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Cover : Pair Of Indian Navy ALH MK III's over Sabarmati Riverfront during Defexpo 2022. Photo: Abhishek Singh Chauhan (Twitter: Ilyushin_76md)

Regular features :
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Admiral Arun Prakash says....

India must reassess its maritime strategy

Indians who fretted over the recent images of Chinese People's Liberation Army Navy (PLAN) ships in Indian Ocean ports such as Hambantota and Djibouti would have been delighted to learn that on 15 August, there were nine Indian Navy (IN) warship in seven ports worldwide – one in each continent – to hoist the Tricolour on the 75th anniversary of our independence. Both navies were sending out the same, subtle, message.

Maritime power, unlike land and air power, has many roles to play, equal in importance to those it accomplishes in war. Given their mobility, versatility and sustainability, warships can be placed in, virtually, any location in the world's seas; right up to the territorial waters, and even harbours of another nation without infringing national sovereignty. The ship's mere presence could attain political ends, by conveying messages of friendship, reassurance, intimidation or coercion. Navies, worldwide, struggle, often in vain, to convince their political masters, about their utility as powerful "instruments of state power". The success attained by the PLAN, in this context, is worthy of examination.

In September 2020, the US Department of Defence made the stunning announcement that the PLAN, with a battle force of 350 ships and submarines, had overtaken the US Navy, with its strength of 293 ships. The PLAN did not grow overnight, and remains the clearest manifestation of the grand-strategic vision of China's political leadership.

On its formal establishment in 1950, the PLAN was provided with hardware and advisers as well as doctrine by a fraternal USSR. The Sino-Soviet split of 1960, although a major setback for the PLAN, also became a blessing in disguise because the Chinese leadership launched a reverse-engineering project, at the national level, to reproduce Soviet armaments. It was a combination of Deng Xiaoping's economic reforms, and the appointment of General Liu Huaqing as PLAN commander, in 1982, that triggered its transformation from an inconsequential coastal force, to a substantive blue-water navy.

Signs of a "maritime awakening" at the political level, started emerging when the 2004 defence white paper spelt out the PLAN responsibilities as, "safeguarding China's maritime security and maintaining the sovereignty of its seas." At the 2012 Party Congress, general-secretary Hu Jintao took China watchers by surprise, when he declared that China aimed to become "a maritime Great Power." A year later, Xi Jinping provided the rationale by spelling out China's maritime objectives as: Defence of the homeland against seaward attack by the US; protection of its seaborne trade and energy traffic; and recovery of national territory (Taiwan).

Clearly, China's political leadership was shrewd enough to realise that becoming a "maritime power" required the acquisition of a full range of technological, industrial and human-resource capabilities. Resolutely, and methodically, they set about putting in place the constituents that have made China a true maritime power. China is today the world's most prolific ship-producing nation, both in terms of warships and merchantmen. China's merchant fleet outnumbers all others, on the high seas. China boasts of the world's largest Coast Guard as well as deep-water fishing fleets, its ports rank among the best internationally, and it is a world leader in seabed exploration.

The IN has had an easier birth and fewer growth pangs; progressively acquiring hardware and capabilities in all three dimensions of maritime warfare. A visionary naval leadership has ensured that today, it is a compact, but highly professional and potent maritime force, assessed as being up to "NATO standard". India's security elite has, however, failed to realise that a "fighting navy" constitutes just one strand of a nation's maritime strength, and without the remaining components, India cannot claim to be a "maritime power".

Incomprehension, at the politico-bureaucratic level, of the significance and constituents of maritime power has had two deleterious effects. First, parsimonious budgets have stunted our navy's growth, in numbers as well as in capabilities. Second, gross neglect in many areas of India's maritime sector has ensured that our civil shipbuilding industry is moribund, our merchant shipping grows at a snail's pace, our major ports are overloaded and await modernisation, seabed exploitation has yet to take off, the fishing industry is antiquated and human resources are lacking.

India's failure to bring a sharp focus on maritime capacity-building represents a huge missed opportunity. The steady development of the maritime sector would have established a badly-needed industrial base for India's naval power. It would have also provided the impetus to heavy as well as ancillary industries, helped in skilling our youth and generated thousands of job opportunities.

Given the current Chinese intransigence, and our misreading of their expansionist intent, Sino-Indian tensions are likely to persist. Keeping the conflict confined to the Himalayan heights is militarily advantageous to China, because a "continental fixation" helps to keep India confined in a South-Asia box.

In this context, we must remember that China's jugular vein is to be found in the Indian Ocean sea lanes, which see an overwhelming proportion of its trade, energy, raw materials and finished products carried by merchant shipping. Since any disruption of seaborne traffic will have repercussions for China's industry, economy and political stability, we must be prepared to exploit this vulnerability, should the situation demand. By the same logic, we must be prepared to see a steady rise in PLAN presence in Indian Ocean waters (and ports). Consequently, this would be a good juncture for India to undertake a reappraisal of its maritime capabilities as well as its maritime strategy.

Air Marshal Brijesh Jayal says...

Our aeronautics dilemma, and how it can be resolved

Laying the foundation stone of the Tata-Airbus consortium manufacturing facility for the C-295 transport aircraft for the IAF in Gujarat the other day, the PM is reported to have said that a message was being sent to the world of a golden opportunity in India when 'Defence and Aerospace' were going to be two important pillars for 'Atmanirbhar Bharat'. Whilst highlighting that for the first time ever, such a huge investment was being made in India's defence aerospace sector and extending his best wishes to Tata Group and Airbus Defence Company, the PM is quoted to have said, "I have been told that more than 100 MSMEs of India will also join this project. In future, orders can also be taken here for exporting to other countries of the world. The resolve of 'Make in India' and 'Make for the Globe' are also going to be stronger from this land."

To this writer who has long advocated the cause of promoting the potential of indigenous civil and defence aerospace, whilst this declaration from the PM was music to one's ears, one was at a loss to understand where the strategy and blue print were towards achieving this vision, as none was available in the public domain. Indeed, to those who briefed the PM and who will perhaps be amongst ones responsible for converting his vision and directions to reality, a brief look at some examples from the past may be of help.

It was as long back as 1970 that Dr Vikram Sarabhai had proposed to the administrative reforms commission, an organisational model with a ministry of advanced technologies comprising of separate commissions for atomic energy, space, earth sciences and aeronautics. It speaks volumes for his foresight that in all the fields, except aeronautics, we have independent departments/ministries with their respective commissions and consequently, the nation is at par with the international community. Only aeronautics remains a technological orphan confined to the folds of the ministry of defence and largely import- dependent.

In 2001, the US Congress had set up a commission on the future of the United States Aerospace Industry to study the future of the US aerospace industry in the global economy, particularly in relation to US national security, and to assess the future importance of the domestic aerospace industry for the economic and national security of the United States. Subsequently, it continued to monitor progress as is evident from a 2009 Congressional Research Service Report. In China, there has been a dramatic growth in the aeronautical ecosystem during past 15 years accompanied by large investments with them using terms like "aeronautical patriotism" to underline the strategic import of this sector. Clearly, there are lessons that we in India can learn from the approach of these countries towards aeronautics.

It was Dr Abdul Kalam, then the president of the Aeronautical Society of India (AeSI) who had said: "Aviation is one of the most significant technological influences of modern time and empowers the nation with strength for international partnership. It is a major tool for economic development and has significant role in national security and international relations." It was in pursuance of this vision and the fact that the aeronautics scene internationally was undergoing a profound change, that in 2004, the AeSI prepared a study after consultations and discussions with all stake holders in the aeronautics sector, both military and civil and arrived at a proposed blueprint titled National Aeronautics Policy 2004. Essentially, the purpose of the study was towards attempting solutions to the core of our aeronautics dilemma summarised below:

For growth in Indian aeronautics, we need an enabling environment, strong incentives, improved infrastructure, enhanced flexibility and adequate human resources. At present, an integrated approach is lacking. Individual organisations and departments involved across the spectrum of aeronautics are like isolated silos.

There is an urgent need for a strategic form of intervention in designing, developing and marketing successful aeronautical products, as objectives are linked across sectors and over time. Progress in a strategic field like aeronautics is impeded when institutions are locked in wasteful adversarial relationships.

Technology will be the greatest driver for growth in this century. In aeronautics, India has the opportunity to leverage technology to generate economic growth and development. For this to happen, we need to transform our latent capability to deliver complex, aeronautical products to the world by improving productivity and moving up to the intellectual end of the chain- from mere 'know-how' to 'know- why.'

Any attempt to establish the Indian aeronautical industry, as a meaningful player in the high technology and highly competitive international aeronautics market needs a will, a strategy, a mission- oriented implementation plan and the grit to stay the course for the long haul. None of these qualities can be seen to exist in the public dominated, bureaucratically- driven and strategically-barren Indian aeronautics scene.

The proposed study attempted to address these challenges and suggested strategy and organisation towards meeting these. If the Prime Minister's words and exhortations during the recent function are to have any meaning, the concerned departments of the government would do well to locate the proposed NAP 2004 and begin a debate on what needs doing to arrive at a strategy and organisation to translate the Prime Minister's words into reality.

Admiral Arun Prakash says....

Without fear or favour

As the world awaits Vladimir Putin's next move in the Russia-Ukraine war, which is in its ninth month, it is obvious that he has blundered as a strategic leader. Questions are being asked, not only about the quality of military advice being rendered by Russian Generals, but also about Putin's rationality and receptivity to contrarian views.

While it is important for us to draw the right lessons from Russia's decision-making processes, there are other reasons, too, why this conflict should engage the attention of India's military. Firstly, it has shattered the belief that future wars will be 'short and sharp', and that our military can get by with war reserves adequate for just a few weeks. Secondly, since 70%-80% of India's military hardware is of Russian and Ukrainian origin, its performance in combat as well as the efficacy of tactics employed by both belligerents will be of vital interest. Lastly, there is a need to visualise how lessons of the war will be interpreted by a rejuvenated Xi Jinping in his third presidential term to advance China's territorial ambitions.

For us, the ongoing 30-month Sino-Indian standoff in Ladakh gives two reasons for concern. Firstly, it betrays a want of clarity about the strategic aims that have underpinned China's diplomatic and military belligerence towards India, and its territorial creep in Ladakh. Secondly, it is a reminder that not only does India lack a China-specific strategy, but also has yet to formulate a national security strategy (NSS) spelling out national aims and objectives that should guide its policies.

However, it is essential that the formulation of NSS be preceded by a strategic defence review; an exercise comprising of a military self-assessment as well as threat evaluation. In the absence of both, India's politico-bureaucratic establishment continues to deprive itself of a realistic picture of its own and adversary's strengths and weaknesses, thereby engendering complacency which could lead to flawed decision-making.

A more worrisome impact of these omissions is that they have left the military in a quandary about resolving its 'ends-ways-means' dilemma. Historically, the roots of this dilemma were seen to lie in the indifference of the Indian politician towards national security issues. A manifestation of this being the absence of any debate or discussion in Parliament on defence matters.

This seemed to change in September 2018, when the present government deployed Special Forces to deliver a punitive strike inside Pakistan, breaching the self-imposed restraint of previous regimes. The air strike that followed in February 2019, targeting a Pakistani terrorist facility, reaffirmed the government's resolve. However, with rival political parties jockeying to extract mileage from these events, this new-found political interest brought with it some avoidable complexities for the military leadership. While not defending themselves could jeopardise their credibility, being too vociferous could attract the charge of becoming politicised.

There were several excellent reasons why India's post-Independence military leadership had decided to firmly exclude politics from the military ethos. Were the military to align itself with a political agenda, operational decisions could be skewed to please politicians and become a recipe for military disasters. If political loyalty were to become a criterion for advancement, military professionalism and combat effectiveness would suffer. Above all, as seen in our close neighbourhood, entry of politics into the military is sure to invite Praetorianism.

