporting the domestic UAV industry?

See us at
Defexpo 2022
Hall 7
Rafael's Stand R20

ORBITER 4
Small Tactical UAS

Legacy of Excellence

DOMINATOR XP
Medium Altitude Long Endurance UAS

ORBITER 1K
Loitering Munition UAS

Aeronautics Group
Ahead of Time
www.aeronautics-sys.com

CNS: The Indian Navy is progressing procurement of Shipborne Unmanned Aerial Systems (NSUAS) under the Fast Track Procedure (FTP).

A joint case for MALE category UAVs is being steered by the IAF as the lead Service, wherein the requirement of all three services have been included. Further, a joint case for upgrade of MALE UAVs for all Services is also being progressed by IAF as the lead Service.

There is a larger issue also here, that is our focus on unmanned solutions. As challenges become varied and unpredictable, compounded with shrinking budgets, an efficient way to retain combat edge is the induction and use of unmanned solutions. In the coming years, the Indian Navy will continue to focus on unmanned inductions.

VAYU: Could you update on Strategic Partnership (SP) model for progressively building indigenous submarine Project 75(I).

CNS: Project 75(I) envisages construction of six modern conventional submarines at an Indian Shipyard, and is the first case to be progressed under the Strategic Partnership model. It includes several unique requirements like Life cycle sustenance, Indigenisation Roadmap, Incentivisation, Transfer of Technology, etc. The RFP of the project is unique with no precedence in other ship building cases. Certain clarifications related to the SP model and other requirements were sought by the Indian Applicant Companies and potential Foreign Collaborators. These clarifications are being suitably addressed. Further, the ongoing COVID-19 Pandemic has resulted in the host countries of potential Foreign Collaborators imposing travel restrictions affecting conduct of discussions between the Indian Applicant Companies and Foreign Collaborators. All efforts are being made to progress the Project within the envisaged timelines.

VAYU: Please give us an update on the Strategic Partnership (SP) model for building Naval Utility Helicopter.

CNS: The NUH case, being progressed through the SP Model, lays the foundation for achieving self-reliance through transfer of niche technologies. Further, it will enable setting up of a maintenance/repair and overhaul organisation, a manufacturing hub in India, an alternate R&D hub for helicopter manufacturing, skill development of MSMEs, and job creation in India.

The Defence Acquisition Council (DAC) has accorded 'Acceptance of Necessity' for procurement of 111 NUH as replacements for the current fleet of Chetak helicopters. The case is presently awaiting 2nd stage DAC approval for shortlisting of OEMs and SPs. Post approval of DAC, RFP will be issued to shortlisted Firms as per the extant procurement process.

VAYU: The first of 24 MH-60R Seahawk multirole helicopters for the Indian Navy should be operational soon. However, the total requirement is for multiple times as many such helicopters; what is the projected timeline for follow up orders if any?

CNS: Indian Navy is exploring the feasibility of meeting future requirements of Multi Role Helicopters through indigenous sourcing. In keeping with the 'AatmaNirbhar Bharat' vision of the Government, Indian Navy has conveyed its decision to support an indigenous project for Multi-role helicopters to HAL in March 2021. HAL is in the process of preparing a Preliminary Project Report (PPR) for indigenous Multi Role Helicopters.

VAYU: HAL has proposed development of an Indian multirole helicopter (IMRH) which is to meet the requirement for both the IAF and IN. What are the Navy's specific requirements which must be met by this helicopter?

CNS: HAL had submitted a proposal for Design and Development of a Tri-Service IMRH in the Medium Lift category. In keeping with the AatmaNirbhar Bharat vision of the Government, Indian Navy conveyed its decision to support HAL's Indigenous project with 19 Naval Spl-Ops and 41 Multi-role helicopters in March 2021. HAL has proposed three separate variants for the IMRH, viz. Special Ops, Anti Surface Warfare (ASuW) and Anti-Submarine Warfare (ASW), and we have asked them to submit a fresh PPR for development of a common multi-role helicopter with both ASW and ASuW capability. HAL has indicated that it would be able to meet Indian Navy's requirement of common ASW/ ASuW platform and that the fresh PPR would be submitted by end of the year.

VAYU: ADA has supposedly begun development of the LCA Navy MK II, also referred to as the Twin-Engine Deck Based Fighter (TEDBF). Has the Indian Navy seconded personnel to ADA to liaise on this project and what is the timeline leading to its first flight?

CNS: Preliminary work for development of the Twin Engine Deck Based Fighter (TEDBF) has begun at ADA with support from Indian Navy. The Project is being monitored by the Naval Project Office at Bengaluru, which was initially set up to coordinate the LCA (N) project. The aircraft is planned to undertake its first flight by year 2026 and roll out the production variant by year 2031.

STRONG SUPPORT

Project 22356

Multipurpose frigate

ROSOBORONEXPORT

Russian Defence Export

more info at

ROE.RU/ENG/

27 Stromynka str., 107076,
Moscow, Russian Federation

Phone: +7 (495) 534 61 83
Fax: +7 (495) 534 61 53
E-mail: roe@roe.ru

www.roe.ru

Rosoboronexport is the sole state company in Russia authorized to export the full range of defense and dual-use products, technologies and services. Rosoboronexport accounts for over 85% of Russia's annual arms sales and maintains military-technical cooperation with over 100 countries worldwide.

Developing the Tejas Mk 2 A technical assessment

Model of the LCA AF Mk.2 seen at Aero India 2021 (photo: Tejaswi Singh)

There were two interesting interviews related to the LCA project in November '21. One is a rather obsequious "interview" of the first Programme Director. The interview certified that ADA's performance has been entirely to ADA's own satisfaction. This is in contrast to the other interview by the new Air Chief who made no mention at all of the place of the LCA Mk II in the future re-equipment plans of the IAF. Given the trail of unkept promises of the LCA project this lack of mention in an important speech has triggered much speculation. One possible construct of the Air Force's view, could be as follows: ADA has had an "order" for forty aircraft since 2003; about twenty have been delivered, just about sufficient to equip *one* squadron. The aircraft have serviceability and design problems resulting in an availability of around 46 hours/aircraft/per year as compared to the 225 hrs. /aircraft/ year that is demanded from foreign vendors. The aircraft is overweight and lacks range. Now ADA has an additional order for 83 aircraft The Air Force's view may be "let ADA get on with that and then the Air Force will see-no more hot air, no more "pie in the sky" but *habeas corpus* please".

The progress on the project with the "new" Government has been much better than the *laissez faire* of the earlier regime but it too has not been steady, matters not there being helped by the fact that there has been five Defence Ministers in seven years. Continuity is vital. The order for 83 aircraft is an indication of the Government's interest. This order actually "calls the programmer's bluff ". ADA now has to deliver; *more than twenty years after the first flight there cannot be any more excuses.* The Government is keen on local development and the keenness is bringing pressure on the organisations and it is beginning to show. In my view the recent "balbo" of sixteen aircraft at Sulur and the interview alluded to above should not be viewed as unrelated and random unconnected events. The reactions to this pressure by the Government is beginning to tell.

Before I put down my views on the re-engineering of the design to avoid total repetition, I will remind the readers of my earlier writings on the LCA. "Wisdom and Courage" "The case for Simpler Fighters", "Beloved aircraft or Lemon?" "The CAG report 2015" and "An inquest into the HF 24" which though on the HF 24 has interesting references to the destructive interactions between the HF 24 and the LCA programmes. These had appeared in various issues of Vayu between June 2009 and June 2021 and some of the later ones would have also appeared in my blog profprodyutdas2 .blog. https://prodyut7.blogspot.com/

The technical minefield

In developing the Tejas Mark 2 from the current Tejas Mk1/1A is not a straight forward development but more akin to a new programme. The challenges are not technical. The problem lies in what I call the "Caritas" or "soft" part of Product Design.

The Design Team has to achieve the following:

1. Increase the length of the fuselage by about 1.5 mtr mainly to accommodate

Head-on view of the LCA AF Mk.2 (photo: Tejaswi Singh)

the new equipment that has become *de rigeur* over the forty years of development

2. Add a set of canards/stabiliser to relieve the continuous tinkering with the flight control laws.
3. Add certain amounts of equipment long pending.
4. Introduce the F414 engine into the airframe.
5. Reduce drag
6. Reduce weight.

Requirements 1, 2, 3 and 4 are hostile to requirements 5 and 6. About forty percent of the design will have to be revisited. For ADA matters are not helped by the fact that the final product on offer must compare with the Saab Gripen E of similar power and configuration.

The following is my assessment of the task:

Aerodynamically the fuselage needs to be increased by only half a meter between the forward pressure bulk head and the nose cone to get the requisite "C of F" and reduce drag. It is presumed that the remaining 1 meter being added for new equipment and fuel. By my estimates the designers have about 780 litres of volume after subtracting the volume of the inlet trunking. The weight of this length increase equipped will go up by about 450 kilos/ metre. The F 414 engine is about a hundred kgs heavier and will need additional fuel provision and that will naturally cut into the space and weight available for equipment. It is going to be a close-run thing between space, weight and fuel provisioning.

Canards

The HAL team has very few options but to put in canards if the problem is that rewriting the software with every major change is a time-consuming headache. However, Canards are misunderstood in their fine print. That it adds to the total lift is recognised but it is draggy and; careless detail design can wash away *all* the gains of the canard. The problem lies in two areas:

i) The canards and the wing form a "flow between two plates" situation where the resistance increases as the cube of the separating distance. On a small aircraft like the Tejas the separating distance is much smaller and so the drag of the layout will be much more than an identical arrangement on a larger aircraft. To be sure there is CFD but if we go by the claim that the LCA Mk 1 was designed using CFD we are letting ourselves in for another round of uncertainty; we know what happened. Driving the CFD was maybe not a problem but knowing where to go certainly was.

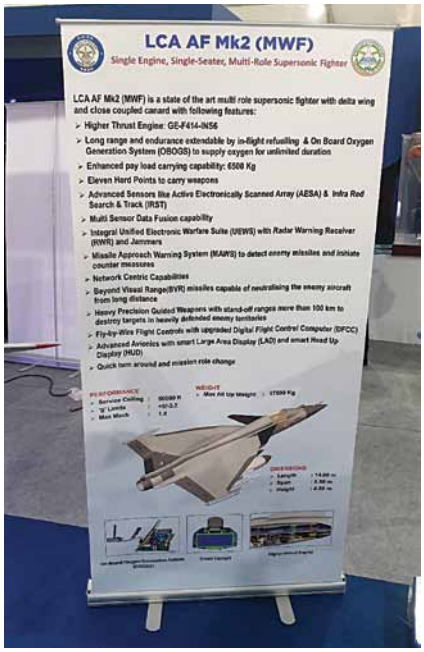
ii) The second problem is that the Tejas wing makes a feature of the "Levcons" which are used to generate additional lift under certain flight conditions. The downwash from the fore planes will affect this flow field significantly being located just forward and above ahead of the Levcons reducing their effectiveness. The flow to the engine will affected whether seriously we will not know as the CFD will not be able to guarantee. The question of what happens when the "levcons" are raised--as has been shown in some pictures--is something of interest --they will act as a dam.

iii) Ideally the fore planes should have a lower aspect ratio so that they can maintain control authority when the wing stalls but generating lift from low AR surfaces does mean drag. One is reminded of a (much disputed!) comparison between the F 16 and the Viggen which were then competing for the NATO orders and it showed that whilst the Viggen had a 16% shorter take off the range of the F 16 was almost double. I mention this as an indication of the care needed in engineering.

The above is an incomplete list of the problem. The problems can be solved - but just how tricky the canard/inlet position in can be is revealed by examining the canards positions in three "in service" fighters with canards and the way those designers have worked to minimise the problems. The Saab Gripen, has the inlet kept well forward of the canards same as its predecessor, the mighty Viggen, accepting the additional weight and drag as a price for uncluttered flow to the engines-engine behaviour in such flow being something that cannot be reliably predicted by CFD-especially if you do not develop your own engines and change on the prototype is always more troublesome than change on the computer.

The Eurofighter Typhoon has the best layout from this point of view. The broad under fuselage as with the F-16, acts as an induction plate guiding the airflow at high angles of attack with the slight anhedral of the canards acting as "endplates" to channel the flow in. The "disturbance effect" of the fore-planes is kept well away from the inlets and it is "long coupled" so the amount of lift it has to generate is less, low aspect ratio canards being "draggier" for a given amount of lift.

The Rafale has a very complicated arrangement but it is, elegant if not simple. Very long and curvaceous strakes separate out the airflow to the inlet well ahead of the canards. The "three dimensional" blended and rounded shape of the strakes assisting in the "channelisation". There is a slight overlap between the canard and the wing but given the size of the aircraft the drag penalty is insignificant compared to the same overlap, say, on the LCA. We are skating on thin ice. Meditation and quiet reflection "thinking first looking around and



LCA Mk.2 proposed cockpit seen here at Defexpo 2020 (Photo: Vayu)

then thinking some again rather than CFD" is the answer. It is true there is CAD/CAM/CAE; CFD can show how the disturbed flow gets into the inlet but it will not show up how much the engine will misbehave. So, trusting on CFD as an antidote to delays without a concurrent ability to flight test quickly will mean a repeat of the delays. There has been no evidence of the ability to test quickly.

Compared to the above the ADA Tejas canard layout seems trouble prone.

Digressing ADA of course has a habit of making various claims/ promises, subsequently found unwarranted. In the claims of use of CFD in the LCA too there is CAD/CAM/CAE but a CFD can show how the disturbed flow gets into the inlet but it will not show up how much the engine will misbehave. There is an interesting anachronism and contradiction When the aircraft was designed in the period 1983 and 1995 i.e., till the roll out of the aircraft CFD, particularly in India, was extremely primitive. The claims about extensive use of CFD during this phase is unlikely to be true. Amusingly, if true, the extensive re-engineering now needed indicates how unskilled the application was! The bright spot is CFD capabilities have gone up by leaps and bounds since then. Unfortunately, what the aircraft needs now as before, is not technology - that is easy, but love and *caritas* which is much more difficult in supply.

The Engine

Much is made of the fact that the GE F 414 engine is a drop fit. A point of worry is the mass flow which is 77 kgs/sec as compared to the 66 kgs/sec of the F404 indicating an enlargement of the inlet trunking if one is not to put up with a 36% increase in duct pressure losses. Given reports that the LCA's inlet system is faulty and does not allow full power even from the existing engine. The new engine will be a convenient occasion to redesign the inlet duct system though a 16% increase in area may eat into the strength of the former fuselage frames' webs.

Quid deinde; What next?

It is not possible for any outsider to know what is ADA's problems in developing to time. I can however share what I have observed from over three decades of developing advanced high-quality equipment in India in several fields of engineering. These are: It is quite probable that many of the LCA's problems originate from the same mindset/culture and therefore may actually be *easily* solvable. These are:

i) The actual problem is rarely known. Usually, some junior engineer reports a problem and that then becomes the gospel truth and that goes up the organisation. Rarely does some seasoned engineer go and make a first-hand survey of the problem. Yes, it happens- and everywhere; Trust me!

ii) Even when the senior man goes and checks up, he is usually from the "management" streamside by training and is as clueless as the young engineer. All the "senior" does is to "manage" the junior and demoralise him by cursing him for being a clueless fool. This shortage of people with engineering interests is of course a by-product of the license permit Raj which, because the market was captive, made engineering and quality control unprofitable whereas "management" i.e. churning out goods for a captive market was paying. The effective opening up of the economy post 1999 has created a cadre of trained development engineers at the middle management level and that will slowly tip the balance.

iii) Finally, there were people with years of experience on the area who would swear very confidently that any change in the status quo in terms of standards, or tolerances or performance was not possible and yet experience shows it was often *surprisingly* easy and *low cost* to put in the necessary upgrades in performance. "It can't be done" etc by senior people with years of experience need not be accepted as the gospel. In fact, "years of experience "may have been the root cause why prompt rectification was not done. Such people, by their disparagement, are often at the forefront of stymieing any effort at correction. It is a defensive reaction. These are personal experience of one practising engineer and no claim is made that it reflects what is the reality with in this particular case.

Given my personal experience and going by the CAG report of 2015 my analysis is thus.

Artistic view of the LCA AF Mk.2 (photo: Tejaswi Singh)

Another view of the LCA Mk.2 (Photo: Vayu)

i) At 7200 kgs the aircraft is badly overweight and correcting the weight alone will transform the Mk1 aircraft into a useful weapon.

ii) If we take the Marut airframe as a starting point then considering that the Marut was larger, over designed and in all metal the LCA Mk 1's *airframe* with its extensive use of composites should weigh between 1900 and 2100 kilos. Is this the case? Indeed, if one compares the F404 engine Gripens (6850 kgs) with the similarly powered LCA Mk 1 then the empty weight of the smaller Tejas Mk1 and 1A should only be around 6200- 6400 kilos

iii) Examples of mis-design is difficult to come across in a" secret" project and ADA has always kept its cards close to its chest. Starting from fundamentals *"fundas "in my college's jargon,* it is clear the weight of an undercarriage strut is a function of the landing weight, the length of the strut between the pivot and the axle and of course the landing speed. The LCA main undercarriage struts should weigh only about 80% of the MiG-21. However, and I confess I say this on the basis of a visual inspection of the undercarriage of a Bison and an early LCA Mk 1, the LCA's undercarriage was definitely "battleship" in its propensities would not look out of place on the *Tirpitz.* I tried to discuss this question with someone who has worked for a long time on aircraft certification but his reaction was typical. He quoted the rules citing the sink rates etc. The question is not the sink rates or the rules which usually have a firm basis. The question is to first establish the comparative weights and see how close we can work to the limits. One hears that Bharat Forge has done an excellent job in weight reduction but how did it that weight get on in the first place? Delays happen because we do the job half cock the first time- not because we are doing it for the first time and so we have to do every job twice. Even then and yet again the question is have we reached the limit? I suspect; aircraft design is all about pushing to the limit but no "bureaucrat" will do that. I use "bureaucrat" because in my humble opinion holding an Engineering degree is merely a license to be allowed to walk on the shop floor.

iv) The improvements in finish as compared to pre 2015 is noticed but again the question is have we reached the limits? The finish of some composite aeroplanes such as the Diamond Arrow is noteworthy. The LCA's is nowhere near; indeed the poor finish of the Hansa is anything to go by it is no wonder the LCA's performance suffered because it appears that the first composites were fabricated by the same sources. That improvements in finish significantly affect performance need not be re-emphasised.

These are three points where I have studied and it would be certain that many other details- The rigging of the aircraft has to be re-examined in case some vey elementary mistakes are being overlooked, electric harness and hydraulic pipeline routing, structural "tricks" to improve weight- "add lightness" was an old and much used phrase.

It appears that the original weight declared i.e., 5500 kilos for the LCA MK 1 as given by the consultants was achievable and would have resulted in a very nippy and useful enough warplane though by the time the consultants design came along almost ten years had gone by since inception and additional equipment was inevitably demanded requiring extensions to the fuselage. Whilst much discourse is available about many technical wonders of the aeroplane the question as to why a 13.2 mts. fuselage was at all accepted from the consultants by the ADA when all other similarly powered aircraft were a least a metre longer is something carefully left unexplained so far. The same goes for the outrageously low aspect ratio.

In sum the situation appears to be like this: Introducing canards to the LCA is a possible solution but one that can run onto the reefs of weigh control and drag reduction especially we continue to show a lack of *caritas*. The proposed layout one sees on the web require refinements along the lines discussed. In addition, there is a new engine to be introduced and that with a new inlet system; my estimate is about forty percent of the drawings will need to be changed which is close to another new design.

Weight control is a skill that ADA has yet to demonstrate but weight makes or breaks an aircraft. With weight of the LCA Mk 1 brought down to around 6200-6400 kgs band the aeroplane will transform into a very reasonable and useful aircraft. Indeed, ADA must demonstrate its ability to control weight on the LCA Mk1/Mk1A along the lines of estimates I have indicated before being trusted with a Tejas Mk 2 or else we will go off on another technical "picnic". Another point to watch is the delivery rate of the aircraft on order. Good intentions are no substitute for hardware. *Habeas Corpus!*

Finally, the Government must begin the process of encouraging the private sector to set up design bureaux so that they can participate ab initio. In the recent tender for unmanned ground combat vehicles (UGVs) some 12 *Indian* contenders offered *thirty five* proposals. Think of the ideas generated, think of the final product which the Army will now request trying to combine the best of every proposal. This can also happen in Aerospace. We can have new projects at one tenth the cost and one fourth the time of what the Government led effort has achieved. The cost to the country will be much cheaper.

By Prof. Prodyut Das

Army, Armour, Armata

The article looks into the capability of the latest Russian grandeur T-14 Armata and try to assess its role as an iron chariot in Indian colours.

In June 2021 the Indian Army released a RFI for the procurement of 1770 next generation main battle tank dubbed the Future Ready Combat Vehicle (FRCV) as the replacement of existing T-72 currently in services. The new one superseded another RFI that had been released earlier in 2017. While both focus on cutting edge technology to defer the potential future threats, the new RFI has added several new criteria amidst emergence of new threats and rapidly changing battle environment. Russia, a traditional weapon supplier to India since early Cold War days, no wonder has extended their warm hands offering their latest and most advanced main battle tank T-14 Armata to India. Not only that, leading another step forward , Valeria Reshetnikova, the Press Secretary of Federal Service for Military-Technical Cooperation (FSMTC) confirmed the offer of new armoured vehicles including a main battle tank based on the Armata Universal Combat Platform to India. The proposal was placed during recent Indian-Russian inter-governmental commission on military and military-technical cooperation as well as during the India-Russia summit . Though Armata is a family of different armoured platforms for different roles this article will focus only on the Main Battle Tank- the T-14 and will try to assess the feasibility of it in the Indian Army.

T-14 Armata

T-14 can be called a 'magnificent piece of art' excelled with armoured technologies best achieved by Russia till date . The project started aftermath of futile 'Project 640' and 'Project 195' of the 90s. The experience led to the further development of highly ambitious technologies and ultimately in 2015 Victory Day Parade for the first time T-14 was showcased publicly. It can be distinguished easily from any other Russian platforms as the hull carries seven wheels on each side rather six as can be seen in T-72/90 and T-80.

Protection

It has an unmanned turret aiming greater protection towards the crew who are placed inside the hull in an isolated armoured capsule. Separated from the ammunition storage, the crew are no more at the mercy of cooking off a stored tank round upon being hit. There's an escape hatch at the bottom of hull for emergency exit. The 44-sv-Sh steel used in T-14 is lighter yet provides an enhanced protection against anti-tank rounds. Thanks to its modular design, it's easy to maintain, repair and change the damaged parts.

Further protection is augmented by 'Monolit' explosive reactive armour (ERA). In ERA a layer of explosive is sandwiched between a pair of metal plates. When triggered by an imminent HEAT (high explosive anti-tank warhead which is used by anti-tank guided missiles as well as anti-tank shells) attack , the explosive inside detonates triggering the plates to move in high speed effectively disrupting shaped charge jet of the warhead as well as increasing the covering length for penetration. Thus the threat is nullified or at least decreased significantly. Traditionally ERA provides protection only against HEAT as those metal plates aren't thick enough to stop KE rounds effectively. Besides, a hit from APFSDS might not trigger an ERA at all! To solve the problem, Russia has developed heavier and new generation ERA like Kontakt 5 and Relikt. Further enhancing the capability, NII Stali has developed Monolit for T-14. Monolit ERA triggers at the exact point of the attack preventing chain explosion increases survivability against multiple attacks.

The air intake and exhaust of the engine are always considered as weak points. So they are reinforced with slat-armour. Besides, armour plates are added to the front side of the glacis. Additionally lower glacis has been fitted with active mine counter measure system, lessons from past mistakes!

The most ambitious prospect of the multi-layer defence possibly will be the "Afghanit" Active Protection System (APS).

Afghanit is equipped with active phased array radars, UV sensors and laser warning receivers (LWR) to identify and track incoming projectiles.

Afghanit is a unique combination of both the "Hard-Kill" and "Soft-Kill" system. There are five hard-kill launchers are mounted on the each side of the turret. While four cartridges of soft-kill system, each carrying twelve smaller charges, are mounted on the top of the turret. The hard-kill interceptor is claimed capable of defeating even KE rounds as well along with anti-tank guided missiles (ATGM). The soft-kill system is developed as a measure against top-attack tandem warhead like Javelin! Top attack ATGMs are still the biggest threat for a tank. In such scenario Afghanit plays a crucial role in the protection of the platform.

No doubt, new generation armour and APS seem much lucrative for Indian Army. The Afghanit with it's unique capability definitely will be a plus point of this platform. However, experts are still skeptical of feasibility of current APS against a high speed KE round. Even if successfully intercepted the velocity will be so high, pieces of the round can still do extensive damage. But army will be interested to see feasible defensive measures against "kamikaze" drones and loitering munitions.

Firepower

The unmanned turret is equipped with 2A82-1M 125 mm smoothbore gun capable of firing a wide ranges of anti-tank munitions. The Vacuum 2 APFSDS (Armour-Piercing Fin-Stabilised Discarding Sabot) which uses a tungsten alloy penetrator is reported capable of defeating at least 1000 mm of rolled homogenous armour at a distance of 2000 meters. Russia has developed a penetrator with depleted uranium alloy as well but obviously this can't be exported. The highly capable KE (Kinetic Energy) round was developed by NIMI originally in the early 90s for the modernised T-72 and T-80! Only a few Western MBT can survive a direct hit from Vaccum rounds but unlikely Chinese origin one, even their latest development Type99A2. Along with the KE round the gun is capable of firing ATGM as well. Two new generation ATGMs are being developed, the 3UBK20 and 3UBK25, to engage at a long range minimising chance of getting hit by the enemy. It must be noted, the Western tanks focus more on the KE rounds and do not use gun launched ATGMs. But this will not be the case with China and Pakistan as their tanks are also capable of firing missiles. In such a scenario, T-14 will be able to annihilate enemy platforms keeping itself out of maximum engagement range of the enemy. There's a 7.62 mm secondary co-axial weapon and the turret is fitted with a 12.7 mm remote controlled weapon system (RCWS).

India has own project to develop a new powerful 125 mm gun and better KE rounds. Today or tomorrow, it will be a reality. Albeit a good offer, only this might not convince the army to go for the platform, or might be!

Mobility

T-14 is equipped with ChTZ 12N360 (A-85-3A) diesel engine with an output of 1500 hp but claimed can generate up to 2000 hp if situation demands so. This will be helpful in critical situations when an extra push is necessary to overcome an obstacle or a quick run to avoid enemy strikes. Note, originally it was to get a better engine but the project didn't see success. It has a 12-speed automatic gearbox, electronically controlled transmission and automatic suspension as well as partial hydraulic one. However the exact nature of transmission and suspension is debatable.

This is definitely the most challenging part India is struggling to overcome with indigenous effort, but with some recent credible success the stone has started rolling.

FCS, Optics and Reconnaissance

The revolutionary automated fire control system will enable the platform to track and identify threat autonomously, thanks to the data on enemy platforms already fed to the computer system!

It is fitted with multiple cameras around the hull and turret to provide a 360° situational awareness. Commander and gunner have new generation optics with visible electromagnetic spectrum, thermography channels and laser range finders .The commander's panoramic sight is integrated with the 12.7 mm RCWS without any kind of visual obstruction thus proving the hunter-killer capability. That means the commander independently can engage a different threat simultaneously with the gunner eyeing another.

According to Russian media, ''Glaz'' reconnaissance system developed by ''Mikran'' can be installed on T-14 as well. Though originally it's a man portable system, in this case it will be remote controlled. The rocket propelled munition can travel more than 1 km of distance and then opens a parachute at a height of 300 meters. While descending it can transmit the tank crew a complete picture of the battlefield. This can come as handy to identify the position of hidden man-portable ATGM operators waiting for ambush!

While India has progressed well in development of indigenous optics and sensors, "Glaz" might be an interesting possession if offered.

Battle Management System

The platform is reported equipped with an integrated computerised control system to monitor the functions of the platform. It is claimed capable of tracking threats in no time and can take own decisions to eliminate it. Edge of AI, is challenging the human might!

It is already mentioned that the tank is fitted with active phased array radars. These help in tracking both the airborne and land targets simultaneously. Thus it can be helpful for target designation to guide other systems as well.

Secured communication channels are used to share information with other units. It helps tank commanders to have a clearer picture of the battlefield enabling to take quick decisions and direct other units.

The last but not the least - Stealth!

Yes, the tank is claimed equipped with stealth technology. But unlike aircraft, tanks are unable to hide themselves completely from enemy weapon locating radars. T-14 has taken several measures to decrease magnetic as well as thermal signature. Besides, it is claimed a special radar-absorbing material is also used to decrease the radar signature.

India has credible success in both the BMS as well as in the field of stealth. Still Russia really have some futuristic components which actually will play the most crucial role in any engagement.

In the Future

To counter the possible threat, NATO countries are working on better tank guns. Rheinmetall is working on 130 mm and Nexter has developed 140 mm smoothbore gun for future tanks. So Russia too doesn't want to lag behind. They have already developed 152 mm gun and a better variant of it might be integrated to T-14 in future.

The Problems

T-14 is no doubt an excellent platform with all the magnificent technologies one will love to see in a tank. But there are some big problems as well with this platform.

First one, it's not tested. More than the advantages, it's much important to know about the flaws of a tank which can lead to catastrophe during military action. All platforms, when under development, carry forward some flaws which are gradually taken care of after thorough inspection. But still some serious unprecedented drawbacks might haunt tank crews amidst extremely critical situation in the battlefield jeopardising its capability. Solving those are much important and only experience can help to understand potential future blockades. Indian Army is using Russian origin platforms for decades and thus experienced with typical problems in T series tanks which have taken care of gradually. But T-14 is completely different from traditional Russian ideology. For any user it will take considerable time to figure out the problems and their solution.

Second problem actually is it's one of most advanced quality itself - the unmanned turret! While it increases the survivability of the crew it decreases the situational awareness as well. Once the externally mounted optics are damaged or taken out, the crew in the hull will be completely blind at that situation. No secondary sight is mounted to help in such conditions. Commander being in the hull can have only limited vision all around. Escaping from a disabled or burning tank through the hull hatches might be problematic. And depending entirely on a remote controlled system might be proved as a grave mistake during a critical moment. In case of barrel jamming, though chances are extremely low but not nil, crew will not have an easy access to solve it.

Third, the weight! Many experts believe, the actual weight of the production model will be close to 60T which is way heavier than what Russia claims. However, there's no way to prove it unless officially measured. Well, it might be described as a Schrödinger's Cat!

Fourth and the most crucial one, the money matter! Of course, it matters. Once promised to deliver 2300 T-14 by 2020, mired with the high cost a token order of just 100 has been placed by Russia! And danger of discontinuation due to financial concerns looming large upon it. India shouldn't take responsibility to rescue it from the grave costing own financial capability.

While it can't be denied T-14 meets much of the requirements of the Indian Army for FRCV, simultaneously these problems are large enough to derail chances of T-14 being the future mainstay of Indian armoured strength. The T-14 is still under extensive trials, new modifications are being done and the future is uncertain. Several other nations are also placing their offer to India which can rival Russian counterpart at ease. On the other hand, India is gradually developing better technologies indigenously to meet the future requirements. Currently there's no existing tank can meet all the requirements of FRCV. But the future will certainly see clash of proposals of highly advanced platforms. At least at this moment, without any doubt it can be said an indigenous attempt will be much fruitful than any foreign offer.

Article by Sankalan Chattopadhyay
(Twitter @vinoddx9)
(All photos: Wikipedia)

UK carriers post Indo-Pacific deployment

By Richard Gardner aboard HMS Prince of Wales

An F-35B of No 617 Squadron takes off during CSG21 (Crown Copyright RN21 photo)

HMS Queen Elizabeth returned to its UK Portsmouth base at the end of 2021 marking the end of a pioneering seven month task force deployment to the Indo-Pacific region. Led by the first of the Royal Navy's new generation aircraft carriers, the nine ships and a nuclear submarine in Carrier Strike Group 21 collectively travelled over 500,000 nautical miles via the Mediterranean, the Middle East, Indian Ocean, and South China Sea, to the Pacific. It visited or worked with 42 nations and took part in 18 major exercises, and reaffirmed the UK's revived military commitment to the region. As reported in Vayu, CSG21 engaged in many maritime exercises and co-operative activities with India's Navy and the Indian Air Force, and is seen in the UK as a step towards re-building closer military and economic ties between the two nations, which share so much history in common as well as a strategic interest in wider regional developments. This is of growing importance in view of the size, reach and aggressive policies of the Peoples Republic of China, which is expanding its naval deployments and base facilities into the Indian Ocean.

The operational journey by CSG21 provided the first real test of the combined multi-service air wing aboard the 65,000t ship, and its jet aircraft completed 3,000 deck landings of which 1,000 were at night. Along the way, the two embarked UK and US F-35B squadrons completed 1,278 sorties and flew more than 2,200 hours. Some 44 combat missions were conducted in support of counter- ISIS missions over Iraq as well as intercepts of inquisitive Russian aircraft based in Syria. Later, in the South China Sea, the ship was subject to close interest from shadowing Chinese ships and aircraft and a high level of air missions were flown over 24 hour periods demonstrating the Air Wing's ability to provide persistent air cover and integrated data sharing with surface and underwater force assets. The carrier's Air Wing flew a total of 4,723hours, with 1,290 at night, and exercised with 64 different aircraft types from 17 nations. Day and night anti-submarine and anti-surface warfare activities were carried out within the task force and with other regional navies including the Indian Navy and very valuable operating experience gained during multiple training exercises involving air, surface and sub-surface elements.

A unique feature of this deployment was the ability to conduct joint operations and exchanges with many other F-35 operators, including those already flying with or awaiting delivery of aircraft, including the Italian, Israeli, Japanese and Singapore armed forces. The UK, US and

Australia are already well into developing their operational F-35 fleets, but there was much regional interest from other naval observers seeing first-hand how the F-35B models can operate alongside helicopters from small flat deck and ski-jump equipped carriers to give an extended fixed wing aviation platform choice, offering increased theatre flexibility. While in the Pacific, HMS Queen Elizabeth's embarked US Marine Corps squadron of F-35Bs flew cross-deck exercises with the USS America and USS Carl Vinson. The combined UK and US F-35B and F-35C Air Wings from the three carriers represented the biggest fifth-generation naval combat air gathering in the Pacific region to date. Invaluable experience was gained throughout the deployment in sortie generation and mission and maintenance sustainment. The integration of the advanced on-board digital systems on the F-35 and ship systems, as well as secure communications and cyber resilience is a highly complex task, but the close co-operation between the UK and US teams aboard the UK carrier provided an enthusiastic baseline to further develop new systems and capabilities in the future.

The advanced design of the new UK aircraft carriers was much admired by US and allied naval air operators, especially in the automated systems that allow rapid weapons distribution and quick sortie turn-rounds with significantly reduced crew numbers. The sophisticated aircraft and deck control and information arrangements represent a step-change in flight-deck design. Additionally, the unique performance of the F-35B and its automated landing systems allows safe all-weather day and night operations, including when the carrier is engaged in at sea replenishment, sailing alongside the support vessel. During CSG21 the carrier also deployed operationally for the first time the Merlin helicopters fitted with Crowsnest Airborne Early Warning and Control radar, and the smaller Wildcat HMA2, which can carry the new Thales Martlet lightweight air-to-surface missiles.

With HMS Queen Elizabeth now back in UK Home Waters, the operational RN focus has switched to the second new UK aircraft carrier, HMS Prince of Wales. On 11 January Vayu was on-board to witness a ceremony marking the ship's new commitment, for the next 12 months, as the NATO Command Ship (Flagship) with the task of leading the alliance's Maritime High Readiness Force, an international task group formed to deal with major global events.

The most senior sea-going staff in the Royal Navy, Commander UK Strike Force, headed by Rear Admiral Mike Utley, has taken charge of the force, ready to deploy in support of NATO exercises and operations throughout the year. This will include major workouts for British and allied forces in the Arctic at the end of the winter, Baltic in the summer, and an extensive deployment to the Mediterranean in the autumn. To mark the formal transfer of command from the French Navy, for 2022, the NATO flag was raised aboard the carrier during a ceremony where Fleet Commander, Vice Admiral Andrew Burns, supported by Captain Steve Higham, Prince of Wales' Commanding Officer, inspected some of the ship's company before addressing them.

"Our battle staff have been preparing for this responsibility over the last 12 months by exercising and developing the capabilities required, which culminated in NATO's Dynamic Mariner exercise in September 2021," Admiral Utley said. "This exercise demonstrated to our NATO allies that the UK's carrier strike capability will strengthen NATO countries' long-term ability to work side-by-side and our commitment to each other."

As well as a test of the battle staff, it will be the first test of HMS Prince of Wales since the carrier was declared fully operational last autumn following two intensive years of trials and training. This year, as the NATO Command Ship, the carrier will spend over 200 days at sea operating globally with allies and is ready to lead UK carrier operations for NATO over the next 12 months. The lessons from CSG21 are paving the way towards longer-term plans to broaden how the full capabilities of the carriers are exploited. The planned lifetime of the two carriers stretches to over 50 years ahead and clearly much will change in terms of what new technologies and capabilities will be needed. Already the Royal Navy and UK MOD is investigating

A Merlin helicopter fitted with Crowsnest early warning and surveillance system taking off with radar in the retracted position (Crown Copyright RN21 photo)

The Commanding Officer of HMS Prince of Wales, Captain Steve Higham RN (Richard Gardner photo)

The ceremony marking the appointment of the new UK aircraft carrier as NATO Flagship for 2022 (Richard Gardner photo)

how unmanned systems might be integrated into a carrier air wing to augment crewed aircraft and that might offer a practical and affordable solution to increasing combat strength as well as providing new platforms that enhance operational flexibility. Other areas being studied under the title of the Future Maritime Aviation Force recognise areas where more attention is needed, including fixed wing airborne early warning, naval sustainment air lift and persistent ISR. HMS Prince of Wales has already trialled the use of Jet Banshee target aircraft as part of a threat simulation exercise and this may lead to adoption as the launchers and vehicles require little deck-space.

While aboard, Vayu was able to talk with the ship's captain and senior naval staff. Captain Steve Higham stressed the importance of preparing and training for joint operations with allies that was essential as the threat from Russia and China was growing, especially the ability of submarines to interfere in sub-surface communications links and it was important to know the location of such adversaries - in all domains. He pointed out that a large carrier was a great force multiplier and could provide a wide range of assets, from combat air power to anti-submarine warfare and in support of an amphibious task group. He said that the UK's Carrier Air Groups could be tailored to whatever the mission required, and no doubt as well as its prime operational value providing a mobile platform for all types of air vehicle, it also possessed a great potential for assisting in humanitarian emergencies when local facilities might be unavailable. He said, "I'm very excited as in the coming months the carrier will be undertaking new capabilities from the Arctic to the Mediterranean, working closely with a multi-national team of aviators, soldiers, marines and sailors in a state of high readiness. We will be delivering mixed Air Groups for the Royal Navy, Country and NATO and will be taking on NATO Flagship duty with pride, passion and purpose."

HMS Queen Elizabeth returned to its home base at Portsmouth at the end of 2021 after its first deployment to the Indian Ocean and Pacific (Crown Copyright RN21 photo)

Merlins with Crowsnest radar lowered (Crown Copyright RN21 credit)

Also embedded aboard HMS Prince of Wales is Lt Cdr Michael Schelcher of the US Navy. A specialist in air and sea operations he anticipates his next posting will be as a USN carrier captain, and is in high praise of how well the US and UK F-35B squadrons operated during CSG21. He said, "Such combinations offer almost limitless capabilities. Area denial, or air dominance, is a key requirement and many lessons have been learnt during the deployment, with integrated communications and data networks being a key to success". He added, "Having the UK carrier with the US 6th Fleet in the Pacific was a huge force multiplier and crews and support teams had much in common, but also did some things differently. Tactical methods, equipment and applications were sometimes different but NATO standards applied and overall it is an awesome capability and must be respected."

There can be little doubt that the deployment of CSG21 to the Indo Pacific region has provided ample evidence of the wisdom of such a development, especially at a time of rising international tensions, and the operational benefits and experiences that are now being evaluated and discussed will ensure that it is not going to be a "one-off" exercise. The UK has invested in new naval support facilities in the Gulf and in Singapore and committed Royal Navy warships to providing a permanent naval presence using these bases. In addition, plans are already underway to prepare for more Indo-Pacific task forces in the future, led by an aircraft carrier or vessels equipped with helicopters for amphibious operations as well as anti-submarine or surface warfare. Although the UK's past policy of maintaining huge overseas bases has ended, providing flexible multi-service operational assets in support of international sea power activities has always been maintained as an option, and this capability is now being upgraded in line with new threats emerging.

Authored by Richard Gardner, this article is his second in the series of CSG21 deployment in the Indo-Pacific.

A pretty image showing RFA Tidespring, which was one of the supporting replenishment ships in CSG21, on its return to Portsmouth alongside HMS Warrior, the first iron-hulled RN warship (Crown Copyright RN21 credit)

Why drone Point Defence Solutions are "pointless" for Strategic Asset Protection

The Indian Air Force (IAF) base in Jammu was rocked by two IED blasts in the early hours of 27 June 2021, when two drones dropped high grade-explosives that damaged the roof of a building and injured two IAF personnel. This is being dubbed as the first drone-based terror attack ever launched on India and signals towards an ominous future, where Unmanned Aerial Systems (UAS), autonomous weapons systems would be employed as new modes of attack strategy.

The discussions about such terror attacks began in 2018 when Syrian rebels used homemade drones to attack Russian military bases in Syria and Venezuelan President Nicolas Maduro narrowly escaped an assassination attempt by a GPS-guided drone attack the same year. And it further gained momentum in 2019 when Yemen's Houthi rebels claimed responsibility for bombing two key Saudi oil installations. There was also a video, on the internet, from Libya of a Turkish drone destroying a Russian Pantsir missile defence system. Next came the veteran S-300 air defence system — also Russian — being taken out in Nagorno-Karabakh by an Israeli-built Harop loitering munition.

Today, the Smart Drone defence system has gained tactical importance for its ability to protect strategic assets in asymmetric warfare. Companies across the globe have developed solutions to address the meandering threat. Experts say that the balance of power between drones and air defence systems is shaping up to be a key to global wars in the near future. Libya, Nagorno-Karabakh, and also Syria have just shown us that if a fielded force cannot protect its airspace, then the large-scale use of UAVs can make life extremely dangerous. Smart drones are classified into Autonomous UAVs, Low RCS Missiles, Smart munitions, and Swarm Drones.

However, behind the cacophony of high-decibel pitch claims by drone defence manufacturers, one needs to understand how drone defence works. Let's break this down.

First off, we're splitting all the Drone defence tech into two categories: Monitoring Equipment and Countermeasures.

Drone monitoring equipment can be passive (simply looking or listening) or active (sending a signal out and analysing what comes back) and can perform several functions, including:

· Detection - (might detect birds too)
· Classification or Identification – (Separates the drones from the birds and also helps in classification of drone category for effective counter measure)
· Locating and Tracking (to know the drone's exact location)
· Alerting

You should be aware that not all equipment performs all of the above functionalities at the same time.

There are four main types of drone monitoring equipment:

Radio Frequency (RF) Analysers

RF Analysers consist of one or more antennas to receive radio waves and a processor to analyse the RF spectrum. They're used to try to detect radio communication between a drone and its controller. Some high-end systems can also triangulate the drone and its controller when using multiple radio units spread far apart.

Pros: Can be low cost, detects (and sometimes identifies) multiple drones and controllers, passive so, no license required. Some can triangulate drone and controller positions.

Cons: Doesn't always locate and track drones, can't detect autonomous drones, less effective in crowded RF areas, typically short-range.

Acoustic Sensors (Microphones)

Usually, a microphone, or microphone array (lots of microphones), which detects the sound made by a drone and calculates a direction. More sets of microphone arrays can be used for rough triangulation.

Pros: Detects all drones within the near-field, including those operating autonomously (without (RF-emissions). Detects drones against ground clutter where other technologies can struggle. Great gap-filler in areas outside line-of-sight of other sensors. Highly mobile and quickly deployable. Completely passive.

Cons: Doesn't work as well in a noisy environment. Very short range (max. 300-500m)

Optical Sensors (Cameras)

Essentially a video camera. As well as standard daylight cameras, optical sensors can be infrared or thermal imaging.

Pros: Provides visuals on the drone and its (potential) payload, can record images as forensic evidence for use in eventual prosecution.

Cons: Difficult to use for detection by itself, high false-alarm rates, mostly poor performance in dark, fog, etc.

Radar

A device using radio energy to detect an object. Drone detection radar sends out a signal and receives the reflection, measuring direction and distance (position). Most radars send their radio signal

as a burst, then listen for the 'echo'. However, almost all radars are designed to NOT pick up small targets. They are designed for large object tracking, like passenger aircraft.

Pros: Long range, constant tracking, highly accurate localisation, can handle hundreds of targets simultaneously, can track all drones regardless of autonomous flight, independent of visual conditions (day, night, fog, etc.)

Cons: Detection range dependant on drone size - most do not distinguish birds from drones - requires transmission license and frequency check to prevent interference.

Countermeasures

Countermeasures can be grouped as either Physically destroying the drone; Neutralising/Repulsing the attack or Taking control of the drone.

RF Jammers

An RF Jammer is a static, mobile, or handheld device that transmits a large amount of RF energy towards the drone, masking the controller signal. This results in one of four scenarios, depending on the drone:

Pros: Medium cost, non-kinetic neutralisation.

Cons: Short-range, can affect (and jam) other radio communications, can result in unpredictable drone behaviour, could unintentionally send the drone to its target.

GPS Spoofer

This device sends a new signal to the drone, replacing the communication with GPS satellites it uses for navigation. In this way, the drone is 'spoofed' into thinking it's somewhere else. By dynamically altering the GPS coordinates in real-time, the drone's position can be controlled by the spoofer. Once control is gained the drone can be directed to a 'safe zone'.

Pros: Medium cost, non-kinetic neutralisation.

Cons: Short range can affect (and jam) other radio communications.

High Power Microwave (HPM) Devices

High Power Microwave (HPM) devices generate an Electromagnetic Pulse (EMP) capable of disrupting electronic devices. The EMP interferes with radio links and disrupts or even destroys the electronic circuitry in drones (plus any other electronic device within range) due to the damaging voltage and currents it creates. HPM devices may include an antenna to focus the EMP in a certain direction, reducing potential collateral damage.

Pros: Within the range, the drone can be stopped effectively, non-kinetic.

Cons: High cost, risk of unintentionally disrupting communications or destroying other electronic devices in the area, drone effectively switches off instantly falling uncontrolled to the ground.

Nets & Net Guns

Firing a net at a drone, or otherwise bringing a net into contact with a drone stops the drone by prohibiting the rotor blades.

Pros: Physically captures drone – good for forensics and prosecution, ground-launched net cannons are semi-automatic with high accuracy, a drone deployed nets have a long-range, low risk of collateral damage.

Cons: Kinetic solution could result in debris depending on parachute options, drone deployed nets imprecise and long reload time, ground-launched nets have a short range.

High-Energy Lasers

A high-powered optical device that produces an extremely focused beam of light, or laser beam. The laser defeats the drone by destroying the structure and/or the electronics.

Pros: Physically stops the drone.

Cons: High cost, risk of collateral damage, large system, mostly experimental technology.

The inherent shortcoming of Point Defence System

If you haven't noticed the common thread yet, to neutralise a UAV threat there must be a physical sighting!

Point defence Anti-UAV systems, currently being contemplated, are deployed at high-value assets. They wait for the target to approach their defended bubble which is a few sq km at best and unsuitable to counter and protect large defence bases and linear infrastructure like international borders. These areas are sensitive areas and subjected to a variety of threats limited to UAVs. Other Low RCS threats include Loiter Munitions, Stand Off weapons, Smart Munitions, and Swarm Drones. Also, the fact that current systems rely on physical sighting for engagement is a huge limitation. As a computation, a minimum of 300 systems is required to be deployed to protect the entire 4000 plus mile border stretch that India shares with Pakistan and China, which is financially not a viable option.

Furthermore, the biggest shortcoming of any of the available off the shelf drone defence tech is that they are at best C2 systems, which means that data that is collected in the field by humans, sensors, or some other means, is then sent back to Command and Control (C2) for analysis and presented to decision-makers. The human intervention in the kill chain process can prove fatal as seen in the Budgam Mi-17 crash.

Autonomous Defence is the future

Autonomy will fundamentally change the dynamics of warfare. Smaller, faster computers, and the ability to split sensing and processing between different nodes, open all kinds of novel possibilities for weapons and warfare.

It needs to be clearly understood that the threat is not from off-the-shelf toys but from extremely well-developed autonomous military-grade technologies. The need, therefore, is for a far more comprehensive approach in this space, which is essentially a sub-space of air defence. A suite of multi-spectral illumination, wide-area distributed surveillance network light data transfer, even and distributed engagement capability, autonomous Non-Rule-based engagement modules powered by Artificial Intelligence would be necessary to protect linear infrastructure and large-sized strategic assets. An immediate move in this direction will be the only option for defences to stay on par with the hugely autonomous weapons, platforms, and UAVs including SWARM threats.

Autonomous Defence/ Weapon Systems are touted as the 3rd revolution in warfare, where a combination of technologies powered by Artificial Intelligence, Cybersecurity, and Robotics are capable of identifying, assessing, deciding, acting, and evolving autonomously in real-time. Whether the threat is single or multiple or a combination of UAVs, Low-RCS, Loitering Munitions, and such, is capable of countering all such threats.

The author, Wg Cdr Sai Mallela, is the CEO Defence at Grene Robotics

First Strike with DRDO's Rudram NGARM

Previously referred to as New Generation Anti-Radiation Missile (NGARM), Rudram-1 is an Anti-Radiation Missile (ARM) developed by Defence Research & Development Organisation (DRDO) and marks a significant development. Defence Research & Development Laboratory (DRDL) is the primary agency which carried out the design and development of the missile system along with Armament Research & Development Establishment (ARDE), Defence Electronics Research Laboratory (DLRL), High Energy Materials Research Laboratory (HEMRL), Research Centre Imarat (RCI) and Terminal Ballistics Research Laboratory (TBRL). Software Development Institute of the Indian Air Force (IAF) helped in the integration of the ARM with Sukhoi Su-30MKI while the Hindustan Aeronautics Limited (HAL), Nasik Division, did the AKU-58 launcher modification which undertook extensive wind-tunnel tests at National Trisonic Aerodynamic Facilities (NTAF) division of National Aerospace Laboratories (NAL).

Meant for Suppression of Enemy Air Defences/Destruction of Enemy Air Defences (SEAD/DEAD) roles, the missile can be launched from large stand-off distances to target enemy surveillance and Fire Control (FC) radars, hostile emitters and communication systems thus creating a surveillance gap in the enemy territory. The missile is comparable to the AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) that can engage re-locatable Integrated Air Defence Systems (IADS) targets and other targets equipped with shutdown capability. On 9 October 2020 India successfully test-fired a Rudram 1 ARM at the Interim Test Range (ITR) Balasore, off the coast of Odisha in the Bay of Bengal which fulfilled all required mission parameters. The production of the Rudram-1 will be undertaken by Bharat Dynamics Limited (BDL) and Bharat Electronics Limited (BEL).

Rudram-1 has a range of 100 to 250-km, can be launched from a height ranging from 500-meters to 15-km and is presently integrated with Indian Air Force (IAF) Sukhoi Su-30MKI as its primary test platform, although can be integrated with Dassault Mirage 2000 I/TI, Dassault Rafale, SEPECAT Jaguar and HAL Tejas.

The missile is a single-stage, approximately 5.5-metre in length and weighs 600-kg with cruciform wing surface to increase high manoeuvrability and to give constant aerodynamic characteristics similar to Astra Beyond Visual Range Air-to-Air Missile (BVRAAM). It uses 60-kg pre-fragmented warhead with optical proximity fuze and is powered by a dual-pulsed solid rocket motor made by Premier Explosives Limited (PEL) under technology transfer from DRDO. The dual-pulsed solid rocket motor produces variable thrust within a range of Mach 0.6 to Mach 2 that reduces the overall reaction time while widening the targeting envelope as well as the engagement capability.

Sayan Majumdar

Atul Dinkar Rane is new BrahMos CEO & MD

Atul Dinkar Rane has been appointed as the new Chief Executive Officer and Managing Director of BrahMos Aerospace Limited that manufactures the BrahMos supersonic cruise missile.

Rane is renowned for his decades of sustained R&D contributions in the indigenous design and development of mission critical Onboard Computers (OBC), hardware in loop simulation studies, systems analysis, development of mission software and avionics technologies for defence applications. His pioneering contributions and techno-managerial leadership has been transformative for the successful development and induction of BrahMos Supersonic Cruise Missile into Armed Forces. Rane graduated in Electronics and Communication Engineering from Guindy Engineering College, Chennai and received his post-graduate degree in Guided Missiles from the University of Poona. He joined DRDO in the year 1987 and started his initial career at Defence Research and Development Laboratory (DRDL) as System Manager and carried out simulation studies and established modular real-time simulation test mechanisms for the indigenously developed Surface to Air Akash Missile System. Later as part of onboard computers division, Research Centre Imarat (RCI), he led the development of Onboard Mission Software for Agni-I missile and also established a unique integrated testbed facility for seamless test and evaluation of Onboard Systems for various missile projects.