Selection for senior military posts remains the prerogative of the government and 'political acceptability' of the individual may tilt the balance in his favour. However, the selected individual must not consider himself indebted to the establishment, nor should the latter demand a quid pro quo. The military ethos requires the soldier to retain independence in professional matters and loyally bear 'true faith and allegiance to the Constitution of India', an oath he swears 'even to the peril of my life'. The fulcrum of military leadership is poised so delicately on the attribute of integrity that the slightest deviation from rectitude erodes the military leader's credibility within his command.

An essential element of integrity is having the moral courage to convey unvarnished views in a frank and forthright manner to one's superiors. This can be difficult in a culture where respect for elders/superiors is ingrained and dissent frowned upon. The Russia-Ukraine conflict is, possibly, an example of how failure of sycophantic military advisers to render honest advice can lead to disasters. Thus, the ability to 'speak truth to power', especially when the truth is unpalatable, is an attribute which should be valued and encouraged by the military.

In the new institution of the Chief of Defence Staff (CDS), we have not only a unitary head of the armed forces, and 'principal military adviser' to the Raksha Mantri, but also the first military officer to be recognised as a functionary of the Government of India. As the military's interface with the political establishment, the CDS is well-positioned to insulate the armed forces from political pressures by insisting that 'enhancement of combat efficiency' must remain the sole criterion for imposition of any change of military policies or concepts.

India's democracy requires that our armed forces must remain detached from politics, and our security situation demands that military leaders be bold enough to render unbiased professional advice to the government, without fear or favour.

Lt Gen Kamal Davar (retd) says....

How 'Agnipath' hiring by Army impacts India's ties with Nepal

In this highly interdependent world, especially among neighbours, a nation's internal policies may have distinct ramifications impinging on each other's relations. That India's newly modified recruitment policy for enrolment in the armed forces has rattled Nepal is more than obvious. Though just introduced, its reverberations points to a long-term negative impact on the historically cordial though continually sensitive long-term relations between India and Nepal. An objective re-appraisal of this step that India has taken, ostensibly without consulting Nepal, must be swiftly looked into without the baggage of self-infallibility!

The Indian Army currently has around 40 Gurkha battalions spread over seven Gurkha regiments. Besides, Nepalese nationals also serve in some paramilitary and other security forces. At any one time, there are around 32,000-35,000 Gurkhas serving in the Indian Army.

Importantly, around 1.40 lakh retired soldiers draw their pensions from India. Nearly 1,400 Nepalese are recruited by the Indian Army each year.

Immediately after India's independence, Gurkha units were allotted to the Indian Army and British Army based on the 1947 Tripartite Treaty. Some politicians in Nepal's Parliament have been complaining recently that India's "Agnipath" scheme violates this agreement. In addition, some vested interests in Nepal have also been spreading disinformation and anti-India propaganda in the tiny Himalayan state. Even Nepal's former deputy PM and defence minister Bhim Rawal recently spoke in its Parliament that owing to the "Agnipath" scheme, which guarantees only four years' service and with no post-retirement benefits, the Nepal government must cancel the Tripartite Treaty. He gave the example of some Nepalese youth joining the Singapore police and the Brunei Army without any formal governmental agreements.

It was on 14 June this year that the government announced the new "Agnipath" scheme for recruitment of personnel for the Indian Army and extended it to recruits coming from Nepal. Two rallies due to be held last fortnight in Nepal have been kept in abeyance, awaiting clarifications from India's defence ministry. Nepal has sought details of the scheme that offers only four years' service, with only one-fourth of those serving to be further retained and overall there being no pension benefits for those leaving after completion of their four-year service.

Nepal's ambassador to India Shankar Prasad Sharma has told the local media that more "understanding from the highest level" is expected.

He added, though, that talks are underway between India and Nepal over the future recruitment process for Gurkhas under "Agnipath". He added, "It is election time in Nepal. All political parties are in discussions and they will come up with a decision soon." The ambassador's statement that all political parties in Nepal in a huddle over Agnipath clearly brings out the criticality of this scheme for Nepal, which should be carefully factored in by the Indian government.

Nepal has rightly been worried about the adverse financial impact of the Agnipath scheme on its fragile economy. The salaries of 35,000 Gurkhas and the pensions of 1.40 lakh ex-servicemen total nearly $620 million, which is three per cent of its GDP, while Nepal's defence budget is only around $430 million. Thus, the announcement of the Agnipath scheme has met with severe criticism in the Nepalese media. This point will also have been surely discussed during the just-concluded five-day visit of Indian Army Chief Gen. Manoj Pande to Nepal and hopefully some of the Nepal Army's concerns would have been addressed by Gen. Pande. As is the tradition between the armies of India and Nepal, both the respective Army chiefs are conferred the honorary rank of general in each other's armies and Gen. Pande was accorded this honour by Nepal's President Bidya Devi Bhandari in Kathmandu. During his visit, Gen. Pande also gifted some non-lethal defence equipment to Nepal's Artmy chief.

New Delhi is more than aware that in the last few decades the Chinese have gone all out to carve out their areas of influence in Nepal in diverse fields. Exploiting their deep pockets and ideological closeness to Nepal's Communists, the mandarins in Beijing have eminently succeeded in making credible inroads into Nepal's development, its economy and political systems. Consequently, China would look for any opportunity to come its way to diminish India's image and poison the latter's traditional and close relations with Nepal. According to some China-watchers in Nepal, the former may try to recruit out-of-work retired "Agniveers" and other Nepalese youth into the Chinese Army -- a step that will be fraught with danger for India. India's defence ministry must therefore weigh the adverse impact on serving and retired Gurkha soldiers of the Indian Army of such mischief by China. As is well known, Pakistan's notorious Inter-Services Intelligence has a well-established presence in Nepal from where it directs many of its terrorist activities against India. It is clear that the ISI will spare no effort to intensify its anti-India propaganda in Nepal in the wake of the Indian Army's Agnipath scheme.

India must never forget that its fraternal ties with Nepal are a strategic imperative for it in its restive neighbourhood, keeping in view China's and Pakistan's consistent machinations towards India. The Gurkha regiments have served the Indian Army with matchless gallantry and glory. Importantly, they have contributed largely to deepening mutually beneficial relations between the two nations. We need to further cement our brotherly relations with Nepal and for that, if we have to modify or even discard the Agnipath scheme for recruitment in Nepal, we shouldn't hesitate, and then switch back to the old system of recruiting the valiant Gurkhas to serve in the Indian Army.

Admiral Arun Prakash says....

Why the Arihant missile test was critical for India

Reports of the successful test of a submarine-launched ballistic missile by INS Arihant, India's sole operational nuclear-powered, ballistic missile submarine (SSBN), on 14 October 2022, should convey an uplifting message of reassurance to the public. Although INS Arihant undertook its first, notional, "deterrent patrol" in 2018, impressive visuals of the missile launch demonstrate Arihant's fully-operational status as well as its crew's proficiency. This drill would also have tested and proven long-range underwater communications as well as command-and-control procedures of the Strategic Forces Command.

India's nuclear deterrent aims to "prevent a nuclear attack on Indian territory or Indian forces, anywhere," and to threaten the attacker with "massive retaliation designed to inflict unacceptable damage." As a nation committed to "no first use", it is of critical importance that the adversary is never in doubt about the credibility of India's nuclear deterrent. This calls for a deterrent capable of surviving a surprise nuclear attack and undertaking retaliation.

Given that land-based missiles (static and mobile) and air bases are exposed to enemy reconnaissance, and will be targets of pre-emptive attacks, the best way to invest the nuclear deterrent with immunity is to send it underwater on an SSBN. For this reason, India has resolutely pursued, with former Soviet and now Russian help, the indigenous design and construction of a series of SSBNs.

Reports about the recent test state that the missile was "tested to a predetermined range and impacted the target area in the Bay of Bengal, with very high accuracy".

While withholding any indication of the missile's actual capability may be a prudent security measure, it is more than likely that this test was closely monitored via technical means — by friends and foes — and the missile's performance parameters were recorded. Moreover, the recent presence in the neighbourhood of Chinese satellite and space-tracking ship Yuan Wang-5 indicated its snooping intent.

The role of an SSBN is to pose a nuclear threat from underwater to two types of adversary targets: Counter-value (population centres) and counterforce (military nodes). To this end, an SSBN is positioned in a safe patrol area that is remote from shipping traffic but within the missile range of its pre-designated targets. It appears likely that India's SSBNs will operate from sanctuaries or "bastions" in the deep waters of the Bay of Bengal, where they can remain under the protective umbrella of our naval units.

From the middle of the Bay of Bengal, Karachi is about 2,500 km, while Beijing and Shanghai are over 4,000 km. Therefore, to threaten counter-value or counter-force targets deep inside China or Pakistan from a safe "bastion," India needs a submarine-launched ballistic missile of "inter-continental range," ie, over 6,000 km. The missile, last reported as being carried by INS Arihant, was the K-15, whose range falls below 1,000 km.

While land-based missiles such as the Agni V and VI, with ranges above 5,500 and 8,000 km, respectively, are reportedly under development, the challenge for our scientists is to design powerful but compact rocket motors so that a battery of 12-16 missiles can fit within the hull of INS Arihant class of SSBN. However, should the dimensions of this new missile call for a larger hull, the resultant size and displacement of the vessel will demand a unique design and a more powerful nuclear reactor for propulsion — challenges that are being tackled by our scientists and designers.

Prolonged deterrent patrols and continuous usage of a submarine's nuclear reactor would call for refuelling with fresh uranium rods every few years. Refuelling entails cutting open the submarine and virtually rebuilding it, thus, taking it out of action for a year or more. India will, therefore, require an inventory of three-four SSBNs to maintain one on deterrent patrol off each seaboard.

Protection of India's SSBN force would call for another type of vessel, the "nuclear attack submarine" (SSN), which also has immense utility in the anti-shipping and land attack roles. Thus, from a 50-year perspective, India would be looking at a nuclear submarine force of 8-12 SSBNs and SSNs.

Apart from its strategic significance, the nuclear submarine programme is an excellent manifestation of Prime Minister Narendra Modi's atmanirbharta (self-reliance) vision. Many private-sector companies have contributed to this programme, designing and fabricating systems for INS Arihant and follow-on vessels. This Indian Navy-managed Defence Research and Development Organisation project has also spawned an enormous indigenisation process; many micro, small and medium enterprises have contributed components manufactured to high precision and reliability specifications.

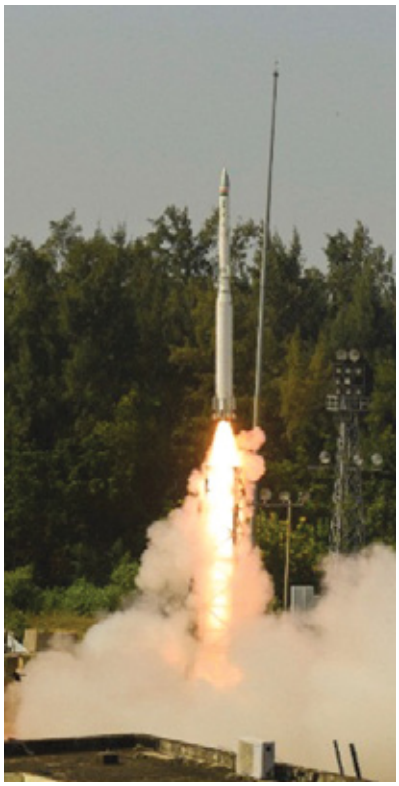
India's nuclear triad and accessories will cost the nation thousands of crores of rupees in the decades ahead. However, our dilemmas demonstrate that a large military and a nuclear arsenal, by themselves, can assure neither India's security nor bequeath "great power" status. Therefore, unless underpinned by a grand strategic vision that integrates its military strength and nuclear triad with other elements of comprehensive national power to generate a compelling national security strategy, we may be wasting precious national resources.