Air version of BrahMos tested

Air version of BrahMos supersonic cruise missile was successfully test fired from an IAF Sukhoi Su-30MKI at 1030 hrs from Integrated Test Range, Chandipur off the coast of Odisha on 8 December 2021. In this copy book flight, the missile launched from the aircraft followed the pre-planned trajectory meeting all mission objectives. The launch was a major milestone in the BrahMos development. It clears the system for the serial production of air-version BrahMos missiles within the country and major airframe assemblies which form the integral part of the ramjet engine are indigenously developed by Indian industry. These include metallic and non-metallic air frame sections comprising ramjet fuel tank and pneumatic fuel supply system. During the test, the structural integrity and functional performance were proven. The air version of BrahMos was last flight tested in July 2021.

BrahMos supersonic cruise missile, with enhanced capability, successfully tested

BrahMos supersonic cruise missile, with enhanced capability, successfully tested BrahMos supersonic cruise missile, with increased indigenous content and improved performance, was successfully test-fired from Integrated Test Range, Chandipur off the coast of Odisha at 1030 hrs on 20 January 2022. The launch was conducted by Brahmos Aerospace in close coordination with the teams of Defence Research and Development Organisation (DRDO). In this text-book flight, the missile followed the predicted trajectory meeting all mission objectives.

The flight test is a major milestone in the way forward for BrahMos programme. The highly manouverable missile cruised at supersonic speed for its maximum range and all mission objectives were met. The missile was equipped with the advanced indigenous technologies and followed a modified optimal trajectory for enhanced efficiency and improved performance. The missile with the modified control system has been fine tuned to achieve an enhanced capability. This flight test was monitored by all the sensors of the range instrumentation including telemetry, radar and electro-optical tracking systems deployed across the eastern coast and the down range ships.

Teams from DRDO and NPOM, Russia participated in the test. BrahMos Aerospace, the joint venture between DRDO and NPOM, Russia, has been continuously upgrading the powerful, highly versatile BrahMos to increase its effectiveness and lethality against sea and land targets. BrahMos is the potent missile weapon system already inducted into the Armed Forces.

SSM variant of Brahmos tested

On 11 January 2022, advanced sea to sea variant of BrahMos supersonic cruise missile was tested from INS Visakhapatnam. Missile hit the designated target ship precisely.

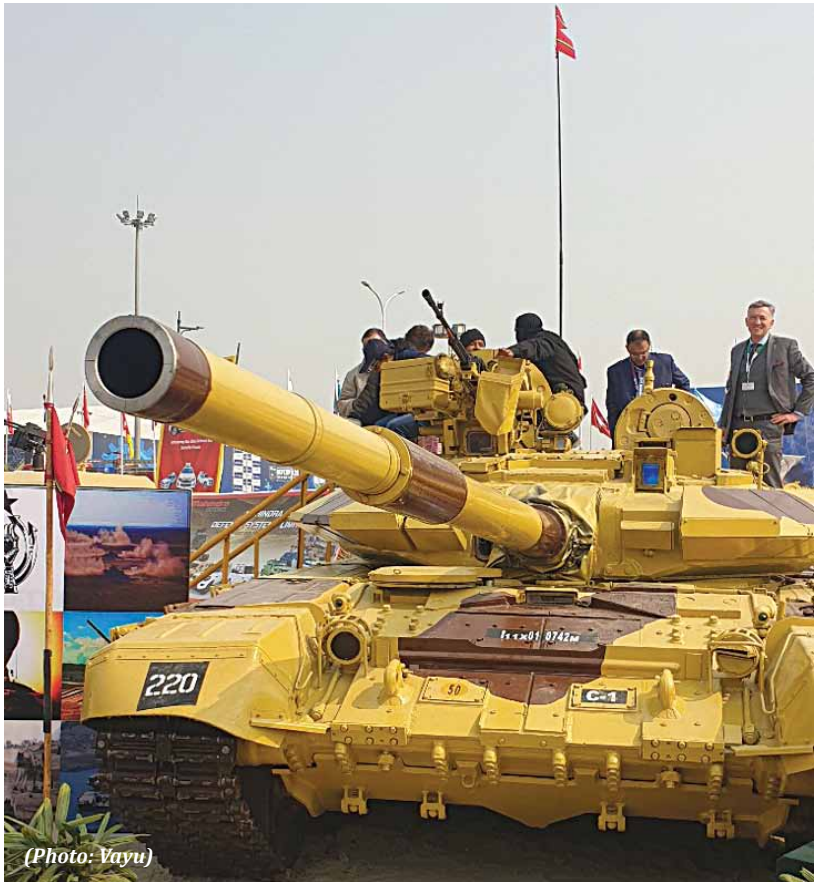
BEL to supply of 957 Commander Thermal Imager/Day Sights for T-90 MBTs

(Photo: MoD)

Providing a further boost to the 'Make in India' initiative of the Government of India in the Defence Sector, the Acquisition Wing of the Ministry of Defence has signed a contract for Rs. 1075 crore with Bharat Electronics Limited (BEL) for the retro-modification of Commander Sight of Battle Tanks-T-90. The retro-modification will be carried out in 957 T-90 tanks of the Indian Army.

Commander sight of Battle Tank T-90, India's premier battle tank, is presently fitted with Image Converter (IC) tube-based sight for night viewing. Based on the requirement projected by the Indian Army, DRDO and BEL have jointly designed and developed an advanced Mid Wave Thermal Image (MWIR) based sight as a replacement for the existing IC-based sight.

The new retro-modified Commander sight employs a thermal imager capable of detecting the targets at 8 kms during day and night and a Laser Ranger Finder (LRF) to find the ranges accurately up to 5 kms, thereby enhancing its capability to engage target at longer ranges. With the corrections from ballistic software and LRF, the Commander of T-90 can detect, engage and neutralise the targets with phenomenal accuracy. The indigenously developed sight completed extensive evaluations under field conditions successfully.



(Photo: Vayu)

HAL signs contract for export of ALH to Mauritius

In-line with Government's vision to boost defence exports to friendly foreign countries, HAL signed a contract with Govt. of Mauritius (GoM) on 19 January 2022 for export of one Advanced Light Helicopter (ALH Mk III) for Mauritius Police Force. The Govt. of Mauritius already operates HAL built ALH and Do-228 aircraft. With this contract, HAL and GoM have further strengthened the long standing business relations spanning over three decades.

File photos of the ALH Mk.III of the Indian Army and IAF

The contract was signed by Mr. BK Tripathy, General Manager, Helicopter Division-HAL and Mr. OK Dabidin, Secretary of Home Affairs, Prime Minister's Office, Govt. of the Republic of Mauritius recently at HAL's Transport Aircraft Division, Kanpur in the presence of Mr. Apurba Roy, General Manager, TAD-Kanpur, Mr. K Jhugroo, Deputy Commissioner of Mauritius Police, Mrs. P Sohun, Dy Permanent Secretary, Govt. of Mauritius, Mr. T Abdoolahkhan, Chief Inspector of Mauritius Police and Mr. Arup Kumar Mallick, Addl. General Manager (Mktg)-HAL.

The ALH Mk III is a multi-role, multi-mission versatile helicopter in 5.5 tonne category. It has proven its mettle in various utility role including numerous lifesaving missions during natural calamities in India and abroad. More than 335 ALHs have been produced till date logging around 3,40,000 cumulative flying hours. HAL also ensures technical assistance and product support to the customer to ensure healthy serviceability of the helicopter.

HAL and the Dornier 228: a status update

Hindustan Aeronautics Limited (HAL) Transport Aircraft Division (TAD) at Kanpur has been manufacturing 19 seater Dornier Do-228 since 1983 under Transfer of Technology from Germany. As of February 2022, more than 150 military Do-228 aircraft have been produced and supplied to various customers. Two civil Do-228 aircraft have also been produced by HAL.

The Research & Development efforts for an indigenous civil transport aircraft have been initiated by HAL to develop a prototype Hindustan-228 aircraft, based on Dornier Do-228 platform. HAL has signed two MoUs with foreign companies for exploration of possible co-operation with no financial commitment, regarding development of an amphibian variant of Hindustan-228 aircraft. Also, ZeroAvia and HAL are to work together for a hydrogen-electric powertrain capable of flying the Dornier 228 up to 500 NM

For development of Hindustan-228 prototype and indigenisation of the various systems, HAL has allocated Rs 94.41 crore from its internal resources.

HAL's indigenous IJT completes Six Turn Spin

The Intermediate Jet Trainer (IJT), designed and developed by HAL for stage –II training of IAF pilots successfully demonstrated the capability to carry out six turn spins to the LH and RH sides on 6 January 2022. The aircraft was piloted by Gp. Capt HV Thakur (Retd) and Gp. Capt A Menon (Retd).

Given the right resources and backing, HAL is capable of designing products that can meet any requirement of Indian Armed Forces, stated Mr. R Madhavan, CMD, HAL. Mr Arup Chatterjee, Director (Engineering and R&D) added that by demonstrating its capability to have six turn spins on both sides the IJT has achieved a major milestone. He attributed the success to the synergy between designers, flight operations and certifying agencies (RCMA and DGAQA). He further hoped that with the completion of spin certification of HTT-40 and the progress achieved in IJT, HAL would soon have the state-of-the-art trainers for stage I and II training of IAF pilots.

The IJT which was conceived by HAL as a replacement to the ageing Kirans of IAF fleet, had completed demonstration of its capabilities in terms of altitude and speed envelope, load factor, satisfactory stall characteristics and limited armament capability as required by IAF, much earlier. The only pending task was spin testing. During the course of spin testing, in 2016, the aircraft departed from controlled flight which brought the programme to a temporary halt. However, HAL decided to proceed further using its internal resources to complete the critical Spin testing.

The capability to enter and recover from spin is a necessity for a trainer aircraft in order to familiarise the trainee pilot to recognise departure from controlled flight and the actions required to recover from such situations. Achieving satisfactory characteristics during spin and an assured recovery from spin form a part of very crucial flight tests due to its unpredictability.

The spin flight testing is inherently a high risk maneuver and therefore progresses incrementally turn by turn. Due to the complex interplay of aerodynamic and inertia forces, the motion of the aircraft in spin is unpredictable and flight testing is the only way to assess the acceptability or otherwise of its characteristics. The spin flights are carried out in good weather conditions with a team of designers, flight test engineers and safety pilot monitoring the various parameters during the flight and therefore time consuming. Several flight tests are required to be carried out before 6-turn spin flights are undertaken as well as a number of flights are further required before full spin certification is achieved.

Subsequent to the temporary halting of flight tests in 2016, HAL undertook major modifications like shifting the vertical tail aft on the airframe and increasing the rudder area and flight testing resumed in April 2019. These modifications entailed the use of a new Anti-Spin Parachute system (ASPS) which is mandated for the safety of the aircraft and test crew during spin flight testing. The new ASPS was integrated into the aircraft in July 2020 and the successful streaming of the parachutes were demonstrated in September 2020. Despite the delays due to COVID-19 pandemic, HAL could commence the stall and spin testing of the IJT in its new modified configuration in November 2020.

HAL signs Rs 2400 crore contract with BEL

In a major boost to indigenisation, HAL signed a contract with Bharat Electronics Limited (BEL) for development and supply of 20 types systems for the LCA Tejas Mk1A programme. The five-year contract spanning from 2023 to 2028 is valued at Rs 2400 crores and involves supplying critical avionics Line Replaceable Units (LRUs), flight control computers and night flying LRUs.

"LCA Tejas programme is an excellent example of synergies between Indian Defence establishments such as HAL, DRDO & BEL. The current order for development and supply of 20 types of critical avionics LRUs for Tejas Mk1A is a shot-in-the-arm for Make in India activity. HAL stands committed to indigenous products", stated Mr R Madhavan, CMD, HAL.

The order for supply of these systems for 83 Tejas Mk1A fighter fleet will be executed by two Divisions of Bharat Electronics Limited at Bengaluru and Panchkula (Haryana). All the contracted items will be delivered by BEL to HAL in a ready to board condition. Deliveries under 83 Tejas Mk1A order to IAF will commence from FY 2023-24 onwards.

Replacement of helicopters through HAL

Indian MoD: "Replacement of aircraft fleet of the defence forces including Cheetah and Chetak helicopters is reviewed from time to time keeping in view the operational requirements. This is a continuous process. The Government has planned replacement of these helicopters with Naval Utility Helicopter, indigenous Light Utility Helicopter (LUH) manufactured by HAL under "Buy (Indian-IDDM)" project and Russian built Ka-226T as "Buy & Make (Indian)". Initial Operational Clearance to LUH has been granted. Four Limited Series Production (LSP) LUHs (2 for Indian Army and 2 for Indian Air Force) would be manufactured by 2022-23 and eight (LSP) LUHs (4 for Indian Army and 4 for Indian Air Force) by 2023-24. This would be followed by manufacture of Series Production (SP) Helicopters by HAL".

HAL in ADE-DRDO supply order for ABHYAS

HAL has secured an order for manufacturing, assembly, integration, testing and supply of High Speed Expendable Aerial Target (HEAT) System known as ABHYAS from Aeronautical Development Establishment, DRDO. Post successful completion of this initial order, HAL would be identified as Development cum Production Partner (DcPP) for supply of this target system along with a private firm (50% of the volume). The platform is estimated to have large requirement from the tri-services, DRDO laboratories for evaluation trials of missile programmes. ABHYAS was first successfully flight-tested in May 2019 and subsequent evaluation trials are being conducted by ADE-DRDO. This order would mark the beginning of series production of ABHYAS.

Trials of HAL Hindustan-228

Hindustan Aeronautics Ltd (HAL) had carried out successful ground runs and Low Speed Taxi Trials (LSTT) of a prototype Hindustan-228 aircraft, a potential commercial aircraft after Type Certification by Directorate General of Civil Aviation (DGCA), India. HAL Kanpur carried out the 1st Engine Ground Run of Hindustan-228 aircraft on 27 May 2021 in co-ordination with DGCA team. Further, ground runs were also carried out for testing of various systems. Subsequently, the LSTT was carried out in co-ordination with DGCA team on 15 August 2021 and the required test parameters were met.

Hindustan-228 aircraft is a variant of HAL manufactured Do-228 aircraft which is already deployed under the UDAN scheme. Hindustan-228 aircraft is being certified to the latest international airworthiness standards with modern avionics system and will be suitable for operations under UDAN scheme. Currently, HAL has entered into an agreement with Alliance Air on 26 September 2021 for dry leasing of its two Do-228 aircraft for deployment in the North Eastern Region.

The project is funded by HAL. The total funds sanctioned and released by HAL for this project is Rs 72.33 crore for the prototype manufacturing and type Certification from DGCA. Additionally, Rs 266.85 crore have been sanctioned by HAL for the manufacture of six more aircraft.

HAL and ZeroAvia to develop H2 powertrain for Dornier 228

ZeroAvia, the leading innovator in zero emission aviation, has announced a development collaboration with the Indian state-owned aerospace and defence company Hindustan Aeronautics Ltd (HAL) for a hydrogen-electric powertrain capable of flying the 19 seat Dornier 228 aircraft up to 500 NM. HAL intends to work with ZeroAvia to develop a Supplemental Type Certificate (STC) to allow retrofit of existing airframes for both Indian military and worldwide operators. HAL also intends to continue to build new aircraft with additional FAA approval, designated Hindustan-228, creating the opportunity to incorporate ZeroAvia's ZA600 zero-emission engines. Additionally, HAL and ZeroAvia engineers will integrate ZeroAvia's ZA600 hydrogen-electric powertrain into the Dornier 228 airframe. ZeroAvia will work closely with HAL and aircraft regulators during this project to ensure that aircraft meets both safety and operational requirements.

Approximately 270 Dornier 228 aircraft have been manufactured globally, with 242 currently in service. The production line of Do-228 aircraft is operational at HAL, India (Transport Aircraft Division, Kanpur, UP, India).

R Madhavan, CMD, HAL, stated, "HAL is committed to contributing to the protection and better development of the environment. This MoU with ZeroAvia has the potential to pave the way for zero emission regional connectivity. We are looking forward to steering and supporting sustainable and environmentally friendly aviation in India and the world".

More ALH deliveries to ICG

The 9th and 10th ALH Mk-III (of a total of 16 ordered) were delivered to the Indian Coast Guard on 2 February 2022. The ALH Mk-III with modern avionics and systems enhancing capabilities will be based at 845 Sqn, Kochi.

A&N Command inducts HAL ALH Mk III

The indigenous HAL Advanced Light Helicopter (ALH) Mk III was formally inducted at INS Utkrosh by Commander-in-Chief, Andaman and Nicobar Command (CINCAN) Lieutenant General Ajai Singh at Port Blair on 28 January 2022. As the rotor blades of the versatile helicopter cut through the air, aircraft were ceremonially welcomed into ANC with a traditional water cannon salute. The induction marks a continuing increase in the capabilities of the A&N Command in the past two decades of its raising as India's only joint theatre command.

The ALH MK III aircraft is manufactured by Hindustan Aeronautics Limited and represents a tremendous leap towards self-reliance in the field of military aircraft, in line with the government's push towards 'Aatmanirbhar Bharat'.

FLY NAVY, FLY

A HISTORY OF INDIAN NAVAL AVIATION

PUSHPINDAR SINGH
ANGAD SINGH

NAMMO's M72 shoulder-fired system

"We plan to offer the product to India as part of the Make in India initiative"

Nammo is highlighting the capabilities of its M72 Shoulder-Fired System and has also initiated discussions with the South Korean army regarding possible sale of the system. More than 20 countries currently use M72 variants. "This is a product that is of interest to the South Koreans," stated Bard Ljones Stenberg, Vice President International Sales and Marketing of Military Ammunition & Shoulder Fired Systems. "They have some experience with the M72; they have used it since the Seventies when they got it from the US. The systems are a bit outdated, and we are now talking to them to see if there is any possibility of coming up with new supplies of the M 72."

The M72 series has been modernised many times since the seventies and is a "totally different product now," stated Stenberg. "South Korea still uses it, and they have also used some products by our competitors. We hope that they can come back to the M72. It is a very secure system to use for soldiers and it is much lighter, at under 3.5 kg, than the products made by our competitors. You can in fact have two of them on your back if you need."

The M72 shoulder-fired system is being used by some of the biggest Special Forces throughout the world, further said Stenberg. "In the Asia Pacific region alone, Australia, Malaysia and Thailand have it. We plan to offer the product to India as part of the country's Make in India initiative."

Nammo signs major M72 contract

Nammo Defense Systems Inc. will produce M72 Fire-From-Enclosure (M72 FFE) shoulder-fired weapon systems and training devices for the Single Manager for Conventional Ammunition (SMCA), supporting various US Services. The initial $96.9-million-dollar delivery order is part of a five-year Indefinite Delivery Indefinite Quantity (IDIQ) contract with a maximum value of $498 million. Delivery of these systems is scheduled to start in 2023.

The M72 FFE weapon is a joint-service qualified, world-leading close combat weapon that allows warfighters to maintain cover and operate from concealed positions. Leveraging Nammo Defense technology innovation and expertise, the M72 FFE is easy to operate, extremely powerful, lightweight and disposable. The anti-armour variant (M72 A8) is effective against tactical vehicles, concrete walls and light armoured personnel carriers, while the anti-structure variant (M72 A10) features a dual-mode fuze that can defeat brick, adobe, earthen fortifications and tactical vehicles.

"A patented inert organic high-density liquid and patented propulsion system, developed by Nammo to satisfy US Marine Corps requirements, significantly mitigates sound levels, visual signature, and back blast effects," stated Nammo Defense Systems Vice President of Engineering, Dominic Jezierski. "We've successfully completed aggressive testing through the Joint Ordnance Test Procedure to validate the capabilities of the system."

US Marine Corps Sgt. Isaac Zimmerman observes as a US Marine fires a legacy M72 munition system. (Photo: USMC/Sgt. Luke Kuennen)

The M72 FFE system is designed to be effective in combat operations and to provide enhanced safety for the operator. By reducing the effect of the back blast, operator safety is enhanced and allows the M72 FFE to be employed in places previously unfeasible. Firing from inside a structure or behind cover, means the operator can remain concealed, and the lighter 13-pound weight means the operator is less physically burdened during the rigors of combat operations.

According to the Nammo Defense Systems' Vice President of Programmes, Tim Clawitter, "When using single hearing protection inside an enclosure, the system's safety specifications exceed the fire-from-enclosure safe operating requirements of both the U.S. Marine Corps and US Army. No system currently fielded by the US Department of Defence has this capability – and that's a game-changer."

"The government and industry team working on the M72 FFE system is confident that it will deliver next-level capabilities," stated Nammo Defense Systems President Gary Goodwin. "This contract award is a significant win for the warfighter. Nammo Defense Systems is focused on providing technologies, capabilities and products to fulfill the requirements of US and allied military forces defending freedom."

Nammo Defense Systems Inc., headquartered in Mesa, Arizona is a US corporation and part of the Nammo group of companies. Nammo is an international aerospace and defence company headquartered in Norway. With more than 800 employees in the United States and more than 2,700 employees worldwide, 28 production sites and a presence in 12 countries, Nammo is a world-leading provider of specialty ammunition and rocket motors for both military and civilian customers.

IAI: Meet the New Battlefield-Roaming Hunter-Predators

Recent conflicts have emphasised the role of the loitering missiles (LM) as a new weapon category blending the range and precision of guided missiles with loitering capability, enabling an army to plan and execute precision strikes against an enemy force, whether those forces are in a defensive or offensive posture during high intensity conflicts or engaging an asymmetric warfare campaign where combat elements are mostly hidden. By utilising the LM's flexibility, range, long-endurance, and coordinated, precision strike capabilities, an army has the potential to take an entire enemy force off balance.

Just as hunters do, LMs stay in an area where targets are expected, scout, and look for prey. Only when they recognise a valuable target, they can strike within seconds. As skilled hunters, the loitering weapons are designed to engage targets that expose themselves briefly, to activate an IED, launch a missile, or transmit, then quickly disappear back to their hideout. With the capability to fly continuously over contested terrain, where enemy targets are expected, the LM waits for the enemy to do the first move, but then, it is ready to attack within seconds.

In asymmetric warfare, the LM provides the warfighters with the assurance they are doing everything they can to avoid collateral damage and avoid risk to uninvolved civilians, by utilising the LM's inherent sensors to assess the target situation and abort the attack if this situation changes even seconds before the attack. The weapon can be instructed to abort the attack, enter a waiting loiter orbit and wait for another opportunity to strike.

In the 1980s, Israel Aerospace Industries (IAI) pioneered the category of loitering weapons, with the introduction of the Harpy LM – also known as 'Kamikaze Drone', an autonomous weapon designed for Suppression of Enemy Air Defence' (SEAD) strikes, considered the most dangerous missions during the Vietnam War, the War of Attrition over Egypt, and the Arab-Israeli Yom Kippur War. Harpy used a passive antiradiation (AR) seeker to locate active radars and attacked those radars with the warhead it carries. The Harpy would loiter over the planned corridor or an area where enemy air defences were expected, and target those assets as soon as they activated their radars.

The Harpy was joined by a guided weapon version – the Harop, which uses an electro-optical (EO) sensor for surveillance and targeting. While the Harpy is designed to carry out a fully autonomous mission, the Harop provides the possibility for operator intervention, particularly before an attack and, if needed, wave off and abort an attack just a few seconds before impact. This capability enables the weapon to call off an attack if the operator selects the wrong target, realises it is a decoy, or when the situation at the target area changes in a way that may cause unintentional collateral damage. The Harpy and Harop are launched from naval or ground-mobile launchers that can deploy multiple munitions/missiles to cover a large area.

While Harpy and Harop are designed to support long endurance and hundreds of kilometers in mission range, the Green Dragon and Mini Harpy represent tactical platforms by using electric propulsion to gain stealth and agility. Mini Harpy

is the first and only loitering weapon equipped with a multi-spectral RF and EO seeker, enabling it to cover the entire hemisphere with its RF sensor. As the RF sensor profiles suspected targets' spectral signature, it points to the onboard EO/IR sensor to investigate the most critical targets.

All of IAI's loitering weapons are designed with unique mission flexibility and robustness, enabling their deployment with numerous ground, sea, and aerial platforms. IAI also offers the Rotem, a loitering weapon to support the dismounted warfighter. Rotem is a military-grade quadcopter designed to act in aerial surveillance and attack, using an integral EO/IR payload and a small warhead comprised of two explosive charges, each equivalent to an M-26 grenade.

All of IAI's loitering weapons are designed to blend with existing force structures, tactics, techniques, and procedures (TTP) and provide the ground and naval force a robust, reliable, and dependable strike asset. These weapons can quickly deploy, launch, fly and strike in the day, night, adverse weather, and in contested airspace where conventional airpower cannot operate.

Through their missions, this flock of 'hunters' provides an updated situational picture. At the same time, each member of the flock can strike a time-critical target (TCT) being detected on the ground, immediately upon detection and approval by the human operator monitoring the group, even if that target is exposed for a very short time. With mission control conducted from a long distance, operators are safe and secure to concentrate on their missions.

Stored and deployed from truck-mounted launchers or ship-based canisters, LMs do not require special infrastructure or setup before launch. Using automatic flight control immune to external interference, they are less susceptible to electronic countermeasures than remotely controlled drones. This automation helps reduce manning and simplifies training and qualification. Having the ability to operate in high or low altitudes, even below the cloud base, and appear from different directions or strike angles, the loitering weapon provides a unique, highly flexible strike weapon to engage priority targets.

As the leader in loitering weapon technology for four decades, IAI has gained extensive experience and know-how in this field. Combat proven in modern armed conflicts, IAI's loitering weapons have demonstrated their agility and precision, enabling the users to strike the most sensitive elements in the enemy force, anywhere and anytime.

IAI displays the BLUE SPEAR (5G SSM) System

For the first time, Israel Aerospace Industries (IAI) displayed the cutting-edge BLUE SPEAR (5G SSM) surface-to-surface missile at Singapore Airshow. The system, co-developed with Singapore's leading defence company ST Engineering and marketed by joint venture company Proteus Advanced Systems, highlighted the companies' superior capabilities in both naval and air defence.

Boaz Levy, IAI President and CEO, stated, "In partnership with Singapore's leading defence company ST Engineering, IAI co-developed the most advanced surface-to-surface missile system with unparalleled capabilities. The BLUE SPEAR's inaugural display in IAI's booth at the Singapore Airshow highlighted IAI's successful heritage developing naval and air defence solutions, and offering highly competitive and advanced holistic systems to the worldwide market. Just a few months ago, Estonia selected the BLUE SPEAR (5G SSM) as a solution for the country's defence needs. The system now joins other IAI state-of-the-art systems reflecting IAI's decades-long legacy producing advanced, operationally-proven technologies."

Aeronautics at Defexpo 2022

Aeronautics Group, a leading provider of integrated turnkey solutions based on unmanned systems platforms, payloads and communications for defence and HLS markets, is presenting it's Orbiter 4 Small Tactical UAS and Orbiter 1K Loitering Munition UAS, at DEFEXPO 2022, Hall 7, Rafael's Stand R20.

Orbiter 1K

The Orbiter 1K loitering munition is designed for loitering attacking missions against soft-shell and human targets. It carries a warhead of more than 3 kg with advanced guidance capabilities, to ensure high precision, lethality and low collateral effects. The Orbiter 1K loitering munition system is based on Aeronautics' mature, combat-proven Orbiter 2B MiniUAS and therefore presents outstanding performances of mission range and endurance.

Moreover, once launched, whenever the situation in-theater requires, the Orbiter 1K can abort the mission and recover safely, in order to the preserve the UAV and avoid expending it unnecessarily. The unique advantages of the Orbiter 1K system creates high level of operational flexibility and provides extraordinary operational advantages for its category.

Main applications include loitering munition missions with ISR capabilities, special operation forces and infantry missions, support and protection of mobile/stationary ground forces, border security; immediate loitering solution engaging threats, loitering solution for coastal ISR, naval special operations raid, offshore facilities security and Forward Operation Base (FOB) protection.

Orbiter 4 Small Tactical UAS

The Orbiter 4 STUAS is an advanced multi-mission platform with extraordinary and versatile carrier, mission and endurance capabilities. Orbiter 4 STUAS delivers top mission performance with its lightest, most versatile and most advanced covert platform

available today, for both land and maritime operations. The UAV can simultaneously carry multiple payloads, extending its ISTAR capabilities. With its ease-of-use, low logistical footprint and small crew of 3 personnel, Orbiter 4, the runway-free aircraft suits all operational needs.

Orbiter 4 builds on the successful system design of the Orbiter 3 STUAS, with its advanced avionics, communications and ground control features and applications. The acclaimed legacy capabilities of the field-proven Orbiter UAS family remain. Measure for measure, Orbiter 4 will deliver the same capabilities as the tactical platforms operational today, but with better endurance, serviceability, operational flexibility and cost-effectiveness.

ORBITER 2 MAUS

The mature and combat-proven Orbiter Mini UAS is part of Aeronautics Orbiter UAS family. This compact and lightweight

system is designed for ease of use by the military forces and security agents, providing efficient operational solutions for tactical missions. The Orbiter 2 platform has proven top performance and high reliability, providing lifesaving support in conflict zones worldwide.

In the maritime configuration, Orbiter MUAS provides maritime surveillance, reconnaissance and target acquisition solution for small naval vessels operating maritime security and naval warfare missions. The system and proprietary control software are compliant with NATO STANAG such as 4586 and 4609.

Dominator XP Medium Altitude Long Endurance (MALE) UAS

The powerful Dominator XP Medium Altitude Long Endurance (MALE) UAS is designed to carry multiple large payloads and to perform tactical and strategic, long-range BLOS missions. Dominator XP is capable of all-weather and denied-GPS operation for strategic ISR, maritime surveillance, and homeland security missions. The maritime Dominator configuration offers the additional capability of under-water detection combined with traditional sea surveillance

Rafael at Defexpo 2022

MicroLite: An innovative, compact, lightweight EO/IR Intelligence, Surveillance, Targeting and Reconnaissance (ISTAR) system, for small aerial platforms such as UAVs, manned aircraft, aerostats, and observation balloons.

LITENING-5: As the latest evolution of the world's most widely-used targeting and navigation pod, Rafael's LITENING-5 incorporates a wide array of sensors enabling target detection, recognition and identification.

RecceLite: Part of Rafael's family of advanced aerial and ground electro-optical systems, RecceLite provides multi-spectral, multi-role, real-time stand-off and stand-in reconnaissance, consisting of an airborne pod, a wide digital D/L, and a ground exploitation station.

BNET Software-Defined Radios (SDR): This family of advanced, tactical broadband IP-MANET (Mobile Ad Hoc Network) provide reliable high-speed, low-delay connectivity for broadband data, voice and video on-the-move for ground and airborne platforms, HQs and dismounted soldiers.

C-DOME: The 'C-Dome' onboard missile defence system is based on the Iron Dome defence system developed by Rafael, with the command-and-control system developed by mPrest. 'C-Dome' interfaces with the Saar 6's 'Adir' radar, developed by IAI's ELTA division.

SPIKE: This Missile Family of 5th generation, multi-purpose, multi-platform EO-guided missile systems provides pinpoint precision up to 32 km and fire-and-update capabilities. SPIKE's exceptionally high precision extends Beyond Line of Sight to greatly enhance the vehicle's survivability while also minimising the risk of collateral damage.

Air Defence Systems: As the developer of the Iron Dome, Rafael is synonymous with air defence excellence, and offers a full range of multi-layered solutions for effective defence and superiority against UAS, rockets, artillery, mortars, cruise missiles and beyond.

DRONE DOME: It is an end-to-end, combat-proven counter-Unmanned Aerial System (C-UAS) providing all-weather, 360-degree rapid defence against hostile drones.

SPYDER: This is a quick reaction, low level surface-to-air missile system designed to counter attacks by aircraft, helicopters, UAVs, and precision guided munitions.

TYPHOON C-UAS Naval Remote Weapon Station: The NRWS C-UAS capitalises on Rafael's long-standing Typhoon family of combat-proven naval defence solutions. The NRWS C-UAS incorporates a diverse mix of synchronised smart multi-spectral sensors, weapons and intelligent effectors that translate to very high hit accuracies.

Naval SPIKE ER: It is an electro-optical, guided missile which comprises a lightweight, compact and stabilized turret with four missiles on the mount, together with a fire control system for effective ranges of up to 8 km. The system enables very fast sensor-to-shooter loop closure in day/night defensive and offensive scenarios, thereby ensuring mission success with surgical precision.

Naval SPIKE NLOS: This compact system enables stand-off of up to 25 km with pinpoint accuracy, providing sea-to-shore fire support or sea-to-sea targeting, on a wide range of naval platforms.

Saab awarded Indian contract for AT4 support weapon

Saab's AT4 weapon has been selected by the Indian Armed Forces through a competitive programme for a single-shot weapon. AT4 will be used by the Indian Army and the Indian Air Force.

The Indian Armed Forces are a new customer for AT4. This order includes the AT4CS AST, which can be fired from confined spaces such as from inside buildings, bunkers and other urban environments. The AT4CS AST offers a tandem warhead with a breach or blast mode, which is optimised to defeat enemies within buildings and to destroy structures, which can create a point of access into them.

The contract was signed by FFV Ordnance AB, responsible for Saab's Ground Combat offer in India.

"We are honoured that the Indian Armed Forces, which are already users of our Carl-Gustaf system, have also selected Saab for their single-shot weapon need. The Indian Army and Indian Air Force can be confident in the knowledge that they have the necessary firepower to give them the advantage," stated Görgen Johansson, Head of Saab's business area Dynamics.

AT4 is one of the most popular and successful support weapon families on the market. Operated by a single soldier, this single-shot system has proven efficacy against structures, landing craft, helicopters, armoured vehicles and personnel. Its 84 mm calibre warhead offers enhanced power and performance.

Saab and Gripen E news

Gripen E entering serial delivery phase for Brazilian and Swedish Air Forces

On 24 November 2021, Saab held a high-level meeting with authorities from Brazil and Sweden to present the first six serial production Gripen E aircraft, which have left the factory and entered the delivery phase. The delegations from both countries also had the opportunity to discuss joint activities that will be beneficial to the Gripen programme. The meeting was attended by General Carlos de Almeida Baptista Junior, Commander of the Brazilian Air Force; Major General Carl-Johan Edström, Commander of the Swedish Air Force; Micael Johansson, President and CEO of Saab; and Jonas Hjelm, Senior Vice President and head of Saab business area Aeronautics.

"These deliveries form an important part of strengthening our capabilities and defending Sweden. JAS 39 E Gripen will increase Sweden's defence capability, allowing us to build a stronger and tactically superior Air Force for every situation," stated Major General Carl-Johan Edström, Commander of the Swedish Air Force.

"It is a pleasure to follow the fulfilment of yet another step in the delivery process of the F-39 Gripen aircraft, which will lead the evolution of the Brazilian Air Force's combat capability. This project represents a new technological level for Brazil and it is of fundamental importance in the development of our Industrial Defence Base," stated General Carlos de Almeida Baptista Junior, Commander of the Brazilian Air Force.

"The start of the serial delivery phase with these four aircraft for the Brazilian Air Force and two for the Swedish Air Force is an extremely important achievement for the Gripen programme. It shows that we have a mature product and that we fulfill our contractual obligations," stated Micael Johansson, President and CEO of Saab. "This all has been possible thanks to our smart ways of working, innovative production technologies and close cooperation with the customers," he added.

During the visit to Saab, several serial production and test aircraft were presented to the authorities, who also had the opportunity to test the new Gripen mission trainer simulator and to view an air display with both Swedish and Brazilian Gripen aircraft.

Saab and FMV sign contract for new Gripen E equipment

Saab has received an order from the Swedish Defence Material Administration (FMV) regarding new equipment for Gripen E. This is a supplementary contract to the original Gripen E contract from 2013. The order value amounts to approximately SEK 1.4 billion. The original contract, regarding development and modification of Gripen E, signed in February 2013, was based on the terms that certain equipment from the existing Gripen C/D fleet within the Swedish Armed Forces should be reused.

Instead of reusing equipment from the Gripen C/D, new equipment is acquired for a part of the total Swedish order of 60 Gripen E aircraft. This approach secures the availability of the Swedish Gripen C/D fleet in service, while Gripen E is being delivered and introduced to the Swedish Armed Forces.

Saab: Harnessing rapidly scaling computing power for advanced EW and navigation technologies

Electronic warfare of today has grown leaps and bounds from its days of simple radio communication jamming. Today, it is also about sensing and seeing first, deceiving and even controlling the entire electromagnetic spectrum.

The future of warfare, aerial or otherwise, is hinged on two big pillars of electronic warfare – one, how higher computing power of faster processors are integrated into system and, second, how the systems talk to each other with information they have captured in a battlefield – in other words, network centric warfare (NCW).

Electronic Warfare also has to continually upgrade in order to meet new threats. As Aerospace & Defence points out, "key elements of EW systems are now often combined within a single component, such as the RF System-on-Chip (RFSoC), including signal acquisition, processing, and generation. Hardware, firmware, and software have become more complex, increasing risk and expense, and thereby increasing the need for effective, high-level development tools."

Why Gripen E stands out as an aircraft that is almost a warfighting supercomputer is because its prowess in EW takes it above other fighters at a time when the defence domain is dominated by EW, overshadowing traditional weapons and systems.

"The highly contested battlespace of today necessitates a superior electronic warfare capability. The Indian Air Force as well can benefit from a new generation EW solution that gives the pilots an armour of information advantage. Knowing first is crucial in order to be able to successfully counter the threats of today and tomorrow," stated Kent-Åke Molin, Sales and Marketing Director at Saab.

When Saab set out to create the smartest electronic warfare solutions for modern air forces, it aimed for something that was a complete package. The result was Arexis, an EW suite that offers unrivalled survivability, superior situational awareness, freedom to act, and a safe return home. The EW suite is fully integrated on all Gripen aircraft, giving the pilots a self-reliant ability to operate without the need of escort of a specialised EW aircraft. It can also be installed in any other aircraft type, in a missionized pod or even used with an unmanned vehicle.

Arexis offers both defensive and offensive capabilities including neutralisation of the Anti- Access/Area Denial (A2/AD) bubble. Powered by Gallium Nitride (GaN) Active Electronically Scanned Arrays (AESAs) and fully digitised receivers, Arexis provides superior situational awareness in every scenario. Saab has also offered India GaN AESA radar technology. "If India requires, Saab is willing to share its know-how of the GaN technology not just for the Gripen programme, but also for ongoing and future indigenous programmes such as the LCA and AMCA ," Kent-Åke adds.

One of the most important reasons behind Arexis' reliability is its unique ability to manage and digitise a wide range and high number of signals and sensor data with extreme rapidity and accuracy. The digitisation is very important because of the sheer number of signals that are to be managed by today's systems.

"A non-negotiable for an effective EW system is its ability to understand radio frequency emitter signals, no matter how many they are, and draw quick conclusions. Arexis provides the pilot a complete threat picture across the entire electromagnetic spectrum. The result is superior situational awareness that helps the pilot to see first and act first. Modern air forces like the IAF need this game-changing capability to ensure mission success," Kent-Åke says.

In addition, a passive infrared search and track (IRST) sensor, a tailored datalink and an enhanced EW system package rides on Gripen E.

The IRST, for example, is an electro-optical system mounted in the nose of Gripen E, and is capable of silently detecting, tracking and identifying all types of targets, without emitting a signal and revealing the aircraft's own position. Also called Skyward G, the sensor is particularly useful against aerial targets with low radar cross section, such as stealth aircraft. It can also register heat emissions from other aircraft, such as helicopters, and from other objects on the ground and sea surface.

The utilisation of networked sensors, both on board and from other platforms, is also one of the most essential aspects of the Gripen E/EW F's system. The pilot will be able to silently geo-locate threats and be the first to react as a result of this. The Gripen pilot can better deal with sophisticated threats like the Su-57 and S-400.Overall, the Gripen's EW suite can operate in the most hazardous settings while maintaining great survivability.

Network-centric warfare today has evolved rapidly to become network technology that at very high speeds integrates technology from different sources into a mesh of information links among all warfighting systems. In effect, signals acquired from radars, communication and sensors are integrated into a singular representation of the battlefield using artificial intelligence and machine learning technologies. This gives the commander the ability a very high level of situational awareness, enabling them to issue commands that helps each equipment and soldier to act in a precise and effective manner.

Apart from superior EW capabilities, the power of faster computing has resulted in development of systems that can help Gripen E navigate in GPS-blind areas. Considering India's difficult Himalayan borders that spans across neighbouring countries, hindrances in terms of weather, geographical landscape or a sudden blackout can black out the GPS system. Currently, non-GPS navigation is a manual process requiring a lot of the pilot's attention, which means less focus on tactical awareness about the hostile surrounding.

New patterns of algorithms have been tested successfully with Gripen E, providing real time and highly accurate positioning based on 3D mapping. In association with Maxar, data from on-board electro-optical sensors and geo-registration algorithms is compared with a 3D surface model database in the aircraft. The sensors have a feature of observing landscapes ahead of the line of sight while the aircraft is moving. This information along with algorithms generate a more accurate velocity vector and assists the inertial navigation system.

Such terrain based technology i.e. TERNAV has previously yielded good results and SAAB intends to pool inputs from this existing technology. The immersive 3D data from Maxar, created using automated technology and precision, has been able to provide resolution of 50 cm or better and 3 m accuracy in all dimensions.

The navigation system will give Gripen pilot a disruptive and unique capability to operate in GNSS-/GPS-denied conditions while maintaining highly accurate positioning by merging these three technologies (3D-mapping, odometry, and terrain navigation).The combination of technologies creates a solution that is impervious to GPS signal interference such as jamming and spoofing attempts, while also reducing the pilot's workload during flying. Because of its precise location, the Gripen allows its pilots to counter the opponent's anti-access/area denial techniques, thereby putting him ahead in terms of threat assessment.

Apart from navigation, this technology may also be used to construct and execute targeting functions, and to assist aircraft landings in difficult environmental situations where regular landing aids are hampered.

"Now we're ready to put this technology to work for our customers. With the IAF's challenging mountainous and high-threat operational environment, this would be a great addition to our already existing offer for India," states Tobias Jansson, Product manager Gripen.

BAE Systems showcases defence capabilities and technology solutions at Defexpo 2022

Global defence, aerospace and security company, BAE Systems, is showcasing a range of capabilities and technology solutions – including the Make-in-India M777 Ultra Lightweight Howitzer (ULH) gun system – at the 12th edition of DefExpo. At the show in Gandhinagar, Gujarat, BAE Systems will promote its partnerships with local industry and its drive to support indigenous defence production. The Company will demonstrate how its products and services are providing competitive edge to Indian customers and strengthening national security in India.

Ravi Nirgudkar, BAE Systems' Managing Director India, Bangladesh, Sri Lanka stated, "India is a key strategic market for us – as demonstrated during the Carrier Strike Group naval visit last year – and we look forward to building upon that at DefExpo. As a founding partner of defence manufacturing in India, BAE Systems is committed to supporting India in its modernisation journey. Our presence at the Show will reflect our commitment to India and demonstrate our intent to secure India's national security with battle-proven defence capabilities."

Highlighting the growing scale of BAE Systems' in-country collaboration and its commitment to Make–in-India, the M777 Ultra Lightweight Howitzer (ULH) model will be a key part of the Company's exhibit at the event. Under an agreement between the US and Indian governments, the 155mm M777A2 ULH systems are being assembled, integrated, and tested in India by Mahindra Defence Systems Ltd. (MDSL), as part of the Make in India programme. The capability is in service with the Regiment of Artillery and to date, BAE Systems has produced and delivered more than 100 guns to the Indian Army.

Additionally, on display will be the APKWS laser-guided rocket, a highly cost-effective solution that turns a standard unguided 2.75-inch (70 millimetre) rocket into a precision laser-guided munition, giving warfighters a surgical strike capability.

Making its debut in India and at DefExpo, PHASA-35, is an ultra-light weight, solar-electric High Altitude Long Endurance (HALE) Unmanned Aerial System (UAS) platform. This next-gen technological system is designed to provide a persistent, stable platform for monitoring, surveillance, communications and security applications.

Another highlight at the BAE Systems stand is the LiteHUD Head-Up Display, offering space and weight advantages paired with the latest digital display technology, revolutionary waveguide optics and highly reliable electronics.

BAE Systems' maritime capabilities at DefExpo is being showcased through – 40 Mk 4 Air Defence Gun and 57 Mk3 Naval Gun System, which provides high survivability and tactical freedom at all levels of conflict and are equipped with agile, flexible weapon systems that enable a lightning-quick response.

Also, featured at the show are models of Combat Vehicle 90 and BvS10 Beowulf, designed to provide strategic mobility, high survivability and protection in any terrain or tactical environment.

"At BAE Systems, we provide some of the world's most advanced, technology-led defence, aerospace and security solutions. We employ a skilled workforce of 85,800 people in 40 countries. Working with customers and local partners, we develop, engineer, manufacture and support products and systems to deliver military capability, protect national security and people, and keep critical information and infrastructure secure", stated company officials.

BAE Systems is located in Exhibition Hall 8 at DefExpo 2022 at Gandhinagar, India.

Thales: A key partner in India's defence modernisation journey

As India progresses towards its goal of becoming Aatmanirbhar, constructive measures are being taken across sectors including defence. These measures along with efforts of the industry will pave the way for long-term success of India's indigenous defence sector.

For close to seven decades, Thales has been partnering the Indian growth story by sharing its technologies and expertise in defence, aerospace, transport and digital identity and security markets. Over the years, it has developed a mature industrial footprint in the country's defence sector via a diverse range of high-tech products, services and collaborations. The organisation has been proudly supporting the Indian armed services' modernisation efforts, aiding them in preparing for, achieving, and maintaining tactical superiority over any form of risk, all with the purpose to build a future that everyone can put their trust in.

Comprehensive services for the Indian Armed Forces

Thales offers a broad spectrum of solutions to help the armed forces gain and maintain operational superiority. Thales has more than 50 offset partners and more than 75 supply chain partners and is cultivating local industrial and supplier ties to serve India's defence and aerospace needs. The organisation has formed various co-operative partnerships with public and private sector industries, like with Bharat Electronics Ltd dedicated to radars and Reliance Aerostructures Ltd for electronic warfare and radar, among others. Thales has developed extensive and broad skill sets in India through these collaborations and is contributing to sustainable manufacturing in India for India as well as for the world.

The Rafale aircraft have significantly augmented the combat capabilities of the Indian Air Force. Thales provides several state-of-the-art equipment and systems aboard the Rafale. It contributes to the Rafale's game-changing capabilities through a variety of solutions such as the AESA RBE2 radar, the SPECTRA electronic warfare suite for 360° detection and action modes, advanced man-machine

Ashish Saraf, VP and Country Director - India, Thales

interface with displays in the cockpit, missile electronics, the front-sector optronic with infrared search and track systems FSO-IRST, the CNI suite (communication, navigation, and identification), as well as power generation systems and a logistics support component.

The RBE2 AESA radar is the key to Rafale's performance. Among other benefits, the RBE2 radar's range has been increased by more than 50% compared with fire control radars from previous generations, ensuring compatibility with weapons such as the Meteor (if we don't want to say Meteor, we can say "very long-range BVR air to air missiles). Likewise, the SPECTRA electronic warfare system is fully integrated in Rafale and boosts survivability from air-to-air and air-to-ground threats from radars, missiles and lasers.

A committed partner to India's growth story

Thales remains a close partner to India. Thales and its joint ventures in India now employ more than 1,800 people, and the organisation hopes to expand its presence in the nation by continuing to hire and nurture more talent in high technology roles. The organisation has also been fostering a culture of innovation in the country through its Engineering Competence Centres (ECC) in the National Capital Region and Bengaluru.

Thales is looking forward to participating at DefExpo 2022, which will provide a forum for stakeholders to establish partnerships and increase the country's technological level. At DefExpo 2022, Thales will showcase its diverse portfolio of

Thales is onboard the Rafale

capabilities covering Aero, Defence, Naval and Land Defence as well as and Space that can effectively support the Indian armed forces' modernisation efforts. The different exhibits will demonstrate the organisation's commitment to 'Make in India for India and for the world' in tandem with the Government's aim of 'Aatmanirbhar Bharat.'

Going ahead too, Thales will continue to develop its footprint in India by by strengthening its local teams, partnerships and innovation.

Captas-1 sea trials and SonoFlash illustration

News from Thales

Thales Sea Fire ready for integration on France's FDI frigates

Thales Sea Fire, full digital radar is qualified by the DGA after exhaustive and thorough testing in Saint-Mandrier, the reference trial centre for the French naval forces. The radar is now handed over to Naval Group for integration into combat system on-board the FDI frigates.

Over a period of 18 months, the Sea Fire radar underwent a substantial number of land-based tests, mobilising a vast panel of resources and combined teams from the DGA, Thales and Naval Group. All testing took place at the Shore Integration Facility (SIF) on the DGA's SESDA site in Saint-Mandrier in the South of France - a major testing reference centre in Europe for the naval sector.

Evaluated and tested against an extensive range of situations including surface targets (light boats, surface vessels, etc), air targets (helicopters, jets, missiles, drones, etc.) in various environments. – the Sea Fire assured its ground-breaking ability to search simultaneously for air and surface targets in a difficult environment, scanning a range of several hundred kilometres with 90° in elevation and an unmatched refresh rate.

Thanks to the Sea Fire's unique full digital technology (for instance digital beamforming), the radar delivers enhanced performance for all missions through dynamic radar resource management with very short response time. This digital radar is at the forefront of technological innovation and benefits from all Thales's Big Data and cybersecurity expertise.

Thales to modernise airport surveillance in Korea

As Korea Airports Corporation (KAC) seeks to modernise Air Traffic Management infrastructure throughout Korean airports, Thales, in a consortium with Hanjin Information Systems and Telecommunications (HIST), was awarded a contract to deliver three next-generation airport surveillance radar systems in the southern cities of Muan, Ulsan and Yeosu.

The radar systems comprise of Thales' state-of-the-art STAR NG primary surveillance radars co-mounted with the latest version

of RSM NG secondary surveillance radars, offering the highest levels of detection performance, reliability, and cybersecurity to help meet the airports' needs for surveillance and safeguard passenger wellbeing.

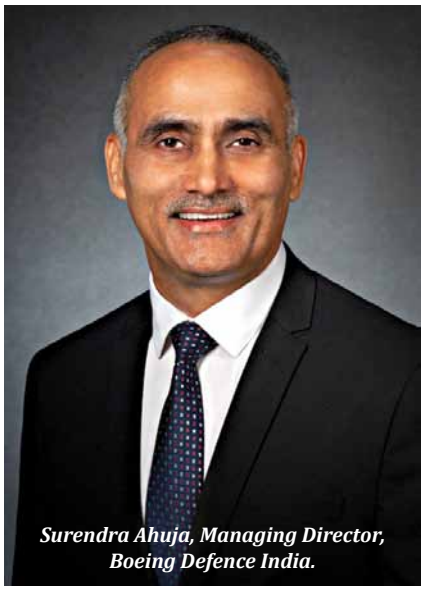
The STAR NG also provides additional functionalities that include altimetry, slow or fast target detection and windfarm filters. The RSM NG is a 2-in-1 meta-sensor, with fully integrated EnHanced Mode S and ADS-B sensors, providing faster track initialisation and detection, with the latest in cybersecurity protection and Health Usage & Monitoring System (HUMS) for optimised maintenance and life cycle costs.

Thales unveils the Ground Observer 20 multi-mission radar

A reference in the field of Ground surveillance radars, Thales, a trusted historical partner to forces worldwide, has unveiled its latest innovation: the GO 20 MM radar. Uniquely combining ground and low-level air surveillance in a single surveillance asset, the radar offers 'exceptional' early UAV detection and automatic classification.

Providing coverage of the full spectrum of threats in the field, the GO20 MM provides continuous 360° 3D coverage for a multitude of threats. The radar surveys a large volume in 3D, with fast update rates, enabling early detection and automatic classification of long-range drones especially when they are not yet a threat, providing additional crucial seconds for C-UAV measures. Thanks to its compact size and modular configuration, the GO20 MM is easily transportable and deployable. In 5 minutes, two soldiers can set it up and quickly redeploy for a new mission, whether on a mast or for off-board operations.

Indo-US Defence Cooperation Growing in Strength



Surendra Ahuja, Managing Director, Boeing Defence India.

Underscores Boeing's Partnership with India

Today, the backbone of India's strategic and theatre transport fleet, its heavy attack and heavy lift helicopter capability, its long-range maritime patrol and anti-submarine warfare aircraft capability – is all US-origin. What's more, major fighter aircraft offerings and services opportunities are being actively discussed that could further advance the bilateral security agenda and realise the value of both countries being Major Defence Partner.

As one of the fastest growing economies in the world, India offers tremendous growth and productivity opportunities for the aerospace industry. There is an extraordinary potential for defence trade and partnerships to grow further between India and the US. The bilateral defence cooperation has evolved considerably in the last few years, driven by the growing convergence of American and Indian defence interests.