INS Arihant in SLBM launch

INS Arihant carried out a successful launch of a Submarine Launched Ballistic Missile (SLBM) on 14 October 2022. The missile was tested to a predetermined range and impacted the target area in the Bay of Bengal with very high accuracy. All operational and technological parameters of the weapon system were validated. The successful user training launch of the SLBM by INS Arihant is significant to prove crew competency and validate the SSBN programme, a key element of India's nuclear deterrence capability.

DRDO tests Phase-II BMD

Defence Research & Development Organisation (DRDO) conducted a successful maiden flight-test of Phase-II Ballistic Missile Defence (BMD) interceptor AD-1 missile with large kill altitude bracket from APJ Abdul Kalam Island off the coast of Odisha on 2 November 2022. The test was carried out with participation of all BMD weapon system elements located at different geographical locations. The AD-1 is a long-range interceptor missile designed for both low exo-atmospheric and endo-atmospheric interception of long-range ballistic missiles as well as aircraft.



Indian Army receives first LCH

HALs Light Combat Helicopter LCH was inducted into the Indian Army on 29 September 2022. The first LCH was formally handed over by HAL to Director General, Army Aviation Corps and the "highly manoeuvrable and agile LCH will significantly enhance the combat capability".

4th positive indigenisation list of 101 items

The 'Fourth Positive Indigenisation List' of 101 items was announced by Prime Minister Narendra Modi during the opening ceremony of Defexpo 2022 in Gandhinagar. All the items included in the lists will be procured from indigenous sources as per provisions given in Defence Acquisition Procedure (DAP) 2020. The fourth list has been prepared by MoD after several rounds of consultations with all stakeholders including the industry. It lays special focus on equipment/systems, which are being developed and likely to translate into firm orders in the next five to ten years.

Creation of Weapon Systems branch in IAF

In a historic step for the Indian Air Force (IAF), Government has approved the creation of a new branch, called the Weapon Systems (WS) branch. The creation of WS branch would entail unification of all weapon system operators under one entity dedicated to the operational employment of all ground-based and specialist airborne weapon systems. The branch would encompass operators in four specialised streams of Surface-to-Surface missiles, Surface-to-Air missiles, Remotely Piloted Aircraft and Weapon System Operators in twin/multi-crew aircraft.

Contract for dual role SSM BrahMos

India's Ministry of Defence (MOD) signed a contract on 22 September 2022 with BrahMos Aerospace Pvt. Ltd. (BAPL) for acquisition of additional dual-role capable Surface to Surface BrahMos missiles at an overall approximate cost of Rs. 1700 Crore under "Buy-Indian" Category. Induction of these dual-role capable Missiles is going to "significantly enhance the operational capability of Indian Navy (IN) fleet assets".

VSHORADS tested by DRDO

DRDO conducted two successful tests of Very Short Range Air Defence System (VSHORADS) missile on 27 September 2022 from a ground based portable launcher at the Integrated Test Range, Chandipur, off the coast of Odisha. VSHORADS is a Man Portable Air Defence System (MANPAD) designed and developed indigenously by DRDO's Research Centre Imarat (RCI), Hyderabad in collaboration with other DRDO laboratories and Indian industry partners.

Test facility for sonar systems launched by DRDO

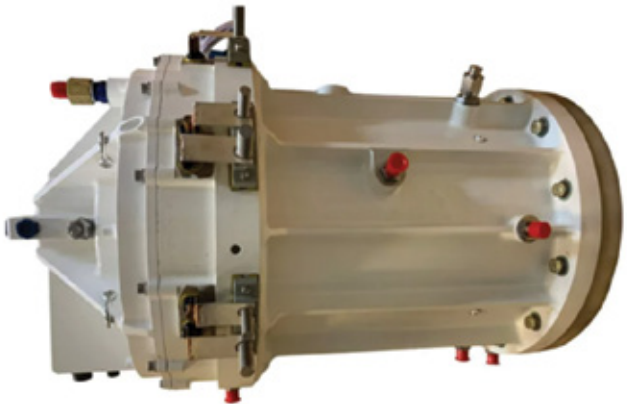
Defence Research & Development Organisation (DRDO) launched the Hull Module of Submersible Platform for Acoustic Characterisation & Evaluation (SPACE) facility at Naval Physical & Oceanographic Laboratory (NPOL) Kochi recently. It is a state-of-the-art testing and evaluation facility for sonar systems developed for use by the Indian Navy onboard various platforms including ships, submarines and helicopters.

GE contract with TASL

GE Aerospace and Tata Advanced Systems Ltd. (TASL) announced on 4 November that they have extended the manufacturing agreement under terms of which TASL will continue to produce and supply several commercial aircraft engine components to GE's global engine manufacturing factories. The multi-year long term contract is valued over USD $1 billion and showcases the growing relationship between GE and TASL in the aerospace industry. The engine parts will be manufactured at the Tata Centre of Excellence for Aero Engines (Tata-TCoE) in Hyderabad.

Honeywell and HAL in turbogenerators MoU

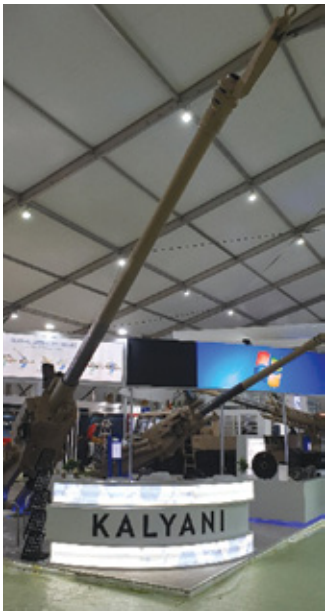
Honeywell has signed a memorandum of understanding (MoU) with Hindustan Aeronautics Limited (HAL) to jointly manufacture high-power, high-voltage turbogenerators. Honeywell will provide its 1-megawatt electric machine, to be utilised as a generator, that will enable a turbogenerator which can power hybrid-electric aircraft, including traditional airframes, unmanned aircraft and urban air mobility vehicles. This generator, which can also efficiently run as a 1-megawatt motor, can be seamlessly integrated with new and existing gas turbine engines to create highly power-dense turbogenerators.



SASMOS JV wiring harness for Boeing P-8s

SASMOS JV has won the contract from Boeing to provide more than 6600 wiring harnesses for the next batch of 16 P-8A Poseidon aircraft. Fokker Elmo SASMOS Interconnection Systems Limited (FE-SIL), a joint venture between Fokker Elmo and SASMOS, has been manufacturing Electrical Wiring Interconnection Systems for the aerospace industry since 2016, including wire harnesses for P-8A and P-8I.

KSSL order for supply of artillery guns



Kalyani Strategic Systems Limited, a wholly-owned subsidiary of the Company, has been awarded an export order for a 155mm Artillery Gun platform to be executed over a 3-year timeframe. The total value of the order is USD 155.50 million. "This order, to a non-conflict zone, is a great testament to the Government of India's AatmaNirbhar Bharat agenda and its sustained push to promote exports of Indigenously Designed Developed and Manufactured (IDDM) advanced defence platforms from India," stated the company.

INS Makar completes 10 years

INS Makar, the first indigenously built twin hull catamaran class survey vessel completed 10 years of service since its commissioning on 21 September 2012.

Launch of two DSVs at HSL

Two Diving Support Vessels (Nistar and Nipun) manufactured by by Hindustan Shipyard Ltd, Vishakapatnam for the Indian Navy were launched on 22 September 2022. The vessels are 118.4 metres long, 22.8 metres at the broadest point and will have a displacement of 9,350 tons. These ships would be deployed for deep sea diving operations. Additionally, with Deep Submergence Rescue Vehicle (DSRV) embarked, the DSVs are designed to undertake submarine rescue operations, in case requirement exists.

GSL's financial performance

In its 56th Annual General Meeting (AGM) held on 29 September 2022, Goa Shipyard Limited (GSL) reported satisfactory financial results for FY 2021-22. While addressing the members, CMD informed that the overall performance of the Yard was positive. Net worth of the Company has reached an all time high of Rs 1,148 Cr and Gross Revenue of Rs 865 Cr and Profit before Tax of Rs 135 Cr during FY 2021-22.

HAL's ICMF inaugurated

The President of India, Droupadi Murmu inaugurated HAL's Integrated Cryogenic Engine Manufacturing Facility (ICMF) in Bengaluru on 27 September 2022 and said it was not only a historic moment for HAL and ISRO but for the whole of India. "India is the sixth country in the world to have Cryogenic Engine Manufacturing capabilities. The glorious past of HAL and ISRO gives us an assurance that they will play a crucial role in the future",

she stated. HAL's ICMF will cater to the entire rocket manufacturing and assembly under one roof for ISRO. The facility is set up over an area of 4500 sqmts housing over 70 hi-tech equipment and testing facilities for manufacturing Cryogenic (CE20) and Semi-cryogenic Engines (SE2000) of Indian space launch vehicles.

Spherea partners with Crown Group

French electronic system manufacturing and testing group, Spherea has signed an MoU with Crown Group Defence, to initiate joint project to establish Electronic Repair Centre and for joint development and deployment of maintenance test solutions for the Indian defence sector. Under the agreement, both Spherea and Crown Group Defence are jointly partnering to establish an Electronic Repair Centre and offer life extension solutions for electronics systems which will contribute to "Make in India" for the benefit of Indian and French industries.

Centum and Indra Sistemas in MoU

Centum Electronics Limited and Indra Sistemas, Spain, have signed an MoU to exclusively collaborate in high-end futuristic

radar systems and technologies for the Government of India. The MoU envisages manufacturing and commissioning of the radar for space applications. The long-range radar is intended to detect, track and analyse objects and debris in space at a distance of thousands of kilometres.

BEL MoU with Aerosense Technologies

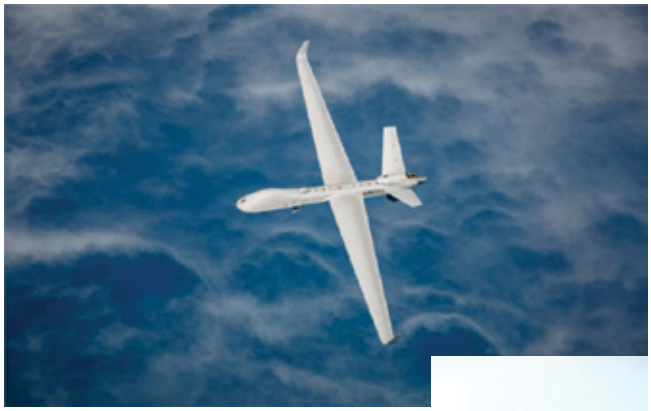
Bharat Electronics Ltd (BEL) has signed an MoU with Aerosense Technologies Pvt Ltd for co-operation in the development and marketing of Drones and Soft Kill Aerial Anti Drone. The MoU aims at leveraging the complementary strengths and capabilities of BEL and Aerosense Technologies Pvt Ltd. It will enable BEL and Aerosense Technologies to collaborate as partners for the design/ development of drones and soft kill aerial anti drone systems.

BEL MoU with Goa Shipyard Limited

BEL signed an MoU with Goa Shipyard Limited (GSL) for joint development of products/solutions in the area of autonomous navigation and associated fields. It will enable BEL and GSL to jointly work towards development of products/solutions in the

fields of autonomously navigated vessels and derivatives thereof, digital control and simulation of ships, networking of vessels and any other identified area for both defence and civilian applications in domestic and international markets.

GA-ASI and India's 114ai partnership



General Atomics Aeronautical Systems announced that Indian Artificial Intelligence (AI) Company 114ai has become one of its first partnerships as part of GA-ASI's "Make in India" roadmap. In November 2021, 114ai made headlines as the only Indian company to win a US-UK Joint Space Contract. "General Atomics is pleased to unveil our partnership with 114ai," stated Dr. Vivek Lall, Chief Executive of General Atomics Global Corporation. "We are looking forward to increased cooperation on NextGen AI technologies that we have been working on with the team at 114ai for the past few months. Their technology, track record and tenacity with customers in the US and UK has stood out".

Indian Army's 73rd Raising Day of TA

The 73rd Raising Day of Territorial Army was celebrated across the country on 9 October 2022 to commemorate its raising by the first Governor General C Rajagopalachari on this day in 1949. Lieutenant General Preet Mohindera Singh, Director General of Territorial Army (TA) paid tribute to the fallen heroes of the Territorial Army by laying a wreath at the National War Memorial.

Indian Army celebrates 76th Infantry Day

Infantry Day is commemorated on 27 October every year to acknowledge the contributions of Infantry, the largest fighting arm of the Indian Army. This day has a unique significance for the Nation, as it was on this day in 1947 that Infantry-men from the

Indian Army became the first troops to land at Srinagar airport, an act which turned back the invaders from the outskirts of Srinagar. As part of the Infantry Day celebrations of 2022, a 'Wreath Laying' ceremony was organised at the National War Memorial to honour the heroes of Infantry, who made the supreme sacrifice in service of the Nation.

Naval Group and IIT Goa in tie-up

Naval Group and the Indian Institute of Technology Goa (IIT Goa) are extending their cooperation in the field of underwater signal resolutions improvement. On 27 September 2022 Naval Group and IIT Goa signed a collaboration agreement, in presence of the Indian Ambassador Jawed Ashraf and the Mayor of Brest, François Cuillandre at Sea Tech Week. The joint research to be conducted aims to improve the analysis of data collected by underwater sensors, using neural systems and Artificial Intelligence.

Optimized Electrotech unveils surveillance systems

Ahmedabad-based defence tech startup Optimized Electrotech is strengthening the country's security cover by solving surveillance-related challenges with its hi-tech long-distance imaging systems. The products offered by the startup work on a wide range of the electromagnetic spectrum and are equipped with different types of optics to enable several applications such as surveillance for smart cities, satellite-based imaging, border surveillance, perimeter surveillance, access control, aircraft tracking and airport security, and emergency SAR operations.

OFC Cable Assembly for BEL radar

Riddhi Infratel, as part of the Make-II initiative of Bharat Electronics Limited, has indigenised the OFC Cable Assembly used in the Air Defence Radar (AD TCR) of BEL for connection between the OPS and Radar Surveillance Vehicle (RSV) shelters. The OFC Cable Assembly, which was so far being imported, has now been fully indigenised, successfully evaluated and qualified for applicable environmental standards by Riddhi Infratel.

Keel laying of Bollard Pull Tugs

Contract for construction of six 25 Ton Bollard Pull Tugs was concluded with Titagarh Wagons Ltd, Kolkata at a cost of Rs 169.5 crores in consonance with Atmanirbhar Bharat initiatives of the Government of India. These Tugs are being built with a service life of 30 years and will be capable of assisting naval ships and submarines in berthing and un-berthing, turning and manoeuvering in confined waters. The tugs will also provide afloat firefighting assistance to ships alongside and at anchorage and will have capability for limited Search and Rescue Operations.

Conclusion of Naval Commanders' Conference 2022

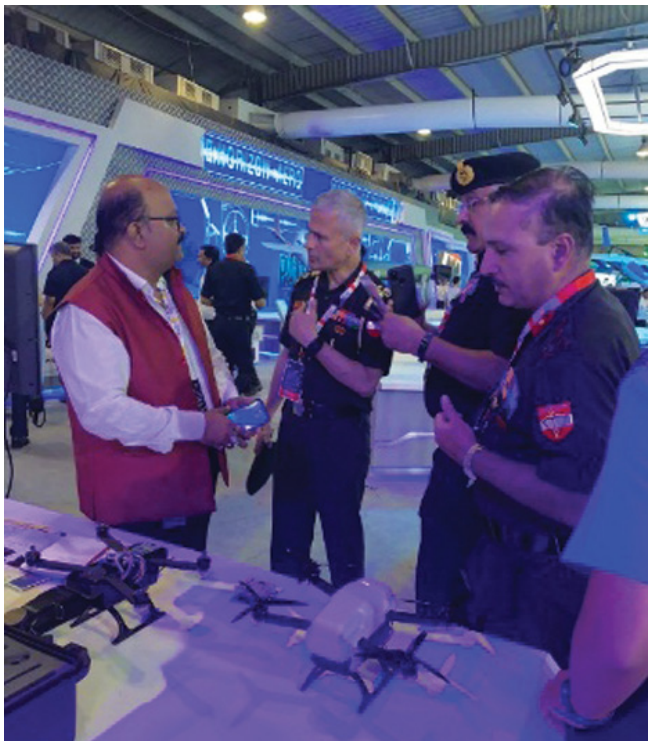
The bi-annual Naval Commanders' Conference concluded on 3 November and Raksha Mantri interacted with the senior leadership of the Indian Navy during the conference. The RM commended the Navy for maintaining a high operational tempo towards ensuring secure seas for national security and prosperity. He congratulated the Navy for successful commissioning of INS Vikrant**,** India's first indigenously designed and constructed aircraft carrier and adoption of a new Naval Ensign.

DroneAacharya AI to acquire drones and train pilots

DroneAcharya Aerial Innovations Limited, a Pune-headquartered integrated drone ecosystem start-up announced its plans to acquire 100+ (as mentioned in the DRHP) new drones as a part of its expansion plan. Further, the company plans to train 500+ pilots and 25 instructors annually starting in 2023. DroneAcharya AI was the one of the first private players to receive a DGCA (Directorate General of Civil Aviation) certified RPTO (Remote Pilot Training Organisation) license in 2022. Since March 2022, the company has trained more than 180 drone pilots.

Ajeet Mini showcased at Defexpo

Zuppa Geo Navigation Technologies Pvt Ltd showcased the Ajeet Mini, fully "Made in India" sub 2kg COTS micro drone, specifically designed for rapid use by dismounted troops, at the recently concluded Defexpo 2022. Ajeet Mini, powered by its



Aatmanirbhar Autopilot "Nav Gati", along with other electronics made by Zuppa, makes it a secure "Made in India" solution, specially designed for surveillance and monitoring. Venkatesh Sai, founder of Zuppa, stated that, "Ajeet Mini delivers exactly the same user experience as DJI from the perspective of ease of flying". The vision driving the development of Ajeet Mini was to build a drone similar to DJI in terms of user experience, but equipped with deep security layers to ensure complete data transparency and security against hacking and remote commandeering.

New ATR42-600s for Alliance Air

Regional aircraft lessor TrueNoord announced the successful delivery of two new ATR42-600s to Alliance Air, India's only public airline. The aircraft will join Alliance Air's fleet on a long-term operating lease and will serve domestic routes within India, specifically focusing on challenging airfields in the Himalayas.

Air India, AirAsia India and Vistara MoU with CSIR-IIP

The airline companies of the Tata group – Air India, AirAsia India and Vistara (Tata SIA Airlines), signed a Memorandum of Understanding with the Council of Scientific and Industrial Research – Indian Institute of Petroleum to collaborate and work together on the research, development and deployment of sustainable aviation fuels (SAFs). The focus of the MoU is the exploration of Single Reactor HEFA Technology for Drop-in liquid Sustainable Aviation and Automotive Fuel (DILSAAF). The MoU also outlines the intent of the signatories to work together in a variety of other areas related to sustainable aviation.

IndiGo touches 100th destination

IndiGo, India's leading carrier has commenced new daily direct flights between Mumbai and Ras Al Khaimah. Ras Al Khaimah is the 100th overall destination and 11th in Middle East in 6E network. With its fleet of 275+ aircraft, the airline operates over 1600 daily flights and connects 74 domestic and 26 international destinations.

BLADE and Eve in strategic partnership

FlyBlade India, a joint venture between Hunch Ventures and Blade Air Mobility, Inc, and Eve Air Mobility announced a strategic partnership which includes a non-binding order of up to 200 electric vertical take-off and landing (eVTOL or Electric Vertical Aircraft, EVA) vehicles, service and support, and Eve's Urban Air Traffic Management (UATM) software solution. The

companies also plan to collaborate on a three-month pilot project connecting passengers using helicopters.

IndiGo CarGo inducts 1st A321 P2F freighter

Building on the success of the CarGo business in the recent years, IndiGo has received its first A321 Freighter aircraft, converted from passenger jet to a full freighter configuration. The initiative will make best use of the natural synergies that IndiGo offers, using the same pool of pilots and engineers that fly and service its current fleet. The aircraft will be used for both domestic and international missions by transporting products such as valuables, express shipments, perishables, general cargo, documents and couriers.

APPOINTMENTS

General Anil Chauhan is new Chief of Defence Staff (CDS)

The Government has appointed Lt General Anil Chauhan (Retired) as the next Chief of Defence Staff (CDS) who shall also function as Secretary to Government of India, Department of Military Affairs with effect from the date of his assumption of charge and until further orders. In a career spanning over nearly 40 years, Lt Gen Anil Chauhan had held several command, staff and instrumental appointments and had extensive experience in counter-insurgency operations in Jammu & Kashmir and North-East India. Born on 18 May 1961, Lt Gen Anil Chauhan was commissioned into the 11 Gorkha Rifles of the Indian Army in 1981. He is an alumnus of the National Defence Academy, Khadakwasla and Indian Military Academy, Dehradun.

Giridhar Aramane is new Defence Secretary

Giridhar Aramane, a 1988-batch Indian Administrative Service (IAS) officer of Andhra Pradesh cadre, assumed the office of Defence Secretary on 1 November 2022. Before taking charge, Aramane laid a wreath at National War Memorial in New Delhi and paid homage to the fallen heroes. In his 32 years of experience in IAS, Aramane has held various important portfolios in the Central Government as well as Andhra Pradesh government. Prior to his current assignment, he was Secretary, Ministry of Road Transport & Highways.

Sanjeev Kishore is new DG Ordnance (C&S)

Sanjeev Kishore, a 1985 batch officer of the Indian Ordnance Factory Service (IOFS), has taken over as the Director General Ordnance (C&S). Before taking over the charge of DGO (C &S), Kishore was the Additional Director General Ordnance at the Directorate of Ordnance (Coordination & Services), Kolkata. Kishore has held many senior positions, including that of the first CMD of Armoured Vehicles Nigam Ltd (AVNL), one of the seven new DPSUs formed by the Government of India in 2021.

HAL's LCH Prachand inducted into IAF No. 143 HU

In a big boost to Aatmanirbharatha in Defence, Raksha Mantri Rajnath Singh on 3 October 2022 presided over the formal induction of Light Combat Helicopter (LCH), designed and developed by Hindustan Aeronautics Limited (HAL), into the Indian Air Force (IAF) in Jodhpur. Naming LCH as "Prachand", Raksha Mantri said that its induction comes during the Amrit kal when the Nation is celebrating Azadi ka Amrit Mahostav and a pointer to the future when IAF will be the top most force in the world, as also making the country fully AtmaNirbhar in defence production requirements. Raksha Mantri also took a sortie onboard the LCH shortly after its induction into IAF.

Chief of Defence Staff (CDS) General Anil Chauhan, Chief of Air Staff Air Chief Marshal V.R. Chaudhary, Air Marshal Vikram Singh Air Officer Commanding-in-Chief, South Western Air Command, Chairman and Managing Director of HAL C.B. Ananthakrishnan, senior officials of Ministry of Defence, IAF and local dignitaries were present on the occasion.