If we start with a quick look at the last five years, Boeing has accelerated growth in India with a razor-sharp focus on the key areas of:

- Customer engagement – meeting the Indian Navy (IN) and Indian Air Force's (IAF) modernisation and mission-readiness needs
- Services growth – localisation of our services, and the value Boeing Defence India, our local establishment in India, is able to provide through the lifecycle of platforms offered
- Supplier expansion – building an indigenous and robust supplier-partner network with a focus on Aatmanirbhar Bharat

We are committed to supporting the modernisation and mission-readiness of India's defence forces through strategic investments in manufacturing, skill development and engineering. Today, India operates 11 C-17s, 22 AH-64 Apaches (with

six more on order), 15 CH-47 Chinooks, 12 P-8Is, 3 VVIP aircraft (737 airframe) and two Head of State aircraft (777 airframe), all Boeing platforms. With more than 275 suppliers in India, we continue to explore areas for an Aatmanirbhar Bharat and adding more value to India's aerospace and defence ecosystem.

We are seeing growth in our services business and, with it, growth in the value Boeing creates through product lifecycle support and training. From performance-based logistics contracting and integrated fleet support to maintenance, modifications and repairs, Boeing provides a broad spectrum of innovative products and services across platforms which directly support and enhance capabilities while reducing total cost of ownership for our customers globally. Boeing's investments in services infrastructure, building local capabilities, workforce training and partnerships in India are aimed at ensuring the Indian armed forces successfully complete their missions, operate their assets at peak condition and do so affordably.

In 2021, we launched the Boeing India Repair Development and Sustainment (BIRDS) Hub. BIRDS is an initiative to bring together ecosystem partners to shape India as a strategic destination for aerospace engineering, maintenance, repair and sustainment services. This is a one of its kind initiative that seeks to provide customers with best-in-class solutions, efficient turnaround times, and optimal economical value, all available in-country. Partnership is Boeing's key to success and we believe it makes more sense to partner with local MROs that are already established and have great capabilities. We bring specific trainings to their employees as required per the scope of work. One such example is Air Works in Hosur who we work with for the heavy checks on the P-8I fleet. Likewise, we are constantly on the look-out to do more here. While we are already doing P-8I wheels and brakes in-country, we are now examining local MROs for their ability to do P-8I landing gear overhaul, and even engines.

Our focus is also to help build a strong indigenous Indian aerospace and defence ecosystem, and invest in partnerships and talent to contribute to the vision of *Aatmanirbhar Bharat.* This will shape the next five years for us. Boeing's sourcing from India has steadily grown over the years and is today worth $1 billion annually. Our Indian suppliers manufacture critical systems and components that go into some of Boeing's most advanced aircraft. In 2021 alone, we added new suppliers including several Micro, Small and Medium Enterprises (MSMEs), as part of our commitment to Aatmanirbhar Bharat. Last year our joint venture, Tata Boeing Aerospace Limited (TBAL) in Hyderabad, also delivered the 100th fuselage for the Apache attack helicopter.

A future blueprint for partnership

The future looks promising and we continue to see several opportunities in India. India's defence sector is poised for growth and Boeing is committed to supporting and enabling this progress.

We're engaging with our defence customers in India on their current and future requirements for national security and regularly engage in discussions over the value our portfolio can deliver to develop capabilities they require for the execution of their missions. In the near-term, those capabilities include the F/A-18 Super Hornet and additional P-8Is for the Indian Navy, the F-15EX and KC-46, the aerial refuellers for the IAF, additional training, sustainment and performance based logistics solutions.

The F/A-18 Super Hornet Block III will be a transformative capability for the Indian Navy for their requirement of Multi-Role Carrier Borne Fighter. With the Super Hornet, the IN will get the most advanced and lethal platform while benefiting from the tactics, upgrades and knowledge related to the US naval aviation ecosystem. The Block III configuration is suited to protect India's maritime interests as it's built to meet the broadest range of missions while benefiting from the upgrades and knowledge related to US naval aviation. We anticipate the Super Hornet opening up opportunities for greater interoperability between the two navies for a secure Indo-Pacific.

Boeing has conducted several studies over the last couple of years, including the ski-jump tests at USN facility in Patuxent River that demonstrate that the F/A-18 Super Hornet is fully compatible with IN carriers. The F/A-18 Super Hornet was specifically designed, from its inception, for carrier operations. Another important fact to note is that the two-seater carrier compatible variant of the Super Hornet offers several unique advantages to the IN.

Talking of those advantages – one, the two-seater can help impart carrier qualification training onboard the carrier rather than just ashore making pilot conversion much safer; two, given that the two-seaters can operate from aboard the carrier for combat roles, this would make the entire inventory available to the IN onboard their carrier(s) rather than the two-seaters just sitting ashore in the hangars when the carrier sails to address a crisis.

We are also engaged with the IAF on their requirement for Multi-Role Fighter Aircraft (MRFA). The F-15EX will excel as a candidate in India's MRFA programme. Given the contemporary sensors and radar, advanced cockpit, range, endurance, speed and payload capacity, the F-15EX brings capabilities that no other fighter aircraft can offer.

As the IAF further shapes its defence capabilities, the KC-46 is the perfect choice for a multi-role tanker-transport aircraft for appropriate mid-air refueling capability. The new KC-46 is designed from the ground-up to be a combat-ready tanker. We also believe that the IAF has requirements for more Chinooks and we stand ready to support them. In early 2020, the Ministry of Defence had also signed a contract for the acquisition of an additional six Apaches for the Indian Army. We believe that the Indian Army will have further requirement for Apaches, and we are ready to support them for their future needs.

We are contributing to the growth of India's aerospace industry; that's why we are investing in partnerships across the ecosystem in skilling, research and development, and manufacturing. India is front and center of significant opportunities for Boeing and the country's role in our global supply chain is big and getting bigger. Our commitment to India is deep and it's for the long term; our vision is to bring the best of Boeing to India and export the best of India to the world!

Boeing updates

GE to power USAF Boeing F-15EX's

The US Air Force has awarded GE a $1.58 billion firm-fixed-price contract to supply F110 engines for the Boeing F-15EX Eagle II. This selection makes GE the sole propulsion provider for the US Air Force's entire planned F-15EX fleet. GE is currently delivering Lot 1 engines for the F-15EX, including two test aircraft currently undergoing flight testing at Eglin Air Force Base in Florida.

1st KC-46A tanker for Japan

Boeing has delivered its first KC-46A tanker to the Japan Air Self-Defense Force (JASDF) marking the programme's first delivery to a customer outside the United States. The Japan KC-46A is capable of refueling JASDF, US Air Force, US Navy and US Marine Corps aircraft. Globally, the KC-46A has already completed more than 5,000 sorties and transferred more than 50 million pounds of fuel to other aircraft through its boom and drogue systems.

Sikorsky-Boeing deliver FLRAA proposal

The Sikorsky-Boeing team released the following statement on the early submittal of the proposal for DEFIANT X for the US Army's Future Long-Range Assault Aircraft (FLRAA). "Continuing a 75-year partnership with the US Army, providing and sustaining the iconic BLACK HAWK, Chinook and Apache, the Sikorsky-Boeing team looks to the future with the Future Long-Range Assault Aircraft - DEFIANT X. Today, Team DEFIANT completed and submitted the proposal for the US Army's FLRAA competition, offering low-risk, transformational capability that delivers on an

Army critical modernisation priority and advances the future of Army aviation. DEFIANT X delivers speed where it matters, survivability, unsurpassed power, maneuverability, superior handling in any environment and lower lifecycle costs – while operating in the same footprint as the BLACK HAWK. We are confident that DEFIANT X, supported by our longstanding Army industrial base suppliers, is the best choice for delivering overmatch on the Multi-Domain Operational battlefield in INDOPACOM and across the globe."

Boeing uncrewed teaming aircraft advances flight testing

Boeing Australia has expanded its flight-test programme of the Boeing Airpower Teaming System, with two aircraft successfully completing separate flight missions at the Woomera Range Complex. The first Loyal Wingman aircraft developed with the Royal Australian Air Force (RAAF) demonstrated a range of key characteristics during the test flights to continue to expand the flight envelope. A second aircraft also successfully completed its first flight mission.

Throughout the flight-test missions, the teams gathered aircraft performance data that will be used to inform and refine the digital twin of the Boeing Airpower Teaming System, with the view to accelerate the aircraft's development where possible. The digital twin models the system's entire lifecycle, from design and development to production and sustainment, and contributes to speed and first-time quality.

Loyal Wingman project achieves milestones

The landing gear of a Loyal Wingman unmanned aircraft has been raised and engaged for the first time during a flight mission at Woomera in South Australia. This was the highlight of several major milestones the project recently achieved, which included the maiden flight of a second aircraft. Head of Air Force Capability Air Vice Marshal Cath Roberts praised the efforts of the team involved in achieving these results.

Boeing delivers 1st P-8A Poseidon to Norway

The Norwegian Defence Materiel Agency (NDMA) has accepted the first of five Boeing P-8A Poseidon maritime patrol aircraft that will be operated by the Royal Norwegian Air Force (RNoAF). Norway's first P-8A aircraft, named Vingtor, was delivered to the NDMA during a ceremony at the Museum of Flight in Seattle, Washington. The milestone comes four years after the NDMA entered into an agreement with the US Navy for the P-8A, and two years before the new aircraft are scheduled to begin taking over maritime patrol duties in Norway's high north.

The delivery to Norway also marks the 142nd P-8 aircraft delivered to global customers, including the US Navy, the Royal Australian Air Force, the Indian Navy and the United Kingdom's Royal Air Force. First deliveries to New Zealand, Korea and Germany will take place in 2022, 2023 and 2024 respectively.

Additional Chinooks for US Army Special Operations

Boeing will build six more MH-47G Block II Chinooks for the US Army Special Operations Aviation Command as part of a $246.48 million contract. Delivery of these aircraft are scheduled to start in 2023. With this additional order, Boeing is now under contract for 30 MH-47G Block II Chinooks, four of which have been delivered to date. These aircraft will be the first to include the new Active

Parallel Actuator Subsystem (APAS), a mission system that helps pilots execute more difficult maneuvers while improving safety and reliability of flight. The MH-47G Block II Chinook also features improved structure and weight reduction initiatives like new lighter weight fuel pods that increase performance and efficiency.

New Honeywell T55 engine for US Army Chinooks

Honeywell has reached a significant milestone with the US Army by being the first engine to test (FETT) as part of its Cooperative Research and Development Agreement (CRADA) for the next-generation engine for Chinook helicopters. The CRADA programme and testing of the T55-714C engine is planned over a two-year period to validate the benefits and ease of integration of the new engine variant onto the Chinook platform. This will allow the US Army to evaluate the capabilities of the newest rendition of Honeywell's battle-proven T55 engine.

Safran's HAMMER for Precision Strike

The Indian Air Force (IAF) evaluated and opted for a significant number of Safran Electronics & Defense designed, developed and produced 3.1-m long Armement Air-Sol Modulaire (AASM) Precision Guided Munition (PGM) for its Rafale fleet that also forms the standard PGM of French Armée de l'Air (Adl'A) and IAF Rafale platforms. In a typical surface attack mission the Rafale carries up to six 500 lb AASM/SBU-38/SBU-54/SBU-64 Highly Agile Modular Munition Extended Range Hammer (all can be ripple fired in one pass to strike six different desired mean points of impact points with clinical precision for simultaneous attacks on multiple targets), plus four MICA Beyond Visual Range Air-to-Air Missiles (BVRAAM) and three 2000 litre drop tanks.

A conversion kit for 500 lb class bombs, the guidance section at the front combines data from a Global Positioning System (GPS) receiver and an Inertial Navigation System (INS) unit through Kalman filtering enabling 10 metre accuracy even in adverse weather and decimation of multiple targets simultaneously. The bomb body (general purpose or penetration) is in the centre and a rocket motor aft. For long distance engagements, the AASM is equipped with a bolt-on tail unit/range extension kit which comprises a solid rocket motor and flip-out wings. Folded wings enable a glide range of 15 km when dropped from low altitude or 50 km when dropped from medium to high altitudes with the guidance processor enabling the pilot or Weapon Systems Officer (WSO) to select the angle at which the bomb impacts the target, thus allowing it to manoeuvre aggressively to engage distant, off-boresight targets.

There is a provision for IIR seeker (SBU-54) for contingency-type operations reported to be capable of being programmed before launch with a template of the target derived from reconnaissance imagery, "acquiring immunity" to GPS jamming and giving it "meter-class" accuracy against precision targets. ATR algorithms compare the actual scene with the memorised scene, identify the designated target, and select the impact point in order to hit with outstanding precision minimising target coordinate errors. AASM has been extensively battle proven over Libya with outstanding performance and reliability. The Semi-Active Laser Homing (SALH) version (SBU-64) gives high accuracy against mobile targets.

Meanwhile, first separation tests of 1000 kg version of AASM Hammer air-to-ground modular weapon, has successfully completed its first two inert separation tests from a Rafale. The separation dynamics observed during the two firings were in line with simulations. These industrial validation

tests were designed to check the correct sequencing of all components of the wing hard points and the weapon, as well as the wing deployment mechanism on the range extension kit.

Following these successful separation tests, the first live firing tests will be conducted in 2021 as part of the final development and qualification of the 1000 kg AASM. The 1000 kg AASM features a guidance kit derived from the 250-kg version and a specific range extension kit, and has the same modular characteristics with the BLU109 penetrating bomb body and MK84 conventional body, as well as its close functional integration with the Rafale, especially for fire control system and configuration options. This new weapon will give the Rafale an enhanced strike capability, with payload configurations of up to three 1000 kg AASMs per aircraft. As noted earlier, its standoff range is also extended, thanks to the integrated propulsion system.

Sayan Majumdar
(All photos: Vayu)

BrahMos signs contract with Philippines for shore based anti-ship missile system

BrahMos Aerospace Private Limited (BAPL) signed a contract with the Department of National Defence of the Republic of Philippines on 28 January 2022 for supply of shore based anti-ship missile system to Philippines. The BAPL is a joint venture company of the Defence Research and Development Organisation. The contract is an important step forward for

Government of India's policy of promoting responsible defence exports.

"The BrahMos supersonic cruise missiles will beef up the firepower of the Philippine Navy, particularly the Philippine Marine Corps Coastal Defence Regiment. This system will provide counter-attack capabilities within the Philippine exclusive economic zone," stated Philippines MoD.

Safran engines on H160M and H160 for French forces

Safran is taking a significant role on the H160M Guépard ("Leopard") helicopter, developed by Airbus for the French armed forces' Joint Light Helicopter programme (HIL), which will replace five different helicopter types currently in service with French forces: Gazelle, Alouette III, Dauphin, Panther and Fennec. Airbus recently received the official confirmation of a first batch of 30 helicopters out of a total of 169 from the French defence procurement agency DGA (Direction générale de l'armement), contracting authority for the HIL programme. The contract also includes an order for ten H160 helicopters for the French Gendarmerie, a decision made within the scope of the French aerospace industry support plan.

Safran's main contribution to these twin-engine helicopters is the Arrano, a new-generation turboshaft engine rated at 1,300 shaft horsepower (SHP) that incorporates the latest aero-engine technologies. The Arrano will offer 20% lower fuel consumption than the helicopter engines it replaces in the French armed forces, and can also use a blend of up to 50% sustainable aviation fuel (SAF). It was certified by the European Aviation Safety Agency (EASA) in June 2019.

Another major contribution from Safran is the Euroflir 410 optronic (electro-optical) pod, which will be fitted on most of these 169 Guépard helicopters and the Gendarmerie's ten H160s to offer unrivaled observation performance. In addition, Safran will supply various safety systems (floatability, life rafts), as well as fuel and cooling management systems.

Safran deploys SAF to UK facility

Safran Helicopter Engines has started using sustainable aviation fuel (SAF) at its Fareham facility in the United Kingdom on a permanent basis, initially with the currently available mix of 38% SAF and subsequently with the maximum permitted blend of 50%. It is the first Safran Helicopter Engines site outside France to use SAF in its engine test cells and now a leading aerospace site worldwide in this field. The SAF is produced by Neste from 100% renewable waste and residue raw materials, like used cooking oil.

MBDA at Defexpo 2022

Supporting Atmanirbhar Bharat

MBDA has two exciting focuses during Defexpo 2022: showcasing the highest performing missile technologies that are in service or available to the Indian Armed Forces, and secondly supporting Atmanirbhar Bharat with our Indian industrial footprint and partnerships as part of MBDA's longstanding partnership strategy with India.

A superb example of this first pillar are the Indian Air Force's new Rafale fighter aircraft that are flying fully equipped with truly game changing set of weapons from MBDA - the revolutionary Meteor beyond visual range air-to-air missile, MICA air combat missile and SCALP deep strike missile. These are the highest performing missiles of their type available anywhere in the world, providing the Indian Air Force – and perhaps the Indian Navy in the future – the ability to stealthily strike deep at enemy targets and to dominate totally in air combat.

MBDA has been actively working in partnership with India's government and industry to build India's defence industrial capabilities for over 50 years. Over this time, many tens of thousands of MBDA designed missiles have been built in India and MBDA is constantly striving to deepen these partnerships to deliver on existing and new programmes.

Today, MBDA is working closely across the Indian defence ecosystem to deliver these two strategic pillars – deliver on Atmanirbhar Bharat while providing world-best technologies to equip the serving personnel of the Indian Armed Forces. This includes close co-operation with DPSUs such as Bharat Dynamics Limited, with whom an agreement was recently signed to conduct the final assembly, integration and testing (FAIT) of ASRAAM missiles in India for the Indian Air Force. The IAF's Jaguar aircraft are the first Indian platform to receive this cutting-edge air-combat missile, and Tejas LCA Mk1A will now also be armed with this potent air dominance weapon, alongside potentially other Indian platforms in the future.

Boris Solomiac, MBDA General Delegate India

The close co-operation between MBDA and Indian industry also includes close co-operation with private sector Indian firms, a notable example being MBDA's joint venture with Larsen & Toubro, L&T MBDA Missile Systems Ltd. Together MBDA and L&T MBDA Missile Systems Ltd will present a comprehensive portfolio of many high performing missile technologies that are in service or on offer to the Indian Armed Forces at Defexpo 2022.

L&T MBDA Missile Systems Ltd already has a fully working site in Coimbatore manufacturing missile and missile launcher components and is competing to provide local Indian solutions for tenders such as it offer of Sea Ceptor, the latest generation of naval air defence system, for the Indian Navy's Short-Range Surface to Air Missile (SRSAM) requirement. Sea Ceptor is a highly advanced naval weapon system that is able to provide the very highest level of protection from air and missile attack for Indian sailors. LTMMSL is also proposing solutions to the Indian Armed Forces for anti-tank and anti-ship weapon systems.

Industrial co-operation between MBDA and Indian industry exists not only at the level of prime contractors, but right across India's vibrant defence ecosystem and including many Indian enterprises of all sizes including micro, small and medium enterprises (MSMEs). This includes Indian expertise being supported on a wide range of complex missile technologies such as hi-specification mechanical, electrical, electromechanical and pyrotechnic items. Extensive examples of such work are being conducted today by Indian firms across a range of missile products being delivered to the Indian Armed Forces, including MICA and ASRAAM.

It is through this long-term- strategy of deeper co-operation with industrial partners and the delivery of further battle-winning technologies to support the Indian Armed Forces' missions that MBDA looks forward to supporting India's vision of Atmanirbhar Bharat.

MBDA news

MBDA delivers 1000th MMP missile to French MoD

Following authorisation from the Direction Générale de l'Armement (DGA), the French procurement agency, MBDA completed the delivery of a batch of MMP (Missile Moyenne Portée / medium range missile) to the French Service Interarmées des Munitions (SIMu) which included the 1000th MMP. According to the Loi de Programmation Militaire, the delivery of 1,950 missiles is planned by 2025.

In use by the French armed forces since 2017, MMP has also been ordered by Belgium and Sweden. MMP is the latest generation anti-tank missile in service to have been successfully engaged in combat on several occasions.

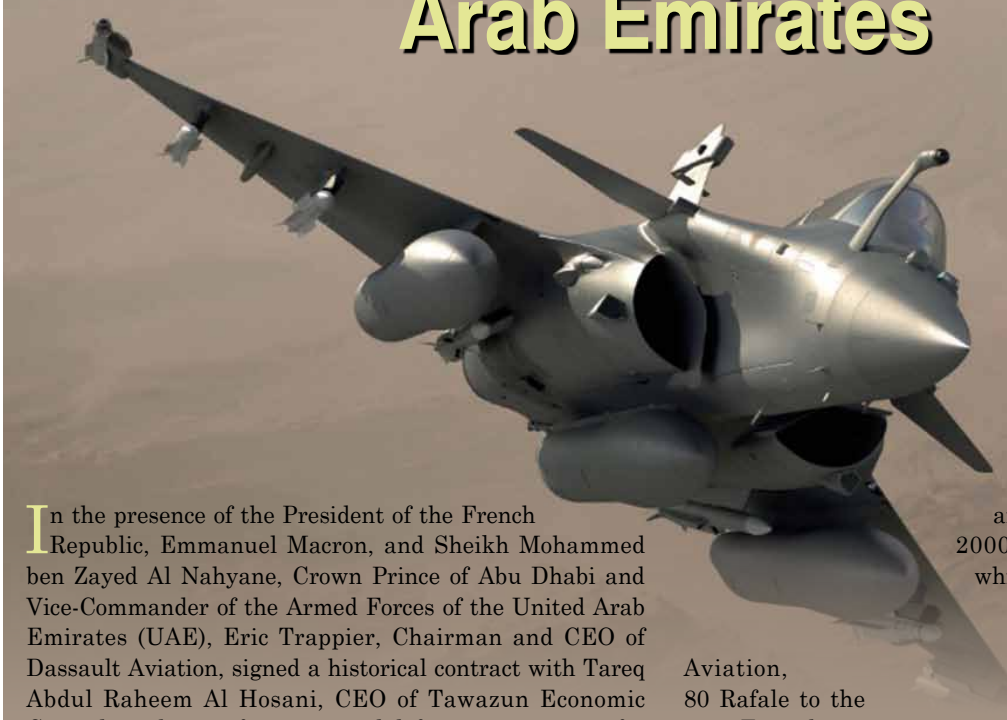
MMP offers both a "fire and forget" capability, allowing the operator to move to another position immediately after firing the missile, and a "man-in-the-loop" capability for engagements requiring a minimised risk of collateral damage. Using a dual-band visible/non-cooled infrared seeker, MMP can acquire both hot and cold targets and then track them completely autonomously. For engagements requiring continuous man-in-the-loop control, a fibre-optic link relays the seekers imaging back to the firing post.

MBDA's Marte ER has successful final test firing

MBDA's new Marte ER anti-ship missile has successfully completed its final test firing. Carried out at an Italian test range in Sardinia, the firing was a key milestone in the validation process of Marte ER. It provided extra confidence in the performance level and reliability of this new missile.

A telemetric production standard missile with all functional capabilities and production hardware embedded was used. The only exception was the use of an inert warhead instead of a live one. The ground based launching system used was also in its final hardware and software configuration. Using its mission planning software, the missile carried out a long range sea skimming flight.

80 Dassault Rafale F4's for United Arab Emirates



In the presence of the President of the French Republic, Emmanuel Macron, and Sheikh Mohammed ben Zayed Al Nahyane, Crown Prince of Abu Dhabi and Vice-Commander of the Armed Forces of the United Arab Emirates (UAE), Eric Trappier, Chairman and CEO of Dassault Aviation, signed a historical contract with Tareq Abdul Raheem Al Hosani, CEO of Tawazun Economic Council, in charge of security and defense acquisitions, for the acquisition of 80 Rafale F4 for the United Arab Emirates Air Force & Air Defence (UAE AF & AD).

The Rafale F4, for which the Emirates Air Force will be the first user outside France, will provide the Emirates armed forces with a tool capable of guaranteeing sovereignty and operational independence. This contract is the result of total mobilisation by Dassault Aviation alongside the Emirates Air Force and comes on the back of a more than 45-year long relationship of trust between the United Arab Emirates and Dassault, built on the Mirage family of fighter aircraft, notably the Mirage 2000-9, the modernisation of which began two years ago.

Eric Trappier, Chairman and CEO of Dassault Aviation, stated, "The sale of 80 Rafale to the UAE Federation is a French success story: I am very proud and very happy as a result. I wish to thank the authorities of the Emirates for their renewed confidence in our aircraft. After the Mirage 5 and Mirage 2000, this Rafale contract consolidates the strategic relationship that binds our two countries and the satisfaction of the Emirates Air Force, a long-standing and demanding partner of our company. I wish to underline the quality and effectiveness of the relationship between the French authorities and industry, which contributed to this success by team France.

Rafale contract for Egypt comes into force

The contract for the acquisition by Egypt of 30 additional Rafales to equip its air force came into force on 13 November 2021. Announced on 4 May 2021, this contract completes the first acquisition of 24 Rafales, signed in 2015, and will bring to 54 the number of Rafales operated by the Egyptian Air Force, the second in the world, after the French Air Force, to operate such a fleet of Rafales.

Dassault Aviation Group

Deliveries, order intakes and backlog as of 31 December 2021

AIRCRAFT DELIVERED IN 2021

30 Falcons were delivered, while 25 deliveries had been guided, versus 34 in 2020.

25 Export Rafales were delivered, in line with the guidance, versus 13 in 2020.

AIRCRAFT ORDERED IN 2021

51 Falcons were ordered, compared to 15 in 2020.

49 Rafales were ordered (37 Export and 12 France). This figure does not include the Rafale UAE contract which T0 is expected in 2022.

AIRCRAFT IN BACKLOG

As of 31 December 2021, the backlog includes:

- 55 Falcons compared to 34 Falcons as of 31 December 2020.
- 86 Rafales compared to 62 Rafales as of 31 December 2020.

(All photos: Dassault)

Dassault: New support contract for French Mirage 2000s

The French Ministry of the Armed Forces' Directorate of Aeronautical Maintenance (DMAé) recently awarded Dassault Aviation the new-generation contract to support the Mirage 2000 fleet of the French Air and Space Force (FASF). Covering a period of 14 years, the BALZAC contract includes all maintenance activities for the French Mirage 2000s until their retirement. Engine maintenance and the services provided by the SIAé (Service Industriel de l'Aéronautique) are the subject of separate contracts.