In his address, Mr. Rajnath Singh praised role of IAF in meeting internal as well as external threats to the country since independence. He added that the induction of LCH, with its tremendous power and versatility, not only enhances the combat capabilities of IAF but is also a big step towards self-reliance in defense production, as envisioned by Prime Minister Narendra Modi. The trust reposed and support

extended by the IAF towards indigenous design and development is evident through the examples such as Marut, Light Combat Aircraft, Akash missile system, Advanced Light Helicopter and the Light Combat Helicopter. "The induction of LCH underlines the fact that just as the country trusts the Indian Air Force, the IAF equally trusts the indigenous equipment," he added.

Raksha Mantri noted that the LCH meets the requirements of modern warfare and necessary quality parameters under varied conditions of operations. It is capable of self-protection, of carrying a wide variety of ammunition, and delivering it to the field quickly. This versatile helicopter perfectly meets the needs of our armed forces in various terrains and as such LCH is an ideal platform for both our Army and Air Force, he added.

Air Chief Marshal V.R. Chaudhary, Chief of Air Staff said on the occasion that induction of LCH adds unique capability to the IAF's combat potential. Versatility and offensive potential of the LCH is at par or better than most attack helicopters operating globally. Selection of the personnel in the No. 143 Helicopter Unit which will man the LCH have been made based on professional competence so as to ensure operationalisation of the unit at the earliest, he added.

The LCH is the first indigenous multi-role combat helicopter designed and manufactured by HAL. It has potent ground attack and aerial combat capability. Inducted in IAF's newly raised No. 143 Helicopter Unit, it is a testimony to India's growing prowess in indigenous design, development and manufacturing and a significant milestone in the path towards 'Atmanirbharta' in Defence. The helicopter possesses modern stealth characteristics, robust armour protection and formidable night attack capability. Onboard advanced navigation system, guns tailored for close combat and potent air to air missiles make the LCH especially suited for the modern battlefield. Capable of operating from high altitude terrain and carrying out precision strike at high altitude targets, the helicopter is a formidable addition to IAF's arsenal.

All photos courtesy Vijay Seth who was at Jodhpur covering the event.

Tata Group to set up FAL for C295 at Vadodara, Gujarat

On 30 October 2022, the Prime Minister of India, Mr. Narendra Modi, laid the foundation stone of the Final Assembly Line (FAL) for Tata Group's India C295 Programme at Vadodara, Gujarat. The unit will undertake aircraft manufacturing and assembly and will deliver a mission-ready aircraft in transport configuration, equipped with an indigenous Electronic Warfare Suite to the Indian Air Force (IAF). Raksha Mantri Mr. Rajnath Singh, Gujarat Governor, Acharya Devvrat, Chief Minister of Gujarat, Bhupendra Patel, Minister for Civil Aviation Jyotiraditya M Scindia, Defence Secretary, Dr. Ajay Kumar, Secretary, Ministry of Civil Aviation, Rajiv Bansal and Chairman, Tata Sons, N. Chandrasekaran were among the dignitaries who were present on the occasion.

In September 2021, India formalised the acquisition of 56 Airbus C295 aircraft to replace the Indian Air Force legacy Avro fleet. It is the first 'Make in India' aerospace programme in the private sector, involving the development of a complete industrial ecosystem: from manufacture to assembly, test and qualification, to delivery and maintenance of the complete lifecycle of the aircraft.

This will be the first time in the Indian private sector that an aircraft will be manufactured in-country, from parts to final assembly. The programme will lead to the development of a strong private industrial aerospace ecosystem in India and will create more than 15,000 skilled direct and indirect jobs across the aerospace eco-system, with more than 125 suppliers qualified on global quality standards across India.

Sixteen aircraft will be delivered in flyaway condition. They are scheduled to be received between September 2023 and August 2025. Remaining forty will be manufactured at the Vadodara manufacturing facility. The first Made in India aircraft is expected from September 2026.

The C-295 is a transport aircraft of 5-10 tonne capacity with contemporary technology that will replace the ageing Avro aircraft of IAF. Robust and reliable, it is a versatile and efficient tactical transport

aircraft which can perform a number of different missions. The aircraft, with a flight endurance of up to 11 hours, can carry out multi-role operations under all weather conditions. It can routinely operate day as well as night combat missions from desert to maritime environments. It has a rear ramp door for quick reaction and para dropping of troops and cargo. Short take-off/land from semi-prepared surfaces is another of its features.

The Prime Minister on the occasion said that the manufacturing facility had the power to transform the country's defence and transport sector. He pointed out that it was for the first time that this big investment was taking place in the Indian Defence sector. Transport aircraft, manufactured at the facility, would not only strengthen the Armed Forces but also help in developing a new ecosystem of aircraft manufacturing "Vadodara, which is famous as a cultural and education centre, will develop a new identity as an aviation sector hub," he stated. The Prime Minister expressed happiness about the fact that more than 100 MSMEs were also associated with the project. He said the promise of 'Make in India, Make for the World' would gain new push from this land as the project would be able to take orders for export to other countries in the future.

The Raksha Mantri described the C-295 as a state-of-the-art aircraft with superior capabilities and global standards that would unprecedently add to the logistical capability of the IAF. "It is a matter of utmost importance and great pride that all 56 aircraft will be fitted with indigenous Electronic Warfare Suite to be manufactured by Bharat Electronics Limited and Bharat Dynamics Limited. Hundreds of MSMEs from across the country will be a part of this project. It is a shining example of meeting the requirements of the Armed Forces with collaborative efforts of the private sector and DPSUs," he added.

Speaking on the occasion of the laying of the foundation stone, N Chandrasekaran, Chairman, Tata Sons stated, "With the set-up of the Final Assembly Line (FAL) in Vadodara, the Tata Group will now be able to take aluminum ingots at one end of the value stream and turn it into a Airbus C295 aircraft for the Indian Air Force. This is a historic moment not only for the Tata Group but for the country, as it embraces the Prime Minister's vision of being truly 'Atmanirbhar'".

"We are honoured to play a role in this historic moment for aerospace in India. Our Airbus teams are committed to supporting the modernisation of the Indian Air Force with the C295 programme, which will also contribute to the development of the private defense manufacturing sector in the country," stated Guillaume Faury, Airbus Chief Executive Officer. "The C295 programme, in partnership with the trusted Tata Group, is strongly aligned with the Government of India's vision of an 'Atmanirbhar Bharat' (self-reliant India)."

The IAF became the 35th C295 operator worldwide. Up to date the programme counts 285 orders, with more than 200 aircraft delivered, 38 operators from 34 countries as well as 17 repeated orders. In 2021 the C295 achieved more than half a million flight-hours.

With a proven capability of operating from short or unprepared airstrips, the C295 is used for tactical transport of up to 71 troops or 50 paratroopers, and for logistic operations to locations that are not accessible to current heavier aircraft. It can airdrop paratroops and loads and can also be used for casualty or medical evacuation. The aircraft can perform special missions as well as disaster response and maritime patrol duties.

ISRO's LVM3 M2 / OneWeb India-1 mission a success

LVM3 M2/OneWeb India-1 mission was launched successfully and all 36 satellites were placed into their intended orbits on 23 October 2022. The LVM3-M2 mission is a dedicated commercial mission for a foreign customer OneWeb, through NSIL. It is the first multi-satellite mission with 36 OneWeb Satellites to the LEO as the heaviest payload mass of 5,796 kg. of LVM3 till date.

Salient features of the Mission

- First Commercial Mission of LVM3
- First Multi-Satellite mission with 36 OneWeb Satellites onboard
- First launch of LVM3 to LEO
- First Indian rocket with six ton payload
- First NSIL Mission with LVM3
- First OneWeb Mission with NSIL/DoS

Technical Highlights:

- Handling of multiple satellite separation events.
- Increased nominal mission duration.
- Ensuring safe separation distance through C25 stage re-orientation and velocity addition.
- Ensuring data availability for entire mission duration.
- Realization of New payload adaptor and interface ring for the satellites dispenser.

OneWeb Constellation Summary:

- OneWeb Constellation operates in a LEO Polar Orbit.
- Satellites are arranged in 12 rings (Orbital planes) with 49 satellites in each plane.
- The orbital planes are inclined to be near polar (87.9 Deg.)
- The orbital planes are 1200 km above the Earth.
- Each satellite completes a full trip around the earth every 109 minutes.

- Theearth is rotating underneath satellites, so they will always be flying over new locations on the ground.
- In full service, each plane will have 49 satellites = 588 Satellites.

IAF @90 Day

2019 was my first tryst with IAF Day Parade at Hindon and 2021 was my second. The difference was during 2019 I couldn't take pictures as I did not have camera. In 2021, I had the camera but I did not have the access to the base. I made a promise to myself that one day, I would have both the access to the media pass and camera gear for the event.

Coming to present day in 2022, my stars aligned while I was researching and I was able to get the permission this time. I consider myself lucky and thanked all my stars and gods as the access to the Airforce Day event as media personnel is extremely difficult. The event was extra special as Indian Air Force turned 90 this year.

But this time, things changed. The event was held at Chandigarh Airforce Base, 12th Wing, Home of the Heavy Lifters. The entire event was divided in two parts. The welcome ceremony, the speech and march drill was done at the base but the main flying display was done at Sukhna Lake. The journey till now was surprisingly smooth as butter but little did I know it was going to go sideways soon.


INDIAN AIR FORCE

Had to run as soon as programme at the base came to the end as I knew that the entire route and parking would become an issue since the flying event at the lake was an open event for the public. It is said when you want something badly, Gods test you. I had to walk 12 kms from the car parking to the lake due to some technical goof up at the state governments end regarding proper instructions for the media. I somehow managed with low on energy and sore feet but all of that went away as soon as the announcement started. All things were forgotten the moment I heard the Mi-17 rotors. Rest you can enjoy from what I was able to capture.

Article and photos: Mayyank Kaul (Twitter: @kmayyank)

Indian space startups

Skyroot's Vikram S rocket makes history

India witnessed history as the first ever privately designed and built rocket from India took off on 18 November 2022 from the Satish Dhawan Space Centre, Sriharikota, Andhra Pradesh. The historic launch was enabled by the Indian National Space Promotion and Authorisation Centre (IN-SPACe), Department of Space (DOS), following their authorisation of the maiden flight of a private Launch Vehicle by the Hyderabad based space start-up Skyroot Aerospace. This heralds a new age for the Indian space programme and etches a significant milestone in accordance with the policy reforms the Government of India is envisaging for the space sector.

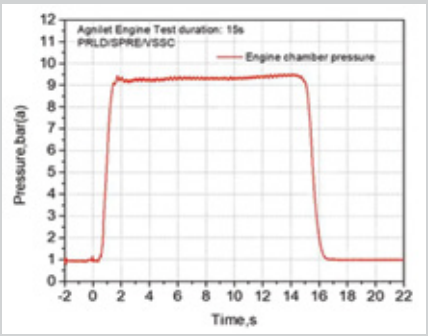
Skyroot launched its maiden rocket under the launch mission named 'Prarambh' meaning 'the beginning', signifying a new era for the private space sector in India and the first mission for Skyroot. The Prarambh mission was unveiled by ISRO Chairman, Dr. S. Somanath in Bangalore on 7 November 2022 following the technical launch clearance issued from IN-SPACe.

The rocket Vikram–S is a single-stage solid fuelled, sub-orbital rocket developed over two years by incorporating advanced technologies including carbon composite structures and 3D-printed components. Equipped with a gross lift off mass of 545kg, and payload mass of 80 kg, Vikram-S carried with it three customer payloads, which will map the measurement and validation of certain flight parameters and payload integration processes.

The Vikram-S rocket flight was a technology demonstrator to showcase the capabilities of the company. The rocket will help validate the technologies that will be used in the subsequent Vikram-1 orbital vehicle of Skyroot that is planned for launch next year, subject to technical clearance by IN-SPACe. The Indian National Space Promotion and Authorisation Centre (IN-SPACe) has been operating as a single-window, autonomous nodal agency of Department of Space (DOS) to boost private space sector economy in India. It has given five authorisations to the Space NGEs for undertaking space activities in India and signed sixteen MoUs. Till date, IN-SPACe has received more than 150 applications from Space NGEs for Authorisation, Facilitation and Promotion.

ISRO facilitates hot testing

Vikram Sarabhai Space Centre (VSSC), the lead Centre of ISRO for the development of launch vehicles, facilitated the hot testing of a rocket engine developed by an Indian space start-up. VSSC successfully conducted the hot test of Agnilet Engine for Agnikul Cosmos Pvt. Ltd. on 4 November 2022 at its Vertical Test Facility, Thumba Equatorial Rocket Launching Station (TERLS), Thiruvananthapuram. The test was carried out as part of MOU signed between ISRO and Agnikul Cosmos Pvt. Ltd. to provide opportunity for Indian space start-ups to use facilities of ISRO through IN-SPACe. Agnilet Engine is a regeneratively cooled 1.4 kN semi-cryogenic engine, working at a chamber pressure of 10.8 bar(a) using Liquid oxygen and Aviation Turbine Fuel (ATF) as propellants. This engine is realised through state-of-the-art 3D printing technology and material of construction is INCONEL-718.



Lockheed Martin's 9th Annual Suppliers' Conference

Lockheed Martin announced the culmination of its 9th annual Suppliers Conference held in Bengaluru on 9 November 2022. The company reiterated its commitment to enhancing indigenous defence capabilities of the Indian industry to boost the government's mission of increasing 'Made in India' defence exports.

The two-day event saw more than 60 Indian companies of all sizes large, MSMEs and start-ups participating in the conference and receiving the opportunity to showcase their capabilities to all four business areas of Lockheed Martin and international partners like GE Aviation, Honeywell, L3Harris Technologies, Raytheon Technologies, Thales and Elbit Systems among others. More than 250 delegates attended the event and over 100 business to business meetings were organised to explore partnership opportunities.

Mr. Basavaraj Somappa Bommai, Chief Minister of Karnakata graced the event as the chief guest for the inaugural ceremony. The Chief Minister's address focused on the vast talent and incentives that the state of Karnataka had to offer to fulfil India's mission of being 'Atmanirbhar' in defence. Key representatives from state governments besides industry leaders spoke at the event to reinforce their commitment to develop a defence and aerospace ecosystem in India.

"Lockheed Martin, in association with our Indian partners, continues to promote an indigenous defence manufacturing ecosystem in India, in line with Prime Minister Narendra Modi's resounding vision of achieving $5 billion worth of defence exports by 2025," stated William L. Blair, chief executive, Lockheed Martin India.

William L. Blair, chief executive, Lockheed Martin India Pvt. Ltd

"We are excited to explore further opportunities to strengthen our presence in India and advance India's strategic security and industrial capabilities," Blair said. "We saw an encouraging response from our supply chain network, MSMEs, start-ups and the industry who engaged in productive conversations focused on realising the government's vision of 'Make in India, Make for the World."

Hindustan Aeronautics Limited (HAL) was recognised as an Outstanding Supplier by the Lockheed Martin Rotary and Mission Systems (RMS) Global Supply Chain Organisation and India Multi-Role Helicopter (MRH) team for outstanding support, dedication and commitment to the success of the India MRH Programme. HAL demonstrated outstanding customer focus through delivery of the first two indigenous Identify Friend or Foe Transponder units and became the first Indian supplier to provide Buyer Nominated Equipment for integration on the India MRH platform.

Another Indian manufacturer, SASMOS HET Technologies was recognised as an Outstanding Supplier by the Lockheed Martin RMS and Missiles and Fire Control Global Supply Chain Organisations and the programme teams for their commitment to the success of the Aegis Low Noise Amplifier (LNA) and Hellfire programmes. During the past two years, while working smartly and safely through the pandemic, SASMOS delivered over 18,000 assemblies, demonstrating an outstanding customer focused approach while meeting or exceeding requirements.

The event reiterated Lockheed Martin's resolve to develop the capabilities of suppliers and to give them access to the global supply chain to manufacture in India, from India, for India and for the world. Post the conference, Lockheed Martin Supply chain teams visited more than 25 suppliers across India to assess their capabilities and establish alliances.

Courtesy: LM

India's first indigenous aircraft carrier INS Vikrant commissioned

Showcasing the country's growing prowess of indigenous manufacturing and a major milestone in the path towards 'Aatmanirbhar Bharat', Prime Minister Mr. Narendra Modi commissioned the country's first indigenous aircraft carrier Indian Naval Ship (INS) Vikrant at Cochin Shipyard Limited (CSL) on 2 September 2022. During the event, the Prime Minister also unveiled the new Naval Ensign (Nishaan), doing away with the colonial past and "befitting the rich Indian maritime heritage". He dedicated the new ensign to Chhatrapati Shivaji.

Addressing the gathering, the Prime Minister said, here on the coast of Kerala, every Indian is witnessing the sunrise of a new future. This event being held on the INS Vikrant is a tribute to the rising spirits of India on the world horizon. He said that today we are seeing a manifestation of the dream of the freedom fighters where they envisioned a capable and strong India. The Prime Minister exclaimed "Vikrant is huge, massive, and vast. Vikrant is distinguished, Vikrant is also special. Vikrant is not just a warship. This is a testament to the hard work, talent, influence and commitment of India in the 21st century. If the goals are distant, the journeys are long, the ocean and the challenges are endless – then India's answer is Vikrant. The incomparable Amrit of Azadi ka Amrit Mahotsav is Vikrant. Vikrant is a unique reflection of India becoming self-reliant."

Commenting on the new mood of the nation, the Prime Minister said, no challenge is too difficult for today's India. He said "today, India has joined those countries in the world, which manufacture such a huge aircraft carrier with indigenous technology. Today INS Vikrant has filled the country with a new confidence, and has created a new confidence in the country." The Prime Minister acknowledged and praised the contribution of the Navy, engineers of Cochin Shipyard, scientists and specially the workers who worked on the project. He also noted the happy and auspicious occasion of Onam that is adding even more happiness to the occasion.

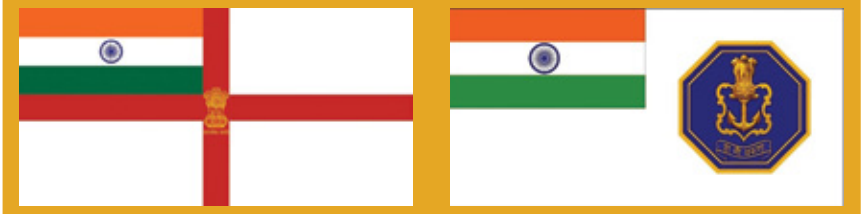
Every part of INS Vikrant has its own merits, a strength and development journey of its own. It is a symbol of indigenous potential, indigenous resources and indigenous skills. The steel installed in its airbase is also indigenous, developed by DRDO scientists and produced by Indian companies, he said. Explaining the massive proportions of the carrier, the

Prime Minister said it was like a floating city. It produces electricity that is sufficient to power 5000 households and the wiring used will reach Kashi from Kochi, he said.

The Prime Minister talked about the Indian Maritime tradition and naval capabilities. Chhatrapati Veer Shivaji Maharaj, he said, built such a navy on the strength of this sea power, which kept the enemies on their toes. When the British came to India, they used to be intimidated by the power of Indian ships and trade through them. So they decided to break the back of India's maritime power. History is witness to how strict restrictions were imposed on Indian ships and merchants by enacting a law in the British Parliament at that time, the Prime Minister said.

The Prime Minister noted that on the historic date of 2 September2022, India had "taken off a trace of slavery, a burden of slavery. The Indian Navy has got a new flag from today. Till now the identity of slavery remained on the flag of Indian Navy. But from today onwards, inspired by

New Ensign of Navy



Then (left) and now (right): the new Ensign of the Indian Navy

Resonant to the ongoing national endeavour to move away from colonial past, need was felt to transition to a new design that drew inspiration from our history. The White Ensign identified nation-wide with the Navy, now comprises of two main constituents - the National Flag in the upper left canton, and a Navy Blue - Gold octagon at the centre of the fly side (away from the staff). The Octagon is with twin golden octagonal borders encompassing the golden National Emblem (Lion Capital of Ashoka – underscribed with 'Satyamev Jayate' in blue Devnagri script) resting atop an anchor; and superimposed on a shield. Below the shield, within the octagon, in a golden bordered ribbon, on a Navy Blue background, is inscribed the motto of the Indian Navy 'Sam No Varunah' in golden Devnagriscript. The design encompassed within the octagon has been taken from the Indian Naval crest, wherein the fouled anchor, which is also associated with colonial legacy, has been replaced with a clear anchor underscoring the steadfastness of the Indian Navy.

Chhatrapati Shivaji, the new Navy flag will fly in the sea and in the sky".

Commenting on the changing geo-strategic situation, he said in the past, security concerns in the Indo-Pacific region and the Indian Ocean had long been ignored. "But, today this area is a major defence priority of the country for us. That is why we are working in every direction, from increasing the budget for the Navy to increasing its capability".

In his address, Raksha Mantri Mr. Rajnath Singh termed the commissioning of INS Vikrant at the onset of 'Amritkal' as a testament to the Government's strong resolve to ensure the safety and security of the nation in the next 25 years. "INS Vikrant is a glowing symbol of an aspirational and self-reliant 'New India'. It is an icon of pride, power and resolve of the Nation. Its commissioning is an unprecedented achievement in the path of building indigenous warships. Indian Navy's tradition is 'old ships never die'. This new avatar of Vikrant, which played a stellar role in the 1971 war, is a humble tribute to our freedom fighters and brave soldiers," he stated.

Mr. Rajnath Singh also asserted that it is a key responsibility of the Indian Navy to secure the country's maritime interests for uninterrupted maritime trade, amid the constantly-changing global situation. He commended the Navy for always being the 'First Responder' in times of any national or international crisis and exuded confidence that the commissioning of INS Vikrant will further enhance the force's capability. He added that this is an assurance to the friendly foreign countries that India is fully capable of meeting the collective security needs of the region. "We believe in a free, open and inclusive Indo-Pacific. Our efforts in this regard are guided by 'SAGAR' (Security and Growth for All in the Region) as envisioned by the Prime Minister," he said.

Speaking on the occasion, Chief of the Naval Staff Admiral R Hari Kumar voiced the Navy's resolve for India@100 to become completely self-reliant until 2047, consisting of 'Made in India' ships, submarines, aircraft, unmanned vessels and systems and remain a 'Combat Ready, Credible, Cohesive and Future-Proof Force'. He added that the Navy is determined to move forward on the path of five pledges - developed India, removing any sign of servility, pride in heritage, unity and fulfilling the duties - as envisioned by the Prime Minister. The Chief of the Naval Staff exhorted the Commanding Officer and crew of INS Vikrant to take forward the proud legacy of erstwhile Vikrant which served the country for 36 glorious years and played a significant role in the 1971 war.

About INS Vikrant

With the commissioning, India has entered into a select band of nations having niche capability to indigenously design and build an Aircraft Carrier and real testimony to the Nation's resolve for self-reliance and 'Make in India'.

INS Vikrant is designed by Indian Navy's in-house Warship Design Bureau (WDB) and built by Cochin Shipyard Limited, a Public Sector Shipyard under the Ministry of Ports, Shipping & Waterways, Vikrant has been built with state of the art automation features and is the largest ship ever built in maritime history of India.

The 262.5 m long and 61.6 m wide Vikrant displaces approx 43,000 T, having a maximum designed speed of 28 knots with endurance of 7,500 nautical miles. The ship has around 2,200 compartments, designed for a crew of around 1,600 including women officers and sailors. The carrier is designed with a very high degree of automation for machinery operations, ship navigation and survivability. The carrier is equipped with the latest state of the art equipment and systems.