Dassault Aviation thus becomes responsible for maintenance of almost all the equipment on the B/C, -5 and D versions of the Mirage 2000 (including

those which have undergone a midlife update, previously covered by some 15 separate contracts, along the same lines as the Rafale and ATL2 verticalised maintenance contracts. The scope covers all electronic systems, in particular those produced by Thales. It also includes enhanced technical and logistics services, including a one-stop logistics center at Luxeuil and Nancy Air Bases, a Dassault Aviation presence in the AIA (Atelier industriel de l'aéronautique – aeronautical industrial workshop) in Clermont-Ferrand, out-sourcing of certain NTI2 workshops and endof-life management of all equipment in order to optimise maintenance costs.

Concerning management of maintenance activities, all stakeholders will have access to a Mirage 2000 aircraft support management information system derived from the OPTIMAL IS being developed for the Rafale under the RAVEL contract. This digital continuity optimises the consistency of reference documentation and the fluidity of exchanges, and enables the company to meet its aircraft availability commitments over the long term.

Dassault Rafales arrive in the Hellenic Air Force (HAF)

On 19 January 2022, six Rafales of the Hellenic Air Force (HAF), operated by its pilots, took off from the Dassault Aviation site in Istres to the Tanagra Air Base, where they were welcomed in a ceremony by the Greek Prime Minister Kyriakos Mitsotakis, accompanied by the Minister of National Defense Nikolaos Panagiotopoulos and Senior Greek authorities. Éric Trappier, Chairman and CEO of Dassault Aviation, was also present to welcome their arrival.

The entry into operational service in the Hellenic Air Force's 332 Squadron of these first six Rafale aircraft comes as a proof of the quality of the partnership between France and Greece, and occurs only one year after the signature of the contract for 18 aircraft. It is a testimony to the excellent relation between French and Greek authorities as well as between the Hellenic Air Force and Dassault Aviation teams.

The expertise of the training provided, in particular by Dassault Aviation, at the Mérignac Conversion Training Center (CTC), to Greek pilots, mechanics and HAF technicians, undeniably contributes to the success of this first ferry. The training of personnel will continue in the coming months in France and Greece.

The delivery of the next HAF Rafale will start at the end of 2022 with the objective to have all the fleet deployed at Tanagra Air Base by the summer of 2023.

"The mastery with which the Hellenic Air Force carried out this first ferry flight is a testimony to the excellence of our cooperation and the strength of our historical relationship with Greece for more than 45 years. Thanks to our mobilization, we were able to meet the expectations of the Greek authorities in record time, who now have the Rafale on national territory to reinforce the protection and sovereignty of the country. It also attests to the outstanding quality of our aircraft, confirmed by its export success. Lastly, it reflects our total commitment to meeting the needs of the HAF and to participating in Greece's strategic ambitions," declared Éric Trappier at the end of the ceremony.

Rosoboronexport: "Our Top 5 Russian export products unveiled for 2021"

"In 2021, the global arms market has largely adapted to work under coronavirus pandemic conditions. Exhibition activities have resumed largely, contacts with foreign customers have returned to the format of direct negotiations. Rosoboronexport took part in 10 international exhibitions abroad and 7 events held in Russia," stated Rosoboronexport General Director Alexander Mikheev. "At the same time, the trend for promoting products on digital platforms has continued. Organising web exhibitions, conduct of remote negotiations and multimedia presentations, and online demonstrations of new products have significantly increased interest in Russian weapons."

Rosoboronexport and Russian defence manufacturers showed their partners long-awaited new products at defence and security exhibitions held in 2021.

"The top 5 new export products unveiled in 2021 includes the Checkmate light tactical aircraft showcased at MAKS and Dubai Airshows, Orion-E reconnaissance/strike unmanned aircraft system demonstrated in Russia and abroad, TOS-2 Tosochka MRL with thermobaric ammunition, Kalashnikov AK-19 assault rifle and the S-350E Vityaz air defence missile system," added Alexander Mikheev.

Rosoboronexport noted increased attention to other latest Russian-made products. In particular, great interest was shown in the Pantsir-S1M anti-aircraft gun/missile system, the Krasukha EW system and the Repellent-Patrol mobile EW system for countering small drones, which were contracted for the first time in 2021. The full-scale models of the Mi-28NE, Ka-52 and Ka-226T helicopters in new configurations, showcased at the Dubai Air Show by Rostec's Russian Helicopters Company, have become among the most popular exhibits.

A full-scale demonstration of Russian shipbuilding industry's new ships in export configurations to foreign customers became the main achievement of the International Maritime Defence Show 2021. The delegations of Rosoboronexport's partner countries which visited the IMDS expressed satisfaction with the fact that they were able to see, visit and evaluate the ships offered to them.

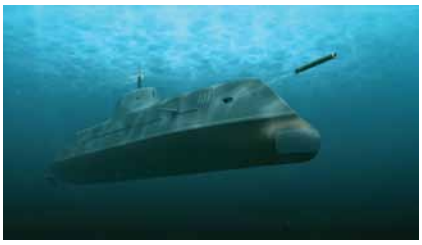
Russia shows who's BOSS!!

The BOSS: New Look, New Features

Rubin of Russia has presented the second version of its BOSS patrol ship that combines the benefits of a submarine and a surface patrol ship. It is the largest version with 72 m length and surface displacement about 1300t. Large dimensions bring more capabilities. New lines with wave-piercing bow and tumblehome hull reduce roll, make the ship a more stable weapon platform and reduce radar signature as well. Sonar array in bow bulb works in better conditions and the bulb itself reduces surface drag. High-power propulsion system allows speed up to 21 kt.

This version is armed with autocannon, two guided-missile launchers and four 324 mm torpedo tubes. Such a weapons package makes BOSS a formidable enemy for even much larger ships. As in other versions, this ship has two pressure-proof multifunctional hangars for boarding team boats and equipment, unmanned aerial vehicles or other payloads. Both radar and sonar can be used for search and target acquisition, allowing discreet detection and approach.

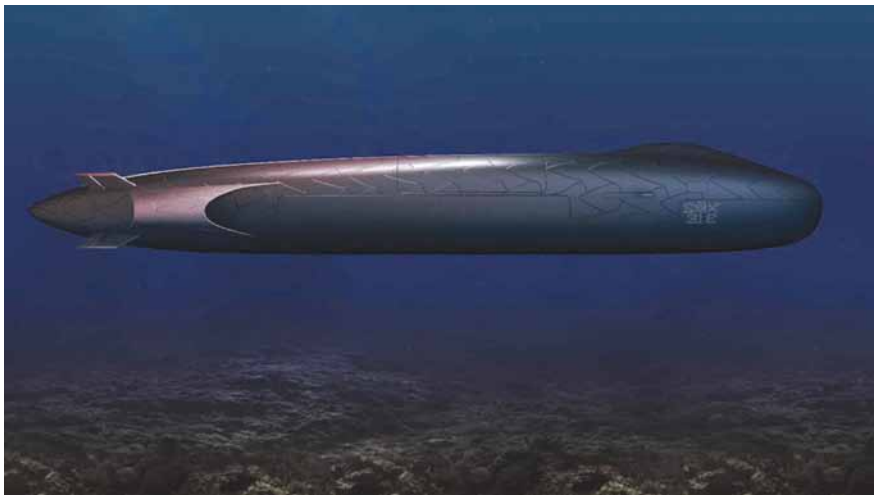
The ship can be used in anti-submarine exercises and training of crews for classical submarines. The cruising range is up to 4000 miles at 10 kt, and can be increased on the customer's request.



As military budgets are decreasing due to the pandemic and its consequences, Navies' demand is shifting to multifunctional ships. "Our response to this challenge is a combination of surface and underwater capabilities in the BOSS project. Due to such synthesis the ship intended for peacetime use retains its relevance as a combat unit in case of a conflict escalation. Moreover, the diving capability allows BOSS to fulfill typical patrol duties in its own innovative ways, some of this ways being cheaper and simpler" stated Rubin officials.

Naval Group at Defexpo 2022

Technologies and Systems being showcased



SMX 31E: The SMX31E, Naval Group newest submarine concept, integrates the latest digital technologies for reinforced operational efficiency and significant versatility of use. Stealthier thanks to her biomimetic covering, the ship also benefits from an unmatched electrical energy storage capacity and a new propulsion concept. SMX31E constitutes a smart naval force to gain superiority in future underwater battlefields. The increased invulnerability is the result of the biomimetic shape and the skin material making it stealthier against active sonar emissions. Endurance is the other asset of the SMX31E –it allows the crew to be submerged for months thanks to the high energy capacities and efficient energy management system.

F21 Heavy Weight Torpedo: Benefiting of highly advanced mission system and very long endurance, F21 is the first heavyweight torpedo able to perform complex mission autonomously. It has far superior characteristics to any other heavyweight torpedo currently in service and is offered for export, strengthening Naval Group's submarine offering. The F21 torpedo is equipped with a very high level of computing power, which gives it exceptional real-time processing capabilities, an advanced mission system and increased autonomy. These technical characteristics considerably broaden the possibilities of tactical use with an unparalleled capacity for target discrimination, even in very difficult environments.

Naval Xplore: Naval Group innovates by introducing the Naval XPlore for the exhibition to respond to the needs of customers, Naval Group created a giant interactive digital environment to present its customer-specific offers in immersive settings to the navies coming to Defexpo.

It will have dedicated presentation of French Barracuda submarine, LPD and other naval technologies which could interest the customer.

1st sortie of Naval Group/MDL's 5th Scorpene 'Vagir'

The fifth submarine of Project 75, Yard 11879, Indian Navy's Kalvari class commenced her sea trials on 1 February 2022. The submarine was launched in November 2020 from the Kanhoji Angre Wet Basin of Mazagon Dock Shipbuilders Limited (MDL). The submarine would be named Vagir, after commissioning.

Despite the COVID pandemic, MDL has 'delivered' two submarines of the Project-75 in the year 2021 and the commencement of sea trials of the fifth submarine is a significant milestone. The submarine will now undergo intense trials of all its systems at sea, including propulsion systems, weapons and sensors. The submarine is scheduled for delivery to the Indian Navy in the year 2022 after completion of these trials.

Lockheed Martin's production capability of fighter wing shipset at TLMAL

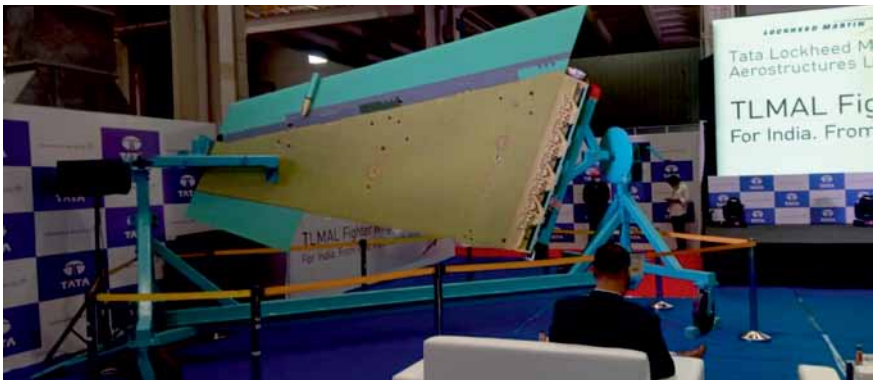
Mr. Sukaran Singh - Managing Director and Chief Executive Officer, Tata Advanced Systems Limited and Ms. Aimee Burnett, Vice President of Strategy and Business Development, Lockheed Martin Integrated Fighter Group holding the Certificate of Qualification

Lockheed Martin, on 7 December 2021, formally recognised Tata-Lockheed Martin Aerostructures Limited (TLMAL) as a potential future co-producer of fighter wings. A ceremonial event marking the first fighter wing prototype built at the TLMAL facility in Hyderabad was attended by Mr. K.T. Rama Rao, Minister for Municipal Administration and Urban Development, Industries and Commerce, and Information Technology of Telangana; along with other government dignitaries; Lockheed Martin Aeronautics and Global Business Development executives; and Tata Advanced Systems Limited and TLMAL leadership.

TLMAL, a joint venture between Tata Advanced Systems Limited and Lockheed Martin Aeronautics, was established in 2010. TLMAL exemplifies the government of India's Aatmanirbhar Bharat 'Make in India' goals and serves as the single global source of C-130J empennage assemblies that are installed on all new Super Hercules aircraft. TLMAL recently reached the milestone of manufacturing and delivering the 150th C-130J empennage.

Lockheed Martin and TLMAL signed an agreement to develop a fighter wing prototype in 2018. Through this prototype project, TLMAL demonstrated the capability to perform detailed part manufacturing and delivery of a fully compliant representative fighter aircraft wing shipset. This achievement further strengthens Lockheed Martin's partnership with India; and supports its F-21 offering for procurement of 114 new fighter aircraft — exclusively for India and the Indian Air Force — by proving additional indigenous production capability.

Lockheed Martin continues to build upon more than seven decades of association and three decades of partnerships with India by nurturing and expanding collaborations with local industry to support the evolution of indigenous defence manufacturing ecosystems, and further advance India's strategic security and industrial capabilities. These range from transport, maritime and fighter aircraft, to shipborne air and missile defence projects, as well as capabilities in civil sectors including new and renewable energy.



Updates from Lockheed Martin

PZL Mielec joins the global F-16 programme

PZL Mielec, a Lockheed Martin company and one of Poland's longest established aircraft manufacturers, is to be a manufacturing partner for the F-16. Beginning 2022, PZL Mielec will build components and assemblies for the latest generation F-16 Block 70/72, sustaining around 200 jobs, with approximately 60 new jobs being created. This development marks a significant new milestone for PZL Mielec, which was last involved in the production of fighter aircraft in the 1960s. Beginning 2022, PZL Mielec will manufacture the rear fuselage, center fuselage, cockpit structure, cockpit side panel and forward equipment bay for new production F-16s, exporting the aerostructures to Lockheed Martin's final assembly line in Greenville, South Carolina.

Advancing LM's F-35 electronic warfare capabilities

BAE Systems has received a $493M contract to significantly upgrade and modernise the EW system for the F-35 Lightning II, enabling the fighter to quickly detect and address evolving electromagnetic threats. BAE Systems received a $493 million contract modification from Lockheed Martin to significantly upgrade and modernise the electronic warfare (EW) system for the F-35 Lightning II, enabling the fifth-generation fighter to quickly detect and address evolving electromagnetic threats in contested battlespaces.

Finland selects F-35 Lightning II

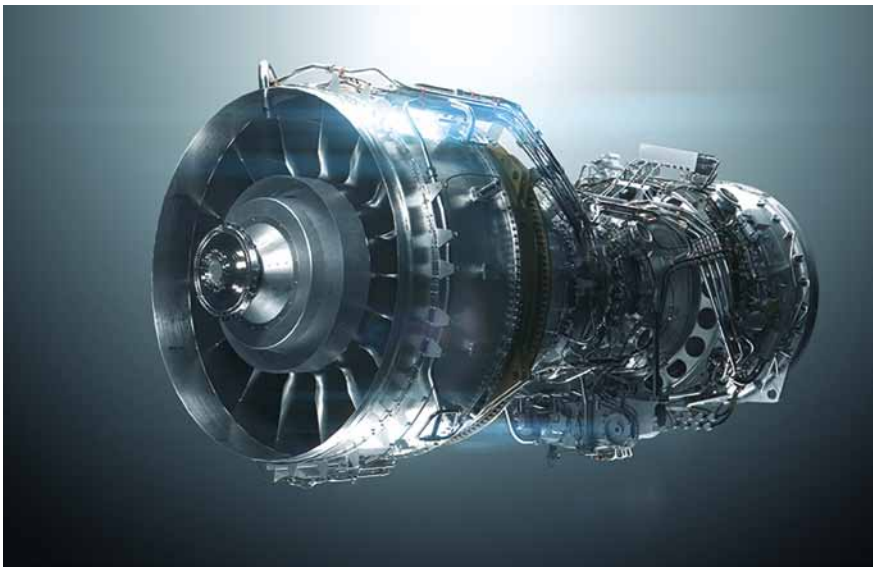
The Finnish Government has announced Lockheed Martin's 5th Generation F-35 Lightning II is the aircraft selected from its HX Fighter Programme.

The Finnish Air Force will receive 64 F-35A multirole stealth fighters, a "robust weapons package, a sustainment solution tailored to Finland's unique security" of supply requirements, as well as a comprehensive training programme.

To date, the F-35 operates from 21 bases worldwide, with nine nations operating F-35s on their home soil. There are more than 730 F-35s in service today (end December 2021), with more than 1,535 pilots and 11,500 maintainers trained on the aircraft.

Rolls-Royce reiterates its commitment to serve India's Armed Forces

Kishore Jayaraman, President – India and South Asia, Rolls-Royce



As India celebrated Navy Day in December 2021, Rolls-Royce saluted the valour and spirit of the brave officers of the Indian Navy for their selfless service in securing the marine borders of the nation.

Rolls-Royce is proud to be a strong partner in the mission readiness of the Indian Navy as well as Coast Guard with advanced power solutions and propulsion systems. With over 80 years of naval propulsion experience, Rolls-Royce has been serving the naval fleets of today and tomorrow with its wide range of technologically advanced offerings. As India strengthens its naval defence capabilities in response to the demand for increased maritime security in the region, Rolls-Royce is well-equipped to provide end-to-end solutions for a future-ready fleet.

Kishore Jayaraman, President – India and South Asia, Rolls-Royce stated, "On Navy Day, we at Rolls-Royce humbly recommit ourselves to serving the present and future mission capabilities of the Navy. Rolls-Royce shares a strong legacy of partnership with the Indian armed forces, and we are well-positioned to partner the Navy's modernisation and self-reliance vision of building a future-ready fleet. As India explores adding powerful warships and electric capabilities to its mighty fleet, we believe that Rolls-Royce's superior product portfolio combined with the deep experience of leading similar programmes globally will bring great value to any future Indian naval programmes."

In India, Rolls-Royce's MTU brand of engines power several vessels of the Indian Navy and Coast Guard. The MTU Series 4000 engines for naval vessels are assembled in Ranchi, in partnership with Garden Reach Shipbuilders and Engineers. Over the years, the company has invested in building engineering and supply chain capabilities in the country, and in 2021 signed an MoU with Hindustan Aeronautics Limited (HAL) to provide packaging, installation, marketing and services support for the MT30.

"Rolls-Royce offers the right mix of products, experience, and capabilities to design, build, deliver, and support customised naval systems and solutions for both hybrid and all-electric naval vessels," Kishore added. Rolls-Royce has pioneered some of the most important technical advances in marine propulsion including the use of aero gas turbines for surface ship propulsion. Its world-leading portfolio of marine products and systems include gas turbines and diesel engines, propulsion, electrical and automation systems, deck handling and innovative unmanned technologies for present and future fleets.

Courtesy: R-R

Pratt & Whitney Canada announces new PW127XT engine

Pratt & Whitney Canada, a business unit of Pratt & Whitney, announced on 15 November 2021 its new regional turboprop PW127XT engine series, designed with the latest materials and technologies to deliver the next level of efficiency, time-on-wing and service. It celebrated with ATR, the launch of the PW127XT-M engine that is purpose-built to offer word-class reliability and increased value for ATR 42/72 aircraft.

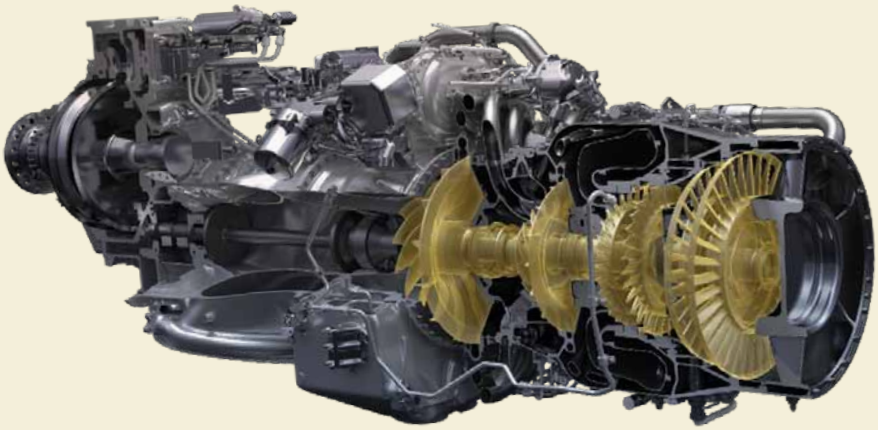
"Since its inception, ATR has exclusively turned to Pratt & Whitney to power its fleet of regional aircraft," stated Maria Della Posta, president of Pratt & Whitney Canada. "We are pleased to launch this exciting new PW127XT-M engine with ATR. Optimised for the ATR 42/72 aircraft family, it will deliver a significant improvement in operating costs, extending the already impressive operating economics and sustainability of this regional turboprop."

"We are truly excited about the launch of PW127XT-M engine and its possibilities, as India's UDAN scheme and regional aviation growth accelerates," stated Ashmita Sethi, president & country head, Pratt & Whitney, India. "The efficient PW100/150 family of engines, which includes the PW127, already powers a vast majority of turboprops in the regional segment for our airline customers like IndiGo, SpiceJet and Alliance Air. In fact, the highly versatile and dependable PW127G engine will also soon power India Air Force's C-295 transport aircraft as well."

Pratt & Whitney Canada's ability to deliver world-class, dependable engines and new technology means that the PW127XT-M engine offers increased savings to customers. Specifically, 40% extended time on wing by moving to the right the schedule for both engine overhaul intervals and hot section inspections from the PW127M and 20% less maintenance costs; with only two scheduled engine events over 10 years.

Regional turboprop engines consume up to 40% less fuel and emit 40% less CO2 emissions compared to regional jet engines. Regional aircraft that are powered by Pratt & Whitney Canada's PW100 turboprop engine families benefit from inherent propulsion efficiency as they burn less fuel, at optimum speed, over the flights they serve (up to 400 nm). The PW127XT-M engine builds on the economic and sustainability advantage of existing PW127M powered aircraft, with a 3% improvement in fuel efficiency. Like all Pratt & Whitney Canada engines, the PW127XT-M engines will be able to operate with sustainable aviation fuels.

Courtesy: P&W



Alpha Design Technologies Pvt Ltd at Defexpo 2022

Alpha Design Technologies Pvt Ltd, has been established with a view to put into action "Make in India" policy of the Government of India. ADTL specialises in R&D, manufacture, assembly, testing, qualification, integration and installation of defence electronics, avionics and space satellites systems. Established in Bangalore during 2004, the Company is structured to offer the above to wide range of products to Indian and International Markets.

Alpha's management, operations and production executives and skilled technicians combine a wealth of experience in all facets of defence technology including R&D, manufacture, quality assurance, evaluation and system integration. The company focuses on Optronics & LRF Based Products, Laser Aiming Systems, Thermal Imagers and Fire Control Systems, Navigation Systems Tactical Communication Radar and C3I Systems, EW Systems Simulators Microwave Components and RF Units and Aerospace Space Technology.

Alkan & Rafaut Group at Defexpo 2022

Tejas LCA

Six months after the acquisition of Alkan by Rafaut Group, the companies of the Group (Rafaut, Alkan, Secapem, Lace, Seca, AEDS, which bring together more than 600 experts) have linked their forces for answering the Indian Forces needs.

Our ambition in India is based on robust Indian partnerships which gives us a solid industrial footprint to support the Make in India initiative. As a group, we are now providing complete solutions of carriage systems under any military aircraft but also target systems for air gunnery training of pilots, aerial munitions and fuel tanks. We work hard to be a key partner for the next generation fighters, and to be a reference player of the commercial aviation sustainability revolution.

Our objective is to provide IAF the ultimate technology on new aircraft and the top support on existing ones, ensuring an optimum operational capability of their fleet.

Rafaut Group is focusing to enforce the Make in India with External Fuel Tanks, Pylons and Racks for Rafale aircraft and soon for Mirage 2000, Jaguar, Tejas LCA, IJT, UAVs while they are already transferring the Release Unit for ALH and LCH helicopters to HAL.

Mounted on more than 60 different aircraft, including Rafale, Gripen, ALH-WSI, Black Hawk, and the global leader on Light Combat Aircraft, we look forward to continuing this cooperation with the Indian industry.

Courtesy: Alkan/Rafaut Group

HAL Rudra

Kuwait receives first two Typhoons

The first Eurofighter Typhoons for the Air force of Kuwait landed at their home base on 15 December 2021 and are the first two Typhoons in the framework of a wider order for a total of 28 aircraft that will be delivered to the Kuwait Air Force. The Eurofighter Typhoon for the Kuwait Air Force feature a wide range of operational capabilities, built by Leonardo according to the specific requirements of the Kuwaiti Air Force.

UAE orders two additional Airbus A330 MRTT

The United Arab Emirates Air Force & Air Defence has formally ordered two additional Airbus A330 Multirole Tanker Transport (MRTT) aircraft increasing the country's MRTT fleet up to five aircraft. With deliveries starting in 2024, this agreement will also cover the upgrade of the country's current A330MRTT fleet to the latest enhanced version.

Indonesia orders two Airbus A400Ms

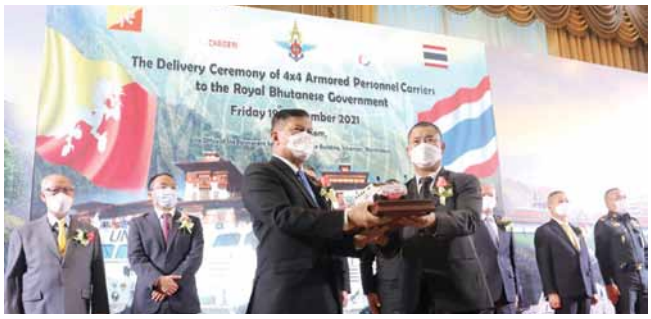
The Indonesia Ministry of Defence has placed an order for two Airbus A400M aircraft in multirole tanker and transport configuration. The contract, which will become effective in 2022, will bring the total number of A400M operators to ten nations. The agreement includes a complete maintenance and training support package. A Letter of Intent was also signed for the future acquisition of four additional A400M aircraft.

Russian Helicopters Mi-171A2 for Bangladesh

Russian Helicopters and the Ministry of Internal Affairs of the Republic of Bangladesh have signed a contract for the delivery of two Mi-171A2 heavy multipurpose helicopters. Under the terms and conditions of the contract, the two rotorcraft are to be delivered to the customer in Q1 2023.

Bhutan buys 15 armoured vehicles from Thailand

Thailand's Chaiseri Metal and Rubber Company Limited, under close cooperation with the Ministry of Defence, has constructed and delivered 15 military 4×4 armoured vehicles to the government of Bhutan.



Bell delivers 2 Bell 505s to Indonesian Navy

Bell Textron announced the successful sale and delivery of two Bell 505 helicopters to the Indonesian Navy. The newly acquired helicopters will be utilised as basic helicopter trainers. This delivery brings the Indonesian Navy's Bell fleet to five aircraft, which already includes three Bell 412 helicopters. More than 100 Bell helicopters are operating in the military and commercial segments in Indonesia.