The ship is capable of operating air wing consisting of 30 aircraft comprising of MiG-29K fighter jets, Kamov-31, MH-60R multi-role helicopters, in addition to indigenously manufactured Advanced

Light Helicopters (ALH) and Light Combat Aircraft (LCA) (Navy). Using a novel aircraft-operation mode known as Short Take Off But Arrested Recovery (STOBAR), INS Vikrant is equipped with a ski-jump for launching aircraft, and a set of 'arrester wires' for their recovery onboard.

With 76% indigenous content, construction of INS Vikrant has resulted in direct employment generation for over 2,000 employees of CSL. In addition, it has resulted in indirect employment generation for approx 12,500 employees for over 550 OEMs, sub-contractors, ancillary industries and over 100 MSMEs as well, thereby bolstering plough back effect on economy.

All photos: Indian Navy/ MoD

Exercises and visits

ICG-USCG exercise Abhyas-01/22

The four day visit of United States Coast Guard Cutter Midgett to Chennai on a goodwill visit culminated on 19 September 2022. During the visit USCG ship had professional exchanges on VBSS, Cross Deck visits, friendly volleyball matches with Indian Coast Guard counterparts. The exercise focused towards acquainting the Coast Guards with each other's capabilities and strengthen their working level relationship towards enhancing inter-operability in the field of maritime search and rescue, boarding operations and other maritime law enforcement duties.

Japan-India JIMEX-22 concludes

The sixth edition of the Japan India Maritime Exercise 2022, JIMEX 22 hosted by the Indian Navy concluded in the Bay of Bengal with the two sides bidding farewell to each other with a customary steam past on 17 September 2022. Indian Naval ships led by Rear Adm Sanjay Bhalla, Flag Officer Commanding Eastern Fleet and Japan Maritime Self Defence Force (JMSDF) Ships Izumo and Takanami led by Rear Adm Hirata Toshiyuki, Commander Escort Flotilla Four, participated in the week-long exercise. The exercise, which marked the tenth anniversary of JIMEX since its inception in 2012, consolidated "the mutual understanding and interoperability between the two navies".

INS Sunayna in Seychelles

INS Sunayna entered Port Victoria Seychelles on 24 September 2022 to participate in the annual training exercise Operation Southern Readiness of Combined Maritime Forces (CMF). This not only reinforces Indian Navy's commitment to maritime security in the Indian Ocean Region but also marks the maiden participation of an Indian Navy ship in CMF exercise. The joint training exercise was attended by representative delegations from USA, Italy, Australia, Canada, New Zealand and ship participation from UK, Spain and India.

INS Tarkash in Port Gentil, Gabon

INS Tarkash made a port call at Port Gentil, Gabon on 26 September 2022 as part of her ongoing deployment in the Gulf of Guinea for anti-piracy patrol. This marked the first visit by any Indian Naval Ship to Gabon. During her stay in harbour, the ship and her crew participated in official and professional interactions as well as sports fixtures.

INS Sunayna in CMF exercise

INS Sunayna participated in the capacity building exercise Operation Southern Readiness conducted by Combined Maritime Forces (CMF) at Seychelles from 24-27 September 2022. The Indian Navy was welcomed to the CMF by Vice Admiral Brad Cooper, US NAVCENT. This is the maiden participation of an Indian Navy ship in CMF exercise. As part of the interactive sessions attended by representatives of the participating countries, a training lecture on Maritime Domain Awareness was conducted by the Indian Navy. A live demonstration on Visit Board Search

& Seizure (VBSS) operations was also conducted onboard HMS Montrose led by the Seychelles Special forces with close support from the Indian naval team.

Indian Navy's P8I at Exercise Kakadu

A P8I Long Range Maritime Patrol Aircraft of the Indian Navy participated in the Multinational Maritime Exercise Kakadu 2022 hosted by Royal Australian Navy in Darwin from 12 to 25 September 2022, along with INS Satpura. The exercise had the participation of 34 aircraft from over 20 nations. The maiden participation of the P8I provided an enhanced exposure to the aircrew, augmenting the understanding of the varied nuances of collaborative anti-submarine and anti-surface warfare operations in a complex multi-threat scenario. The seamless operations conducted by P8I in consonance with the exercise theme 'Partnership, Leadership, Friendship' along with USN and RAAF P8s enabled "refining joint SOPs and enhance interoperability and reaffirm Indian Navy's commitment to the Indo-Pacific".

South Korean naval ships visit Chennai

Republic of Korea (ROK) Navy Cruise Training Task Group consisting of two naval ships, ROKS Hansando and ROKS Daecheong arrived in Chennai on a three-day visit on 28 September 2022. Rear Admiral Kang Dong-goo, Commander of Cruise

Training Task Group along with Capt Ko Dae-jong, Commanding Officer ROKS Daecheong, Cdr Park Jin-sung, Commanding Officer ROKS Hansando and other officials of the consulate of Korea had discussions with the Flag Officer Commanding Tamil Nadu and Puducherry Naval Area on matters of common interest. During the visit, professional interactions and friendly sports activities took place between the personnel of the Indian Navy and ROK Navy. ROKS Hansando is South Korea's first dedicated training ship and ROKS Daecheong is the logistics support ship.

First Training Squadron at Kuwait

The ships of First Training Squadron (1TS) comprising INS Tir, Sujata and CGS Sarathi arrived at Port Al-Shuwaikh, Kuwait on 4 October 2022. The ships were deployed in the Persian Gulf as part of their training deployment. The ships were accorded a warm welcome by senior officers of the Kuwaiti Naval forces, Border Guard and the Embassy of India officials besides school children. The ships of 1TS, based at Kochi, are part of the Southern Naval Command, Indian Navy's Training Command.

Indian Army exercise

Lt Gen Upendra Dwivedi, Army CDR NC witnessed the combined arms manoeuvre in Akhnoor on 10 October 2022 to validate the operational preparedness. He complimented all ranks for their professional standards and encouraged troops to strive for excellence.

INS Tarkash in S. Africa for IBSAMAR VII

INS Tarkash reached Port Grequhrea (also known as Port Elizabeth), South Africa to participate in the seventh edition of IBSAMAR, a joint multinational maritime exercise among Indian, Brazilian and South African Navies from 10-12 October 2022. The previous edition of IBSAMAR (IBSAMAR VI) was conducted off Simons Town, South Africa from 1 to 13 October 2018. The Indian Navy was represented by the Teg class guided missile frigate, INS Tarkash, a Chetak helicopter and the personnel from the Marine Commando Force (MARCOS). The harbour phase of IBSAMAR VII included professional exchanges such as damage control and fire-fighting drills, VBSS/cross boarding lectures and interaction among Special Forces.

Exercise Prasthan conducted

An offshore security exercise, 'Prasthan' was conducted in the Krishna Godavari Basin Offshore Development Area (ODA) on 11-12 October 2022, under the aegis of Headquarters, Eastern Naval Command, Indian Navy. Conducted every six months, this exercise is an important element of ensuring offshore security and aims to integrate the efforts of all maritime stakeholders involved in offshore defence. Led by the Navy, the exercise saw participation from the various oil operators, like ONGC, RIL, Vedanta, and other stakeholders in the domain of maritime security including AP Marine Police, AP fisheries department and the Coast Guard. The two-day exercise resulted in refining standard operating procedures (SOPs) and response actions to several contingencies in the Offshore Defence Area off Kakinada.

Singapore-India exercise SIMBEX-2022

The Indian Navy hosted the 29th edition of the Singapore-India Maritime Bilateral Exercise (SIMBEX) from 26 to 30 October 2022 at Visakhapatnam. SIMBEX-2022 was conducted in two phases – Harbour Phase at Visakhapatnam from 26 to 27 October

2022 followed by the Sea Phase in Bay of Bengal from 28 to 30 October 2022. Two ships from Republic of Singapore Navy, RSS Stalwart (a Formidable Class Frigate) and RSS Vigilance (a Victory Class Corvette) arrived Visakhapatnam on 25 October 2022 for participation in the exercise.

FOC-IN-C (West) reviews readiness of Western Fleet

Vice Admiral Ajendra Bahadur Singh, Flag Officer Commanding-in-Chief Western Naval Command Indian Navy, embarked ships of Western Fleet off the West Coast of India from 11 to 13 October

22, to review operational/combat readiness of the fleet in a multi-threat scenario. Over 20 Indian naval warships, six submarines and a variety of aircraft participated in the exercise. This day and night tactical exercise included extensive weapon and integration drills and target engagements in all three dimensions.

Indian Navy in trilateral exercise with Mozambique and Tanzania

The first edition of India-Mozambique-Tanzania Trilateral Exercise (IMT TRILAT), a joint maritime exercise among the Indian, Mozambique and Tanzanian navies commenced at Dar Es Salaam,

Tanzania on 27 October 2022. Indian Navy was represented by the guided missile frigate, INS Tarkash, a Chetak helicopter and MARCOS (Special Forces). The exercise had three broad objectives: capability development to address common threats through training and sharing of best practices, enhancing interoperability and strengthening maritime cooperation.

French Navy ship Aconit visits Mumbai

French Navy Ship Aconit, one of the five La Fayette Class frigates of the French Navy was on a goodwill visit to Mumbai from 28 October to 2 November 2022. The ship's crew had professional and social interactions with personnel of Indian Navy. The visit culminated with an exercise at sea with a warship of the IN's Western

Fleet. The frigate had earlier visited Visakhapatnam in 2015. Over the decades, cooperation between India and France has grown exponentially in various defence related fields. The current visit of FNS Aconit to Mumbai was a reflection of the growing cooperation between the two navies and their enhanced interoperability. With peace and stability in the region being of common interest, the two navies "are committed to working together towards that goal".

Joint IAF and RSAF exercise

On 3 November 2022, the 11th edition of the annual Joint Military Training (JMT) between the Indian Air Force (IAF) and the Royal Singapore Air Force (RSAF) commenced at Air Force Station, Kalaikunda, India. The two Air Forces have resumed this training after a gap of two years. The training could not be carried out in the intervening two years due to the COVID-19 pandemic. This edition of JMT will be conducted over a period of six weeks. The RSAF participationd in JMT-2022 is with F-16s while the IAF is fielding the Su-30MKI, Jaguar, MiG-29 and LCA Tejas aircraft.

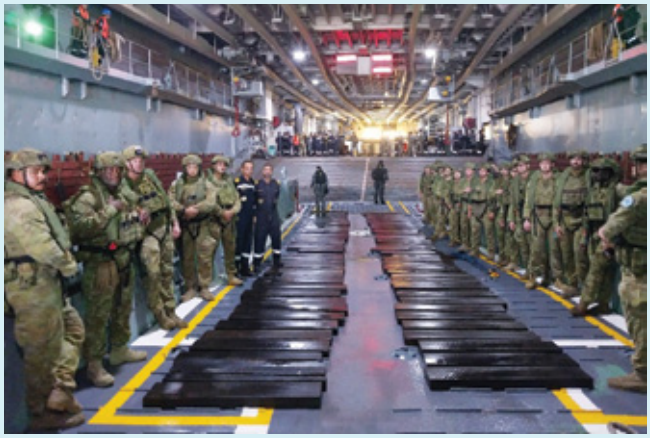
Indian Army's ITE

Indian Army's Integrated Training Exercise (ITE) was conducted in November 2022 by Airawat Division practising opposed canal crossing and firing by mechanised forces; validating operational preparedness.

Exercise with Royal Australian Navy concludes

A Maritime Partnership Exercise involving Royal Australian Navy (RAN) ships HMAS Adelaide and HMAS Anzac and Indian Navy Ships Jalashwa and Kavaratti along with their embarked helicopters was held in the Bay of Bengal from 2 to 3 November 2022. The exercises included tactical manoeuvres, helicopter landings and amphibious operations, which signified the high degree of interoperability between IN and RAN.