Bell delivers Huey II to Bosnia and Herzegovina

Bell Textron announced the delivery of four Bell Huey II aircraft to the Armed Forces of Bosnia and Herzegovina (AFBiH). The aircraft are part of a Foreign Military Sale signed in December 2019. The Huey II worldwide fleet of more than 300 aircraft have a combined 1.2 million flight hours. Prior to the delivery, members of the AFBiH Air Force and Air Defense Brigade completed adaptation training at the Bell Training Academy in Fort Worth, Texas.

Australia for Hellfire AGM-114R2 missiles

Australia has requested to buy up to eight hundred (800) Hellfire AGM-114R2 Missiles. Also included is Tactical Aviation Ground Munition Programme Office Technical Assistance; Security Assistance Management Directorate, Joint Attack Munition Systems Technical Assistance; classified and unclassified publications; spare parts; repair and return; storage; and other related elements of program and logistical support. The total estimated case value is $108 million.

Lithuania for Javelin missiles

Lithuania has requested to buy an additional two hundred thirty (230) Javelin FGM-148F missiles and twenty (20) Javelin Command Launch Units (CLUs), that will be added to a previously implemented case that was under threshold. The original FMS case, valued at $28.23 million, included one hundred eleven (111) Javelin FGM-148F missiles and ten (10) Javelin CLUs.

Spain signs for 36 H135s

The Spanish Ministries of Defence and Interior have ordered 36 Airbus H135 helicopters. This signature takes place in the context of the stimulus plan activated by the Spanish government

to support the industry. The Ministry of Defence will receive 18 helicopters to be operated by the air force and the navy while the Ministry of Interior will also take delivery of 18 helicopters to be operated by the National Police and the Guardia Civil. The deliveries will start in 2022.

France orders the H160M

The French Armament General Directorate (DGA) has signed a contract with Airbus Helicopters for the development and procurement of the H160M in the frame of the Light Joint Helicopter programme (HIL). The contract includes the development of several prototypes and the delivery of a first batch of 30 aircraft (21 for the army, 8 for the navy and one for the air force). The French Ministry for the Armed Forces plans to order a total of 169 H160M helicopters, or Guépard as it will be known in the French armed forces. Deliveries will start in 2027 beginning with the French Army.

Rolls-Royce to work with IHI Japan

The engine demonstrator programme will be a critical step forward in enabling the two nations to develop their future fighter aircraft requirements, potentially securing hundreds of future

jobs in the UK and Japan. Work on the joint engine demonstrator will kickstart early next year, with the UK investing an initial £30 million in planning, digital designs and innovative manufacturing developments. A further £200 million of UK funding is expected to go towards developing a full-scale demonstrator power system, supporting hundreds of highly skilled jobs, including many at Rolls-Royce's Filton facility in Bristol.

MC-21-300 to be tested under low sub-zero outdoor temperatures

The MC-21-300 prototype aircraft manufactured by Irkut Corporation (a member of Rostec's United Aircraft Corporation) flew from Zhukovsky (Moscow Region) to Yakutsk for testing under sub-zero outside temperatures. Tests of the MC-21-300 aircraft will be performed as part of the extension of the type certificate which currently allows its operation at outside air temperatures near the ground of minus 30 degrees Celsius. Previously, the aircraft systems were successfully tested on stands under temperature conditions of up to minus 55 degrees Celsius.

UAC's first strategic missile carrier Tu-160M makes its maiden flight

On 12 January 2022, the first Tu-160M, the newly-manufactured strategic missile carrier, took off from the aerodrome of Kazan Aviation Plant, a branch of Tupolev (part of Rostec State Corporation's UAC).

The 30-minute flight was at an altitude of 600-meters and the crew of Tupolev test pilots performed the required maneuvers to check the aircraft stability and control.

The programme for restoring the Tu-160 manufacturing in the Tu-160M modernised version was launched upon the decision of Russian President Vladimir Putin.

As part of the governmental contract between the Ministry of Industry and Trade of Russia and Tupolev, the design documentation for the Tu-160M aircraft was fully digitised in a short time, the titanium vacuum welding process restored, the airframe component manufacturing resumed, and a new cooperation arranged, uniting industry leaders in metallurgy, aviation, mechanical engineering and instrument making, as the majority of them belongs to Rostec State Corporation.

Denis Manturov, Minister of Industry and Trade of the Russian Federation, emphasised, "We have restored the full production cycle of the Tu-160, but now in the M version, having upgraded the engines, aircraft controls, avionics, and weapons. The revamp of Kazan Aviation Plant has greatly aided to the restoration of the unique model's manufacturing processes – the machines and testing infrastructure were upgraded and the world's largest plant for titanium electron-beam welding and vacuum annealing was put into operation. Today we see significant prospects for the Tu-160 platform – its further development will serve well for new types of promising weapons."

The aircraft retains its predecessor's appearance, while being based on novel engineering concepts and digital technologies.

"Tu-160 is one of the largest and most advanced projects in Russia's aviation industry. This project has required both the infrastructure upgrade and the completely new digital environment. A number of aircraft designers have participated in preparing the digital documentation for the project. The fundamental importance of today's event is that the new aircraft has been completely rebuilt from scratch," stated Yuri Slyusar**,** UAC CEO. "Its systems and equipment have been upgraded by up to 80 per cent."

The programme for upgrading and re-launching the Tu-160 strategic missile carriers has required a significant revamp of the plant infrastructure.

"Within the framework of the programme, Kazan Aviation Plant had to renew or upgrade over 40 per cent of its equipment and deliver extra trainings for a majority of the staff. For Tupolev, the restoration of the Tu-160 production is the most significant project, reflecting not only the infrastructure upgrade and key competencies restoration, but also a new level of designing and mass manufacturing to yield most advanced aviation systems," Tupolev CEO Vadim Korolev said.

Tu-160 is the largest and most powerful military supersonic aircraft with variable-sweep wing.

United Aircraft Corporation (PJSC UAC, part of Rostec State Corporation) was established in 2006 to consolidate the assets of major aviation enterprises of Russia. The corporation's enterprises produce many world-renown brands, such as Su, MiG, Il, Tu, Yak, Beriev, as well as new ones - Superjet 100 and MS-21. UAC covers a full processing cycle for aircraft and aviation equipment – from their design to after-sales servicing and disposal. UAC CEO Yury Slyusar is also Vice President of Russia's Union of Machine Builders.

BA Evreux

On 10 November 2021, the French Air Force (L'armée de l'Air et de l'Espace) presented an overview of its capabilities and missions to the auditors of the Institut des Hautes Etudes de Défense Nationale (Institute for Higher National Defense Studies, IHEDN) and the Ecole de Guerre (War College, EDG) , at the Base Aérienne 105 Evreux "Commandant Viot" air base.

During the day, officers from France and from countries all over the world could be seen walking along the various stands and aircraft.

The Institut des Hautes Etudes de Défense Nationale (IHEDN) is a French public academic institution for research, education and promotion of expertise and sensitisation towards defence matters. The aim of the Institute is to train high-level military, government officials and high-ranking executives in defence matters.

The Ecole de Guerre (EDG) is a French military academy that trains senior officers to become as high-ranking senior officers.

As a part of the event, various presentations were made and these demonstrations illustrated the capabilities of the French Air Force, guaranteeing air superiority, while staying ahead and cultivating the moral strength of airmen.

Static presentation

On a static display, the French Air Force showcased its following aircraft:

1 Airbus A330 MRTT "Phenix"
1 Airbus A400M "Atlas"
1 Lockheed Martin C-130J "Hercules"
2 Dassault Rafale
1 Pilatus PC21
1 Beechcraft King Air 350
1 Eurocopter EC725 "Caracal"

Close to the aircraft and helicopter, the crew was gathered to answer questions from the participants. On another platform, ground-based units of the French Armed Forces like the Ground-to-Air Defence units demonstrated their capabilities.

Dynamic presentation

The dynamic presentation was performed by selected aircraft from the static display:
1 Airbus A330 MRTT ''Phenix''
1 Airbus A400M "Atlas"
1 Lockheed Martin KC-130J "Hercules"
1 Pilatus PC21
2 Dassault Rafale, flying from another location of the airbase
1 German Air Force C-160 Transall, flying from another location of the airbase

During the dynamic presentation, two Rafale aircraft and the PC21 took off and later the PC21 was intercepted during a 'slow-mover interception' whereby the PC21 was forced to land afterwards.

Then the A400M flew by and dropped a number of paratroopers, followed by the landing of the KC-130J. After landing, soldiers deboarded from the C-130 via the

open ramp to take up defensive positions. Finally, the old and venerable C-160 landed at the airbase.

C-130J

For the first time the recently established Franco-German tactical transport squadron demonstrated its new Lockheed Martin C-130J "Hercules" aircraft. After the formal decision to establish a mixed tactical transport squadron in 2017, work started at

BA Evreux to create a huge new apron with large hangars to locate the future aircraft. And for this very purpose, orders were placed at Lockheed Martin.

The mixed squadron will receive 10 aircraft: two French C-130J, two French KC-130J and six German C-130J. All French C-130Js have been delivered and the first German is expected to arrive around February 2022 in France. Full operational status is expected to achieve around 2024 and by then, the final C-130J should have been delivered. The pilots of the two nations will then train in mixed teams "without distinction of nationality".

Text and Photos: Alex van Noye & Joris van Boven

Dutch Wildcats celebration

"300 Squadron, the 'You never walk alone' feeling"

It has been 25 years since the first of the 17 brand-new AS-532 Aérospatiale Cougars of the Royal Netherlands Air Force (RNLAF) landed for the first time at Soesterberg Air Base, home base for 300 squadron at that time. The initial contract was signed on 23 October 2013. The first 'Cougar' was delivered on 3 May 1996 and all 17 deliveries where completed in the subsequent two years. Currently, 300 squadron operates out of Gilze-Rijen Air Base as part of the RNLAF Defense Helicopter Command (DHC), established in 2008.

'In Mobilitate Vis Nostra'

The 'Wildcats', their usual callsign when operating in the Netherlands, of 300 squadron have completed more than 55,000 flight hours to date which, since 1996, enabled them to participate in a very respectable number of major deployments and exercises. Active deployments all around the world, consisting of ship- and land based operations, shows mobility is clearly within the DNA of the squadron. Something that is also embedded within the squadron's motto 'In Mobilitate Vis Nostra' (in mobility lies our power).

New Commander

Since the beginning of September 2020, Lt Col. Roy Hemmelder became the new Commander of 300 squadron. He has been with the unit flying the Cougar helicopter ever since the beginning of this millennium. Only being away from the squadron while broadening his rotary wing experience flying the NH90 for several years for the maritime 860th squadron and learning the ropes as a flight instructor at the 131st squadron. Having been deployed to Bosnia, Iraq and Afghanistan for numerous times he proudly elaborates; "300th Squadron just breathes agility. Its people combined with the Medium Utility Cougar helicopter are able to operate in multiple domains, over land and water, supporting conventional, maritime and Special Forces. The Defense Helicopter Command has many capabilities up its sleeve, of which agility and versatility are definitely a major part of 300 squadron's trademark". This also shows in the squadron's numerous partners, simultaneously operating with Special Forces, Navy Marines and Air Mobile Infantry during various exercises and deployments. Lt Col. Hemmelder adds; "Such diversity fits perfectly within in the 5th generation air force concept, where integrating and sharing knowledge between joint assets and operating in a multi-domain battlefield is vital". After serving various staff functions at the Airforce HQ and Armed Forces HQ, LtCol. Hemmelder finished his Advanced Staff Training during 2019-2020. One year in as Commander of 300th squadron he reflects: "Thus far this has been one of the most rewarding jobs I've experienced, mainly due to 300 squadron's people and esprit the corps, but also the diversity. I'm enjoying every day, looking forward to what the future has in store."

History

The squadron's history dates back to 1962, at the time operating out of Ypenburg Air Base, close to the city of The Hague. First, they started operating in the training role with the H-23 Raven. By August of 1965 the transition was been made to the Alouette III. From this point on the squadron also

operated the L-21B Super Cub and the DHC 2 Beaver. With the retirement of the last Super Cub in 1976 and Ypenburg Air Base losing its operational state, the squadron moved to Deelen Air Base and operated there from 1968 to 1995. From 1996 to 2008 the Squadron was based at Soesterberg Airbase after which it was relocated to Gilze-Rijen Airbase during the establishment of the Dutch Defense Helicopter Command.

Shocking news

In 2011, after another round of Dutch defence cuts, it was decided that 300 squadron would be decommissioned. This came as a huge shock to the squadron, especially since the continuous record of accomplishment since the introduction of the 17 Cougar helicopters in 1996. The decision was (partly) reversed in the same year due to a shortage of SAR-helicopters (due to replacement of the Lynx for N90 and the retirement of the three AB-412 helicopters, which had a dedicated SAR task). The plan was to continue to execute tasks with three 'Cougars' (in a dedicated SAR role) in anticipation of future maturity of the NH-90 fleet. The squadron would stay operational until 2012. However in the same year the decision was rolled back further by increasing the number of operational AS-532 'Cougars' to eight and prolonging the squadrons task up to 2018. In 2015 four more where made operational which leads to the current fleet of twelve Cougars that remain in service of the squadron. In 2018 it was decided that the squadron will stay operational with the Cougar helicopter until at least 2030. 'Being uncertain about our future, as a team, we had to endure a lot the last decade. I believe flexibility and teamwork was key to deal with this situation' Lt Col Hemmelder added. But I also believe the Medium Utility Helicopter in itself has contributed significantly in this regard. 'In the end we are like an oiled Swiss Army knife, which has proven its added value over the years, and is quickly available when called upon".

Deployments

Since the 1990s the 'Wildcats' have been deployed during numerous conflicts and humanitarian missions all over the world. In 2001 and 2002, 300 squadron took part in the Stabilisation Force (SFOR) in Bosnia. For this mission five Cougars operated out of Divulje Barracks, Croatia, for a period of a year. The primary tasks was Air Mobility; transporting cargo and troops but also operating as an Incident Response Platform from Sipovo Hospital throughout the AOO.

In 2004, 300 Squadron took over the duties in Iraq as part of the Stabilisation Force Iraq (SFIR). For this operation three 'Cougars' operated out of Tallil Air Base. Again in the transport and MEDEVAC role.

The 'Cougars' of 300 squadron also deployed to Afghanistan several times during 2006 to 2010 Operations took place out of Kandahar Airfield in support of the Task Force Uruzgan. Besides a transport role of supplies also missions to support Special Operations Forces (SOF) where executed.

300 Squadron also supports humanitarian missions like fighting forest fires (Fire Bucket Operations – FBO), in 2004 the squadron deployed two Cougars to Portugal, and in August 2007 towards Greece to support the firefighting there.

From Wildcats to Seacats

Furthermore, the Cougars have also been involved during anti-piracy missions of the coast of Somalia operating from the Royal Netherlands Navy vessel Hr. Ms. In Rotterdam. A wide variety of tasks were carried out ranging from reconnaissance flights, transportation of boarding teams (Marines), drugs encounters and even blocking suspicious ships. The unit has been involved in anti-piracy missions during 2012 until 2017 under various mission names; 'Atalanta', 'Ocean Shield' and 'Carib'. For these amphibious overseas missions six Cougars (serials S-419, 441, 442, 445 and 447) are available with maritime equipment like floats to prevent the helicopter from sinking when it comes in the water.

Until 2015, the squadron was tasked as Patients transport (Air Ambulance) from the Wadden Islands, which are located in the upper north of the Netherlands in the Wadden Sea, to hospitals on the mainland. In 2019, 300 Squadron deployed two Cougars for 'Hurricane Disaster Relief' after Hurricane Dorian hit the Bahamas. A naval exercise towards the Bahamas went from training towards a real mission overnight. In 2020 the 'Cougars' operated from the Royal Netherlands Navy vessel 'Hr. Ms. Karel Doorman' in the Caribbean for the "COVID Support 2020". Though Covid-19 remains to have impact on the global society, 300 squadron has been adapting to this new situation. Indeed, 'In mobility lies their power'.

Mission Qualification Training (MQT)

As international training and exercises where largely cancelled during 2020 due to COVID-19, the unit organised a six-week Mission Qualification Training (MQT) including a tactical electronic warfare exercise (TAC EW) itself in the Netherlands. Captain Jimmy, one of 300th Squadron's Flight Commanders, stated, "this all is part of the continues learning curve we enjoy during our careers, to train as new pilot towards operational (combat) readiness takes about two years, but the learning never stops". The MQT took place during January and February of 2021. Following that precious training, in April 2021 the exercise 'Port Defender' took place in the Port of Rotterdam with a dedicated focus on Dutch Counterterrorism activities during which 300 squadron was further able to hone its

skillset. Lt Col Hemmelder added, "before the year is through, we'll also have trained our environmental skills in Degraded Visual Environments during EDA HOT in Beja Portugal, and Mountain Training in Aviano Italy. Furthermore, valuable joint training is coming during the International SOF-exercise Nighthawk in Denmark and the maritime amphibious exercise Joint Warrior near Scotland and Ireland. The MQT serves its purpose, in laying a firm bedrock for our crews to build upon when training towards those various mission sets.

Maintenance

Currently 300 squadron maintenance crews are performing a 'Base Maintenance Inspection' on one of the Cougars. According to 1st Lieutenant Niels Henderson, Chief Helicopter Maintenance of 300 squadron, this is a unique opportunity. During early 2018 Heli-One (based in Richmond, British Columbia, Canada), a leading provider of Helicopter Maintenance, repair, and overhaul (MRO) services signed an agreement with the Royal Netherlands Air Force (RNLAF) to provide on-site Intermediate/Depot-level maintenance on the twelve AS-532US Cougar helicopters and to support five additional aircraft in storage. A staffing facility at Woensdrecht Air Base with project managers, technicians and support crew from Heli-One Poland has been established at that time. The agreement covers Inspections and Maintenance above the 750 Hours/2-year interval, Engine Makila 1A2 inspections, Corrosion Prevention, and support to the Operational Level Maintenance organization upon request.

Recent exercises

This year (2021) again a number of international training exercises are planned explained Jimmy, 300 squadron flight Commander. 'We started off in July 2021 with 'Hot Blade' in Portugal to retain profiency in brown out operations. Lt Col Hemmelder adds "It has been a valuable multiship and multi type training for us. We are able to improve and further standardise our military cooperation with our European partners who took part during Hot Blade".

"This year 2021 we also have planned the 'High Blaze' exercise again taking place at Aviano Air Base in Italy. This exercise will be important for our crews to catch up with operations in mountainous areas operations. In preparation for the mentioned exercise, late July 2021, we deployed to Laupheim in Germany where we organised an initial mountain training before heading to Italy".

The rest of 2021 will bring the four weeks 'Hebrides Archer' exercise out of the Royal Netherlands Navy vessel 'Hr. Ms. Karel Doorman' with 2 Cougars together with one NH90 starting at the half of September. The final exercise for 2021 will be the three weeks SOF 'Nighthawk' exercise held in Denmark out of Aalborg Air Base, starting at the last week of September.

SOF-exercise Nighthawk

Captain Jimmy states, "in order to improve our conventional support tasks and capabilities towards the Special Operations Forces (SOF), we will be involved in the large scale SOF-exercise "Nighthawk" which will be held in Denmark later this year. The 'Wildcats' of 300 Squadron will be in direct support of the Special Operations Forces (SOF) of the Netherlands and various other partners present at that exercise".

During 2013, a dedicated Programme was started to build up SOF Air capabilities within NATO. This Programme was initiated by the Supreme Headquarters Allied Powers Europe (SHAPE) as part of the NATO Special Operations Headquarter (NSHQ) in Mons, Belgium. In the Netherlands, on 5 December 2018, the Netherlands Special Operations Command (NL SOCOM) was established as a dedicated Command for all Special Forces activities. These forces comprise of Commando's (Korps Commando Troepen, KCT) and Maritime Special Operation Forces, (MARSOF).

Article & Photos by: Carlo Kuit & Paul Kievit/ Bronco Aviation

Photos on facing page: Sven Scheffers

End of Dutch Chinook CH-47D's

On 22 December 2021, the very last Boeing CH-47 Chinook type D (Delta) was taken out of service by the Royal Netherlands Air Force ("Koninklijke Luchtmacht"). The 298 squadron from Gilze-Rijen Air Base (ICAO code: EHGR), arrived with the very last flying Chinook D type (registration D-667, nickname "Rodney", with matching callsign "Grizzly47D") at the GLV5 training area near Oirschot, in the southern part of the Netherlands. GLV means Low Flying Area or "Gebied Laag Vliegen", where Dutch Air Force helicopters can exercise in flying low-level and performing 'brown-out' landings.

This last Chinook flight was announced in various photo and spotter social media sites. And there were some 75 photographers present for an early (around 9 o'clock in the morning) and a cold (-5 degrees centigrade) photoshoot to capture the last flight of this helicopter type.

The existing 11 Dutch CH-47Ds were replaced by 14 new Boeing CH-47F MYII CAAS (Common Avionics Architecture System) aircraft. This brings the total of helicopters to 20 Chinooks in total, because the 6 existing CH-47F aircraft are being modernised and brought to the same CH-47F MYII CAAS standard as the rest of the fleet.

Photos and text: Joris van Boven

Farewell flight of the Belgian C-130s

Michael Moors, copyright 'Belgian Defence'

On 17 December 2021, the official farewell flight of the Belgian Lockheed C-130 Hercules took place and after 50 years of loyal service, the C-130s were replaced by the Airbus A400M. For this formal farewell, a formation flight of 2 or 3 Belgian C-130s plus Italian, Polish and American C-130s was planned to fly over all Belgian provinces. Due to very heavy fog at Melsbroek Air Base (ICAO code: EBMB) that day, only a formation flight of one C-130 and one A400m could be arranged in the afternoon. During this flight, the C-130 and the A400M changed places for photo sessions by photographers on the open ramp of both aircraft. After landing, the Melsbroek Fire Department gave the C-130 a 'water shower' as a last farewell.

When all engines were shutdown, a group photo could be made of the remaining C-130 crews and mechanics. Later that night a big party was held on the base.

In their 50 years of service in Belgium, around 150,000 tons of cargo was transported, around 285,000 flying hours were logged in around 199,500 landings.

After the formal flight on 17 December, some local navigational flights were flown on the 20th and 21st. On the 22nd, the remaining aircraft were flown to Charleroi airport (ICAO code: EBCI), where their future is uncertain. Some sources say these aircraft will be sold as forest fire fighters ('water bombers'), some sources say these aircraft will be scrapped.

The Belgian Air Force ordered twelve Lockheed C-130 Hercules aircraft in 1971 and the first one (CH-01) was received in

The A400 has replaced the C-130s

July 1972 by the 20th Tactical Transport Squadron of the 15th Transport Wing at Melsbroek AB . The last one (CH-12) was received in May 1973. Two aircraft were lost, one to a hangar fire and one by a crash; both C-130s were replaced later.

Here is a short and incomplete overview of the many international missions flown by the Belgian C-130s. Soon after receiving the first aircraft, in May 1973 a humanitarian support mission was launched in Africa 'SOS SAHEL'. More humanitarian relief missions were flown in Africa throughout the years. Also, civil repatriation missions in Africa were flown in 1978, 1991 and 1993 (NEO, Non-combatant Evacuation Operation). During the first Gulf War in 1991, transport missions were flown, to support the Belgian Mirage detachment in Jordan and for humanitarian assistance for the Kurds in Iraq and Iran. From 2003 until 2021, transport missions were flown to support ISAF (International Security and Assistance Force) in Afghanistan. In August 2021, NEO mission 'Red Kite' was launched to evacuate civilians from Kabul airport in Afghanistan. Three C-130s flew an airbridge between Kabul (Afghanistan) and Islamabad (Pakistan).

Text and photos (except where mentioned): Joris van Boven and Alex van Noye

Exercise Blue Flag

(Photo: RAF)

After every two years, the Israel Air Force holds the Blue Flag exercise: an international training exercise hosting air forces from around the world to strengthen cooperation between the nations. This year witnessed the largest and most advanced aerial exercise ever held in Israel. "Holding an international exercise in this current reality, while continuing our public and covert operational activities on all fronts, is of utmost strategic importance and has extensive impact over the Israeli Air Force, the IDF, and the State of Israel"

On 17 October 2021, after months of extensive preparations, the international Blue Flag exercise led by the Israeli Air Force with the participation of seven air forces officially commenced. The exercise lasted two weeks and ended 28 October 2021.

A Historic Exercise

Germany, Italy, Britain, France, India, Greece and the United States participated in Blue Flag 2021. This was the first deployment of a British fighter squadron in Israel since establishment of the country, as well as the first-ever deployment of an Indian Mirage fighter squadron in Israel, and the first deployment of a French Rafale fighter squadron in Israel.

Each participating air force differs in weapon systems, combat doctrines and operational protocols, which could pose challenges in joint training. "The participants aren't familiar with the airspace so we designed a gradual two-week-long training programme", Lt Col E. shared. "First, training scenarios designed to familiarise aircrew members with the airspace and its challenges took place to allow for safe training in the days ahead. To start, each country flew in separate formations and over time, we began flying in joint formations of different nations and platforms. Also, we performed singular training sessions with the aim of understanding the training ground and the aerial and ground forces it contains. Lastly, we shifted to air superiority situations, simulating various ground and aerial threats while completing varying operational missions".

Between Generations

This year's theme was the integration of fourth and fifth-generation aircraft in complex operational scenarios. "Due to the rise in the use of fifth-generation fighters around the world, this year's Blue Flag

exercise focused on combining them with other platforms in the battlefield", explained Lt. Col. E. "Air forces understand that, at least in the near future, they will not strictly operate fifth-gen aircraft, but also the older fourth-generation platforms", he added. "When planning the exercise, we tried to create heterogenic scenarios that combine different countries, squadrons and generations. Fourth-generation aircraft will fly alongside fifth-generation aircraft in ways that utilise the relative advantages of each platform. Cooperation between different generation aircraft strongly enhances the power of an air force".

A Historic Flyover

Another event taking place for the first time was a joint honorary flyover in Israeli skies. Maj. Gen. Amikam Norkin, commander of the Israeli Air Force, headed the flyover in a "Baz" (F-15) alongside an Israeli "Adir" (F-35I). Lieutenant General Ingo Gerhartz, Commander of the German Air Force, flew alongside them in the "Eagle Star" Eurofighter, which has been specially painted with the Israeli and German flags.

Maj. Gen. Norkin stated, "This exercise is groundbreaking in terms of technology, quality of training, and the number of participating nations. It illustrates the partnership and strong bond between the nation's air forces and acts as a stepping-stone toward regional and international cooperation".

Article by: Roni Kolman and Israel Air Force

Photos: RAF (@RoyalAirForce)/German Air Force (@Team_Luftwaffe)/Israel Air Force (@IsraelAirForce)/USAF/Tomar Aizik/Amit Agronov/Nevo Levin

IAI's Scorpius T AESA EW next generation threat simulator debuts at Blue Flag 2021

Israel Aerospace Industries' (IAI) subsidiary, Elta unveiled the Training Scorpius (Scorpius T) system participating in the Blue Flag 2021 military exercise- the first use of the system in an international military exercise.

The mobile, Scorpius T, AESA EW threat simulator, emulates modern, signal-dense, multi-threat scenarios for aircrews and operators training, as well as test EW functions. The system is compatible with 5th generation fighters, mission-aircraft and fighter aircraft. The technology uses a range of small transmitter/receiver units, opposed to a single mechanical antenna, to provide a mobile training unit capable of simulating a range of combat scenarios. In addition, Scorpius T is the first system to combine IAI Elta's AESA technology with EW systems to simulate multiple land-based threats in training exercises.


भारतीय वायु सेना


K1213

Exercise Cormoran 2021

"An exercise with ambition"

In 2021, the French Navy (la Marine Nationale) and the French Army (l'Armée de Terre) organised an exercise called "Cormoran 21 an exercise with ambition". Previous Cormoran exercises were conducted with only one helicopter-carrier "porte-hélicoptères amphibie" (PHA) of the amphibious Mistral class of helicopter carriers. In this year's edition, two PHAs were involved: the PHA Tonnerre and the PHA Mistral.

Two amphibious helicopter carriers not only gave double striking power, but also increased the planning burden to get all ships and helicopters at the right place and at the right time. More planning, more communication and more synchronisation were needed by the French Navy (Marine Nationale), the French Army (l'Armée de Terre) and the boarded Army helicopters of the ALAT (Aviation Légère de l'Armée de Terre).

From 27 September until 15 October 2021, the Naval Air Mobile Group (Groupe Naval AéroMobile, GNAM) conducted Exercise Cormoran 21 in the Mediterranean Sea. Some 1,500 soldiers from the French Navy and the Army were engaged in this high-intensity exercise. For the first time, a GNAM consisting of two amphibious helicopter carriers, the PHA Tonnerre and PHA Mistral, deployed with two airmobile groups with a total of 24 combat helicopters, as well as a support group.

Each amphibious helicopter carrier carried 12 helicopters onboard, the PHA Tonnerre carried the helicopters of the 1RHC, the PHA Mistral carried a mix of 3RHC and 5RHC helicopters.

The exercise was commanded by a joint staff, deployed aboard the PHA Tonnerre. The staff was made up half of soldiers from the 'Force Aéromaritime Française de Réaction Rapide' (FRMARFOR, the Aeromaritime Rapid Reaction Force) and other half contained soldiers of the the 4e Brigade d'AéroCombat (4e BAC, 4th Air Combat Brigade, based at Clermont-Ferrand (FR)). The helicopter carriers were escorted by a number of battleships that would protect the ships from air and sea threats.

Cormoran leadership

The GNAM (Groupe Naval Aéromobile) command is currently under command of Marine Admiral Christophe Cluzel, and its deputy commander is Armée de Terre General Frédéric Barbry. GNAM is responsible for the CORMORAN exercise and both Admiral Cluzel and General Barbry were present onboard of the PHA Tonnerre and during a press meeting, both officers mentioned the unique challenges, opportunities and ambitions to work with 2 helicopter carriers at the same time, during the whole 3 weeks of the exercise.

Cormoran exercise planning

Colonel Hubert is the Cormoran exercise director and he explained how the GNAM (Groupe Naval AéroMobile) prepares and executes this exercise. In order to get all cards rightly placed, it requires immense planning of more than an year to execute this exercise. The GNAM role was to intervene and to remove the invader.

PHA helicopter carriers

The Porte-Hélicoptères Amphibie (PHA, Amphibious Helicopter Carrier) PHA Mistral (L9013) and PHA Tonnerre (L9014) belongs to the Mistral class of French amphibious helicopter carriers. The whole class consists of three ships, together with the sistership PHA Dixmude (L9015). Originally, two additional Mistral-class PHAs were built for the Russian Navy but after the Russian annexation of the Crimea, these were sold to the Egyptian Navy.

These PHAs have three large diesel engines and a smaller spare diesel engine, that use their power to drive alternators that produce electric power for the ship.100 per cent electric power is used to drive the two large propellers and they will give the ship a speed of some eighteen knots.

With a length of nearly 200 meters, the PHAs can store four embarkment barges in a submersible dock, 40 LeClerc tanks, 70-100 trucks, 400-500 armed soldiers and some 15-20 helicopters, depending on their size.

The first ten days of the exercise were used for familiarisation and integration, to learn to operate from the amphibious carriers by day and by night in large helicopter formations. Three raids were planned involving the two carriers, with increasing difficulties.The first two raids were into the mainland of France, while the third and last raid was the night raid into the Solenzara airbase (Base Aerienne 126 "Solenzara", ICAO code LFKS) at Corsica.

In order to increase the complexity for the planners and the participants, a Forward Operating Base (FOB) was established on Corsica. Transport helicopters then set up a supply line to transfer cargo and soldiers between the two carriers and the FOB. While the other helicopters were performing the actual raid on Solenzara airbase. This all during the night, with no or minimal radio transmission, under a very hostile environment.

Planning challenges with ambitions

The helicopters can be transported from the hangar deck to the flight deck with two elevators, one on the right side near the stern for helicopters with folded rotors and another one on the stern for helicopters with unfolded or fixed rotors. On deck, there were six launch positions during daytime operations and for security reasons only five launch positions during nighttime operations. The launch positions can only be reached from the stern of the ship. The six or five of launch positions plus the elevators with different capacities, gave planners an 'ambitious' headache when a large number of helicopters were needed to be launched in a short time frame. As the Tigre attack helicopters can not fold their rotors, they can only be transported via the stern elevator, but they can take-off fast due to the fact that there is no time needed to unfold the rotors. Other helicopters can use the side elevator, but they need more time to unfold the rotors on deck. Also helicopters with folded rotors can easily be moved around the flight deck, which is less easy for helicopters with unfolded rotors .

Besides the 'ambitious' deck planning, the fuel capacity of the various helicopter types was also an 'ambitious' planning headache as the Gazelle helicopters have a smaller fuel capacity than the Tigre and NH90 helicopters. So the Gazelle helicopters would be the last helicopters to leave the carrier and they would return first; while the Tigres, NH90s and Cougar helicopters loitered around the carriers until the helicopter formation was established.

And as the launch raid for 12 to 16 helicopters was planned ahead, the return of these helicopters was at random, with various fuelstates, giving even more headaches to the handlers to move the helicopter to the hangar deck fast.

Text by: Joris van Boven
and Alex van Noije
Photos by: Joris van Boven

Atlantic Resolve 2021

In the fall of 2021, the US Army deployed the first Air Cavalry Brigade helicopters to Europe for the "Atlantic Resolve" deployment exercise. Whereby, the brigade and its helicopters get deployed all over Europe for nine months and at the same time, the 1st Combat Aviation Brigade moved back to the United States after completing their 9 months tenure in Europe.

The first ACB from Fort Hood (Texas) arrived at the port of Vlissingen onboard the transport ship ARC Endurance. 44 helicopters and rolling material were moved from the ship to shore and the helicopters were then re-assembled in a large hall. After re-assembling, the helicopters were transported to a nearby area, from where they flew to the nearby Woensdrecht Air Base (ICAO code: EHWO). After this short check flight, the helicopters flew further into Illesheim Army Air Base in Germany. The returning first CAB moved its helicopters from Germany to the Gilze-Rijen Air Base (ICAO code: EHGR), as a buffer base close to the final destination of Vlissingen. When the incoming 1st ACB cleared the port of Vlissingen, the 1st CAB helicopters flew to Vlissingen for disassembling and further transported back to the United States.

Host Nation Support: The United States asked the Netherlands for support with the relocation. The Dutch defence deployed military personnel for this so-called "Host Nation Support." This mainly happens in the port of Vlissingen and around Gilze-Rijen Air Base and Woensdrecht Air Base. The first CAB helicopters flew in groups from Germany to Gilze-Rijen Air Base in the last weeks of November, while the 1st ACB helicopters flew around the same time to Woensdrecht Air Base and further into Germany.

Dutch deployment: The transshipment site in the port of Vlissingen is a 'temporary military object'. This is guarded day and night by army soldiers and dog teams. Navy units ensure the safety of the transport. For example, divers check the quays for explosives. The Royal Netherlands Army coordinates and supervises the entry of the helicopters.

On 22 November 2021, the first group of returning helicopters arrived at Gilze-Rijen Air Base during the afternoon and in the evening. On 26 November 2021, a media moment was organised by the Dutch Army in the port of Vlissingen, at the quay of the "Verbrugge International" company. The main crux of this event was to demonstrate the arriving of helicopters and their re-assembly in the large hall.

Photos and text: Joris van Boven and Alex van Noye

Ukraine's military aviation legacy

Line up of Ukraine aircraft out of use

By land size, the largest European country is currently facing an almost equal high sized level of tensions with a threatening situation at its eastern borders. The crisis situation in Ukraine, now confronting its earlier close Soviet partner, the latter which is concentrating military forces in the border areas of the both countries, has been dominating the global news for considerable time. Due to Ukraine's desire for closer relationships with its neighbouring European Union community and, even more sensitively, with NATO, Russia has demanded no new NATO membership for the country connecting directly to its borders. All of Ukraine's defence forces remain therefore in a high state of alert and the countries' air force is no exception to that. Although the current operational fleet of Ukrainian fighter aircraft is outnumbered by its Russian opponent, the situation is completely different from what Ukraine had in the nineties.

1991

With a failed coup in Moscow in 1991, the earlier firm and for years established Soviet Union power was affected for some time, causing several states to consider new future ambitions, or even claimed independency; like Ukraine, supported by 90% of its population in a poll during that year. Until that turning point, Russia had considered Ukraine as a strategic important country and consequently had deployed numerous military assets throughout the partner state. The Soviet developments of 1991 lead to a power vacuum and the deployed military units started to return home, abandoning their bases and leaving equipment behind including an arsenal of strategic nuclear weapons. The following years Russia and Ukraine negotiated on the terms how to separate and settle with all the present stocks of armour, including an estimated 1500 combat aircraft. In 1994 it was announced that Ukraine would voluntarily give up all the disputed nuclear - and several other strategic weapons, besides the dismantling of appointed armour. Nevertheless the Ukraine Air Force had suddenly an enormous quantity of aircraft in its inventory. With the lack of sufficient means and crew to operate them, the majority of aircraft seemed to be destined for an inactive career and often acted as a source of spare parts. The disrupted relationship with Russia also caused that Ukraine had to take care itself of the maintenance of its MiG's, Sukhoi's and other Russian manufactured aviation hardware and therefore the numerous inactive aircraft were essential for the spare parts.

Mainly caused by inadequate budgets the aircraft dismantling projects could not, or only partially, be executed. However being stored outside for years and without maintenance the status of non-airworthy was also quickly reached. As a consequence the inherited legacy of aircraft can nowadays still be found throughout the country,

like monuments on display in public areas. Other sites are less easy visible, like on active operational air bases. Here you can find obsolete aircraft lined up or in between operational aircraft, giving the impression of a large available force. Estimates of various unofficial sources on the current operational frontline fighter aircraft, due to the lack of official reliable numbers, indicate a little more than 100 aircraft divided over MiG-29's, Su-24 Fencers, Su-25 Frogfoots and Su-27 Flankers, being only a fraction of what it once was.

Kyiv- Zhuliany museum

An interesting place to see the current operated aircraft types of the Ukrainian Air force, as well as their predecessors, can be found in capital city Kyiv, at Zhuliany International Airport.

The airport operates a civil terminal for European and domestic destinations. Further a military-governmental branch is based, operating several Antonov transport aircraft and some helicopters. More interesting is the "Oleg Antonov State Aviation Museum". The museum hosts a wide variety of Russian built military aircraft of which the majority has had a historic career in Ukraine aviation, including Russian aviation detached to Ukraine. Impressive samples are several Tu-22 Backfire strategic bombers and a Tu-142 Bear of the Russian Navy. Next to the current Ukraine operational fighters, the historic collection of the museum shows types from the "MiG family" ranging from Mig-15, 17, 19, 21, 23, 27, 29 and finishes with the close to Mach 3 speed capable Mig-25 Foxbat. The collection continues with a variety of Sukhoi's and Tupolev's on display. A mix of older helicopter types towards nowadays operational samples of Mi-8 transport and Mi-24 Hind attack helicopters, provide more insight in the vertical oriented aviation. Must see items are the impressive, oversized Mi-6 Hook plus Mi-26 and coaxial rotor powered Kamov Ka-25 and Ka-27 of the Ukraine Navy. General impression is a wide overview in the unmistakable unique legacy of the Russian oriented aviation in Ukraine over several decades.

Early and ongoing efforts to bring back the desired stability in the affected region, would provide new opportunities to discover more of the rich historic Ukraine military aviation, of which, as mentioner earlier, the traces can be found throughout the immense country.

Text and photos by Peter ten Berg

Mi-6 RusAF

Mi-24 UkrAF


Tu-22 UkrAF


Tu-22 of UkrAF


Tu-142 RusAF

Ka-25 UkrNavy

Tu-22 UkrAF

Ka-27 UkrNavy

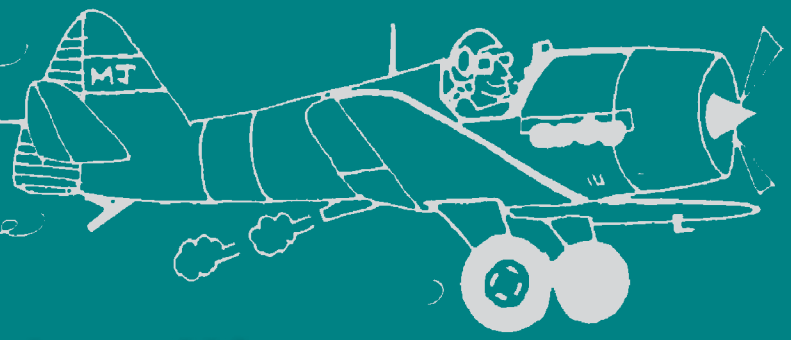
Su-25 UkrAF

Be-12 UkrNavy


Mig-25 RusAF

Su-24 UkrAF

Ancient Aviator Anecdotes



Air Vice Marshal (R) Cecil Parker and his.....

NEARLY NINETY

Representative photo of the Tiger Moth

Our air force and this writer were both born in 1932 and, 20 years later, the latter became part of the former. My boyhood dreams to 'fly' were fulfilled in 1951 when I made my very first flight in the rear cockpit of a fabric-covered Tiger Moth as a flight cadet of No 58 Pilots Course at No 1 Air Force Academy in Ambala. For the next 35 years I continued to enjoy my time in the cockpits of piston/jet, single/twin engined, fixed/rotary wing aircraft in various operational and training assignments till I retired in 1986. The following 35 years of post-air force service included a decade in the corporate and academic worlds after which came the freedom of non-commercial retirement. This period also had regular air travel, initially business related and thereafter leisure flying primarily to visit our two children wherever in the world they were located. This brought us in age into our late eighties and in family status to great grand parenthood.

Another representative photo of the Tiger Moth

Though communication technology continues to keep us in touch with the children, the travel ban imposed by the pandemic prevented any personal visits for close to three years. The recent relaxation in November 2021 however allowed us to accept an invitation to visit our son and family. Accompanied by my wife and escorted by our family sevadaar, we boarded a commercial Airbus 320. The flight itself was pleasant enough but the transit to/from airports and pre/post flight procedures

therein were rather tiring. Our son had arranged a wonderful 89th birthday party for me. Among the invitees was a 91 year old coursemate whom I had not met for a decade and with whom I share a birthday and 70 years of friendship. He is spry, mentally alert and regaled the gathering with recollections of our youthful (mis) deeds on the ground and in the air! We cut our birthday cakes in formation.

The other guests from the air force fraternity included a young pilot from No 20 Squadron (now 75 years old) who was my wing-man during the air strike on the Attock Oil Refinery on 06 December 1971. His wife is an air force daughter whom I had first seen as a little child in the early 1950s. Another was the widow of a fighter pilot who was my student at DSSC Wellington in the 1970s. The youngest guest (now in his early sixties) was not only the son of one of my closest air force friends (now sadly no more) but had also been the student of my wife who had taught him at Mount St Mary's School in the 1960s. He had continued to keep in contact over the years and it was a touching sight to see them bonding a half century later. Such are the connections and friendships that cement the extended air force family.

Back home we now look forward to the arrival of our daughter and son-in-law in time for 16 December 2021; a date that marks the end of the 1971 Indo Pak war and incidentally, is also my wife's birthday. This is being written as 2021 draws to a close so let me wish all readers of this column a healthy, happy 2022. We ourselves look forward to the arrival of our second great grandchild in April 2022. Our air force will have its 90th birthday in Oct 2022; (hopefully) this writer will follow suit a month later!

UNIT HISTORIES

History is the link between the past and the present. A primary source for any history of the IAF should be the histories of it's constituent units. In my years with the air force (1951-1986) these were normally recorded in squadron/unit diaries and vetted by the CO at periodic intervals. The scribe was the officer whose written communication was the best and he was directly supervised by the flt cdr. Currently the Swarnim Vijay Varsh celebrations have focused a great deal of attention on actual events of the 1971 Indo-Pak war from recorded or recollected history.

Image of Hunter Mk.56 courtesy: Dave Welch Collection

Representational image of Hunter Mk.56 courtesy: Tom Cooper

In 1957 as a flt lt I was posted to Ambala to set up and command the very first MEU (Mobile Echelon Unit) in our air force. It comprised just one officer, ninety airmen of all trades and near fifty specialist vehicles. I wrote the history of the unit and handed it over to my successor a year later. I understand that as the IAF grew the MEU was revived as a C & MU and then as the FBSU. If the unit history has survived it may well be buried in the basement of Air HQ.

In 1966 as a wg cdr I was posted to Jamnagar to set up and command the IAF's first OTU (Operational Training Unit) on Hunter Mk.56 aircraft. It was a most challenging assignment and I had no choice but to personally record all initial events as it was several weeks before I got an officer with the requisite attributes to take over as the scribe. The OTU (now renamed OCU) completed 55 years on 1 Oct 2021. From time to time I am delighted to hear from next generation COs/CIs that the unit diary continues to record its history faithfully.

In 1969-72 I was in command of No 20 Squadron on Hunter Mk 56A ac in Hindan and then Pathankot. Among the 29 officers under my command was a young naval aviator on an exchange posting. In due course he became fully operational on type and assimilated seamlessly into air force squadron life as a fighter pilot. Among his many attributes was the ability to write well, and I suggested to the flt cdr that he be deputed as the O ic Squadron Diary – one of wisest decisions I had made. His written record of No 20 Squadron's War Diary during the 1971 war was factual, truthful and a faithful written rendition of both individual and collective performance of all squadron personnel on the ground and in the air. His talents were not only on the ground but in the air too and I was extremely proud that he earned his VrC from the air force. In due course he rose to become the CNS and very thoughtfully organised a memorable Reunion of all his 1971 squadron colleagues at Navy House in 2005–a fine example of 'jointmanship' so much in the news today. In retirement the admiral lives in Goa and continues to write effectively on national defence strategy and allied topics.

I was the AOC of the air base at Adampur 1978-79 when HQ WAC instructed all air bases to compile their complete histories of which one copy was to be sent to Comd HQ and the other to be retained in the VIP guest room. A great deal of our input came from the four MiG squadrons on base but we had immense difficulties in obtaining credible past data. We did finally succeed and I was proud that the Education Officer received a congratulatory commendation from HQ WAC. In this digital age I assume that unit histories are now recorded electronically.

25 Years Back

From Vayu Aerospace Review Issue I/1997

New Civil Aviation Policy

On 24 January the Cabinet announced an integrated policy for domestic air transport services which allows 40 per cent foreign stake in private airlines but kept out foreign airlines from the equity participation. "Any airline owned and substantially controlled by any Indian national will have the right of free entry and free exit in the Indian skies," the new civil aviation policy provides.

74% Foreign Equity in Civil Aviation Infrastructure

According to the draft policy submitted to the Union Cabinet, foreign companies would be permitted up to 74 per cent stake in any venture dealing with aviation infrastructure which would include airport projects. Mr CM lbrahim, has said that the government does not have sufficient finance to upgrade or build new airports and other related infrastructure. As a result, it has been decided to permit foreign players to take majority stake in such projects. These projects would follow the concept of build, operate and transfer (BOT) according to the civil aviation minister.

FIPB Clears Tata-SIA Venture

The Foreign Investment Promotion Board (FIPB) has cleared the Rs 2,480-crore Tata Industries' venture with Singapore Airlines to set up a domestic airline in the country. The proposal is to "set up a viable Indian airline with 60 percent Indian participation and 40 percent foreign direct investment as per the prescribed norms."

AI 'Red' Phase Till 98-99

Analysts have stated that Air India is confident of coming "out of the red" in 1998-99 when it hopes to make a profit of Rs 60 crore. The projections are based on macro parameters like the growth in traffic, economy and increased business visits. According to internal airline sources, the imposition of sales tax on aviation turbine fuel (ATF) has been causing "avoidable loss to the airline" when at least seven competing global carriers are not paying sales tax on the ATF lifted by them in India. The Ministry of Civil Aviation has already taken up the matter with the Ministry of Finance.

Jet's Foreign Equity At Stake

Civil Aviation Minister CM Ibrahim has said that Jet Airways will get 3 months to shed its 40 per cent foreign equity from the date the government announces its decision to bar foreign airlines from investing in the equity of domestic carriers. The Minister's stand is that no foreign airline can invest in the share capital of a domestic airline.

Jet Airways Inducts Boeing 737-500

Jet Airways has inducted new generation Boeing 737-500 aircraft into its fleet, the airliner powered by CFM 56-3C1 engines with 20,000 lbs thrust. With the addition of this twelfth aircraft into its fleet, Jet Airways has opened three new stations i.e. Indore from 14 December, whilst Pune and Aurangabad will be on-line effective 26 December 1996.

Mi-172s Join Pawan Hans Fleet

On 24 January 1997, Pawan Hans Helicopters inducted two new Mi-172 helicopters for heavy-duty operations. PHL will add another four heavy-duty and two light helicopters to its fleet by the end of 1997. With the new helicopters that cost Rs 10 crore each, the strength of Pawan Hans' fleet increases to 26 including 20 Dauphins, three Bell and two Robinson helicopters.

Saab 2000 Favoured

An Indian Airlines' board sub-committee has recommended the Swedish Saab-2000 as the choice of 50-seater aircraft for IA subsidiary Alliance Air's (AA) feeder operations. According to sources, the sub-committee's technical evaluation report has already been submitted to the Board. The choice was made from amongst the French ATR-42, the Canadian De Havilland Dash-8 and the Fokker 50. The Swedish plane scored in effective cost of operations over a 10 to 15 year period, the sources said. Alliance Air have been offered a liberal leveraged financing package by all the bidders, similar to that by Boeing and Airbus.

Ex-Luftwaffe Alpha Jets Offered

Germany has offered second-hand Alphajet advanced jet trainers (AJTs) to the Indian Air Force. The offer is reported to have been made during German defence minister Volker Ruhe's recent visit to India. The IAF had earlier shortlisted the Alphajet along with the BAe Hawk for its requirement of up to 66 AJTs at an estimated cost of Rs 3,000 crore four years ago, but, no decision was taken in regard to the acquisition of these for a number of reasons. The French company Dassault has been offering to transfer the entire Alphajet production line to India and further transferring the right to sell the aircraft to third countries.

IAF Personnel In Russia For Su-30 Conversion

In the second week of January, a 50-member team of the Indian Air Force left for Russia for an 80-day "conversion course" on the Sukhoi-30MKI to enable induction of the first batch of eight of these warplanes by March this year. The team which has gone in several batches, includes ground supporting personnel and technicians besides fighter pilots of the IAF and will be under training for more than two-and-a-half months to covert to the new generation Su-30s. On 30 November 1996, India had signed a Rs 6,300 crore contract with Russia, for the purchase of 40 Sukhoi-30s.

Some familiar 'noses' in India's Armed Forces inventory: Can you guess them?

(Top to bottom: Apache, ALH, Chinook, LCH, LUH, Mi-17, Mi-35 and Rudra)

Tale Spin

Russia launches "5th Gen" perfume

This was at the presentation of its Checkmate fighter at Dubai Airshow'21. According to the company, "The notes of the fragrance combine the scents of glass, natural leather and metals used in the construction of the fuselage, engines and cockpit of the aircraft". Hmmm….

Can we have an Eau de Tejas Parfum or Cologne please?

Airbus meets customer request for vegan helicopter interior

When a 'valued customer' specified that his new helicopter must have an interior that was fully vegan, Airbus Corporate Helicopters' (ACH) design team rose to the occasion. The resulting ACH145 has now been delivered to German construction entrepreneur Dr Urs Brunner who insisted on the requirement at the urging of his wife, ethical fashion pioneer Daniela Brunner.

What next? An edible interior too? In the future, can we munch on the seats and seatbelts?

Available in the UK over Christmas!

Our kind of Christmas Market! We're sure AMCA cheddar cheese and Tejas Light Gouda would be delicious as well!

That's progress!

118 years of powered flight. From one flight on 17 December 1903 to more than 16,000 flights in the air at the same time on 17 December 2021. We have truly come a long way. (Image from Twitter)

Professional gambling

Jokes doing the rounds on WhatsApp: While the Govt of India sells its stake in Air India to the Tata Group, it takes equity in troubled cellular service provider Vodafone India.

Afterburner

VAYU

Aerospace & Defence Review

48th year of Vayu

Continuously, ASIA's finest Aerospace & Defence Magazine

Visit us at www.vayuaerospace.in

Vayu Aerospace Review, D-43, Sujan Singh Park, New Delhi 110003 India
Tel: 91 11 24626183, 24617234 Fax: 91 11 24628615 • E-mail: vayuaerospace@lycos.com

F/A-18 BLOCK III

THE ADVANCED SOLUTION TO DEFEND INDIA TODAY AND TOMORROW

Boeing's F/A-18 Block III Super Hornet delivers affordable, next-generation warfighter technologies and advanced capabilities to meet the requirements of virtually any naval mission. Combat-proven and carrier-compatible, this platform builds upon our over 75-year history in India and proves our commitment to the Indian Navy.

boeing.co.in

BOEING