RAN ships HMAS Adelaide and HMAS Anzac visited Visakhapatnam from 30 October to 1 November 2022 which was part of Australia's Indo-Pacific Endeavour 2022 (IPE 22). The Australian Defence Forces were hosted by the Eastern



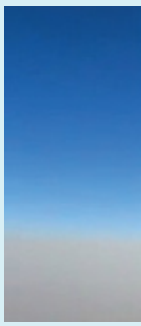
Naval Command. Ships of the Indian Navy's Eastern Fleet as also personnel from the Indian Army and the Indian Air Force participated in various joint activities. The harbour phase included a wide range of professional interactions including experience sharing, joint planning activities and friendly sports exchanges. The successful completion of the exercise "marks another milestone in the growing India-Australia military interactions".

Exercise Garuda VII at AFS Jodhpur

Indian Air Force (IAF) and French Air and Space Force (FASF) participated in a bilateral exercise, named 'Garuda VII', from 26 October to 12 November 2022 at Air Force Station Jodhpur. In this exercise, FASF participated with four Rafale fighter aircraft, one A-330 Multi Role Tanker Transport (MRTT) aircraft and a contingent of 220 personnel. The IAF participated with Su-30MKI, Rafale, LCA Tejas and Jaguar fighterss as well as the Light Combat Helicopter (LCH) and Mi-17 helicopters. The IAF contingent also included Combat Enabling Assets like Flight Refuelling Aircraft, AWACS and AEW&C. This joint exercise provided a platform for both the countries to enhance operational capability and interoperability, while also sharing best practices.

This was the seventh edition of the bilateral exercise. The first, third and fifth editions were conducted in India in 2003, 2006 and 2014 at Air Force Stations Gwalior, Kalaikunda and Jodhpur, respectively. The second, fourth and sixth editions were conducted in France in 2005, 2010 and 2019.

Participation of the IAF and FASF in this exercise "promoted professional interaction, exchange of experiences and enhancement of operational knowledge, besides strengthening bilateral relations between the two countries".

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EX GARUDA VII
JODHPUR 22
IAF – FASF
AIR FORCE EXERCISE

Delivery of Y 12705 (Mormugao)

Y12705 (Mormugao), the second ship of Project 15B stealth guided missile destroyers being built at Mazagon Dock Shipbuilders Limited (MDL), was delivered to the Indian Navy on 24 November 2022. The contract for four ships of Project 15B was signed on 28 January 2011. This Project is a follow-on of the Kolkata class (Project 15A) destroyers commissioned in the last decade and the lead ship of the Project INS Visakhapatnam has already been commissioned into the Indian Navy on 21 November 2021.

Designed by the Warship Design Bureau, Indian Navy's in-house organisation and built by Mazagon Dock Shipbuilders Ltd, Mumbai, the four ships of the Project are christened after major cities from all four corners of the country, viz. Visakhapatnam, Mormugao, Imphal and Surat.

The keel of Mormugao was laid in June 2015 and the ship was launched on 17 September 2016. The design has largely maintained the hull form, propulsion machinery, many platform equipment and major weapons and sensors as the Kolkata class to benefit from series production.

The ship is 163 metres long and 17 metres wide, displaces 7400 tonnes when fully loaded and has a maximum speed of 30 knots. Apart from myriad indigenous equipment in the 'Float' and 'Move' categories, the destroyer is also installed with under-mentioned major indigenous weapons. The overall indigenous content of the project is approximately 75%.

Some features include Medium Range Surface-to-Air Missiles (BEL, Bangalore), BrahMos Surface-to-Surface Missiles (BrahMos Aerospace, New Delhi), Indigenous Torpedo Tube Launchers

second ship of Project 15B

(Larsen & Toubro, Mumbai), Anti-Submarine Indigenous Rocket Launchers (Larsen & Toubro, Mumbai) and 76mm Super Rapid Gun Mount (BHEL, Haridwar).

The ship had sailed out for her maiden sea sortie on 19 December 2021 to coincide with the Goa Liberation Day and the ship has now been delivered. The delivery of Mormugao is an affirmation of the impetus being given by the Government of India and the Indian Navy towards 'Aatmanirbhar Bharat' as part of celebration of the 'Azadi ka Amrit Mahotsav'. The early induction of the destroyer, almost 3 months prior to the contractual date, despite the COVID challenges, is a tribute to the collaborative efforts of large number of stake holders and would enhance the maritime prowess of the country in the Indian Ocean Region.

BMP-2M with AVision's loitering munitions and Rafael Spike ATGM

Defexpo 2022 at Gandhinagar—a review

IAF and Indian Army LCH Prachand's

The 12th and largest-ever defence exhibition Defexpo 2022 marked the emergence of India's defence industry as a sunrise sector for investment on the global scale in line with the theme of the expo 'Path to Pride'. Held in Gandhinagar, Gujarat, the five-day event, which commenced on 18 October 2022, witnessed unparalleled participation of over 1,340 exhibitors, businesses, investors, start-ups, MSMEs, Armed Forces and delegates from several countries, with engagements spread over four venues.

The overwhelming response of investors and businesses showed that the objective of a defence sector worth USD 22 billion, with exports of Rs 35,000 crore by 2025, will be achieved. The best minds of defence sector came together at over 20 seminars across three business days to brainstorm over wide ranging topics on defence research and development, new technologies for air warfare, indigenisation of defence production, promotion of exports and encouraging investments.

Conclusion of 451 MoUs, Transfer of Technology agreements, product launches and orders to domestic businesses, worth Rs 1.5 lakh crore, reflected India's progress towards achieving aatmanirbharta in defence and integration between the Armed Forces requirements, R&D and defence production by public and private players. The prowess of the Indian defence and aerospace manufacturing was evident in the display of aircraft, tanks, arms and ammunition, cutting-edge technologies and weapons systems at the first Defexpo exclusively for domestic companies. The visits of the Prime Minister, the Defence Minister and other dignitaries - both local and foreign - to the stalls encouraged the Indian defence industry.

For the first time, an investor outreach event 'Invest for Defence' was organised bringing together businesses and investors. The importance of this historic Defexpo was reinforced when Prime Minister Mr. Narendra Modi graced the inaugural ceremony on 19 October 2022 and invited the world to be part of the 'Aatmanirbhar Bharat' journey. The Prime Minister made a number of announcements, including

the 4th positive indigenisation list; laid the foundation stone of Air Force Station Deesha, just 130 kms from India's western border; unveiled the HAL-designed and developed HTT-40 trainer aircraft; launched Mission DefSpace and inaugurated the India and Gujarat Pavilions.

Raksha Mantri Mr. Rajnath Singh attended various seminars, in which Armed Forces, government stakeholders and industry representatives from India and abroad got an opportunity to engage with each other to carry forward the Prime Minister's vision of 'Make in India, Make for the World' for a secure and prosperous future.

India's growing global influence was apparent in the multiple bilateral and multilateral engagements held on the sidelines of Defexpo 2022. The India-Africa Defence Dialogue and the Indian Ocean Region plus Defence Ministers' Conclave hosted by the Raksha Mantri and his bilateral meetings with friendly nations, other than those of Raksha Rajya Mantri Ajay Bhatt, Chief of Defence Staff General Anil Chauhan and Defence Secretary Dr Ajay Kumar, was a "reflection of India's growing stature and the world's increased confidence in the Indian defence sector".

The people of Gujarat and millions following via digital media were enthralled with live demonstrations on the banks of the Sabarmati River by the Armed Forces, DRDO and DPSUs. Uniformed personnel performed daredevil exercises with helicopters above and boats below, mesmerising the audiences to the edge of their seats. A spectacular drone show, the biggest ever with 1,600 drones, on 19 October lit up the evening skies of Gandhinagar as thousands were "left in awe of India's technological progress powered by local start-ups".

Defexpo 2022 has served as a unique platform to project India's vision for 'Aatmanirbharta in Defence' as an integrated pursuit of economic development and national security. Mr. Rajnath Singh's speech during the Bandhan ceremony clarified that India's efforts to strengthen the defence sector are not aimed at establishing supremacy, but to protect the nation from future threats and reaffirmed that India is a peace-loving nation which is fully equipped to give a befitting response if provoked. Throughout Defexpo 2022, India has sent a clear message to the world that its defence industry has entered into a golden era and is fully ready to meet the country's security requirements. India's invitation to global players to become partners in an 'Aatmanirbhar Bharat', with the slogan 'Make in India, Make for the World' resonated well with friendly foreign countries.

345 MoUs, 42 Major Announcements, 46 Product Launches and 18 Transfer of Technology agreements were concluded as part of the Bandhan ceremony. The host state of Gujarat contributed 28 MoUs and one Product Launch. In a major boost to indigenisation, the Indian Air Force and

Garuda Aerospace showcases Vajra Drone

India's drone start-up, Garuda Aerospace at Defexpo 2022 showcased their new delta wing tactical drone, Vajra. Garuda Aerospace signed a partnership with William Blair- National Head, Lockheed Martin Canada CDL and Jayashree Muralidharan- Managing Director and TIDCO Chairman, for providing advanced Uncrewed Aerial Systems software solutions for defence and commercial purposes.

Dassault and BDL in MoU

BDL and Dassault Aviation Pvt Ltd entered into MoU for integration of BDL weapon systems such as Astra and SAAW on the Rafale. The MoU will also open avenues for export to friendly countries.

Hindustan Aeronautics Limited (HAL) also signed a contract for 70 HTT-40 trainer aircraft worth Rs 6,800 crore, which was unveiled by the Prime Minister on the 2nd day of the expo at the India Pavilion, the marquee pavilion showcasing indigenous defence products. The Raksha Mantri acknowledged that the 12th edition of the event marked a new chapter in the growth of Indian defence sector, and progress in achieving the twin objectives of self-reliance and increase in defence exports.

On the sidelines of the expo, India's growing global influence was visible as African nations took part in the India Africa Defence Dialogue (IADD) in Gandhinagar. Raksha Mantri indicated India's readiness to fulfil security requirements of African nations, and it was welcomed by all those in attendance. The civilisational links between India and Africa are maturing into strong partnerships, with defence cooperation being one of the potential areas of convergent interests. Fifty African countries, including 20 Defence Ministers, seven CDS/Service Chiefs and eight Permanent Secretaries participated in the Dialogue attesting to the high priority accorded to India-Africa engagement in defence and security fields.

The second Indian Ocean Region Plus (IOR+) Defence Ministers' Conclave also witnessed participation from 41 countries, and India communicated its vision of international relations as a win-win rather

before the event, showing the potential for immense growth in the Indian Defence industry in the future.

This expansion in the defence sector is not restricted to large businesses as it throws up wide variety of opportunities for start-ups as well as the MSMEs. Rs 300 crore have been approved so far for more than 100 iDEX winners to develop products/ technologies in more than 50 technological areas to further support this growth. Over 6,000 applications in the last seven editions of Defence India Start-up Challenge and Open Challenge show that start-ups are contributing extensively to the growth of Indian defence. The Raksha Mantri Awards for excellence, were presented to 22 enterprises of different sizes and included 13 private players.

than zero sum paradigm. In addition, Raksha Mantri, Raksha Rajya Mantri and Defence Secretary Ajay Kumar held bilateral meetings with a host of defence officials of participating nations during Defexpo.

'Invest for Defence', a marquee event of Ministry of Defence, was held to promote investment in the defence sector in the country both by the Indian industry as well Foreign OEMs. Private sector enterprises such as Airbus, Lockheed Martin, Saab, Adani Defence & Aerospace, Bharat Forge and L&T shared their ambitious plans at panel discussions held

Garuda Aerospace and Elbit in teaming

Garuda Aerospace teamed up with Elbit Systems to provide Skylark 3 UAS drones for commercial as well as government agencies. These high-end drones will be equipped with advanced sensors which can be utilised for large scale mining projects for steel plants, coal mines like BCCL, Coal India, NTPC facilities across the country.

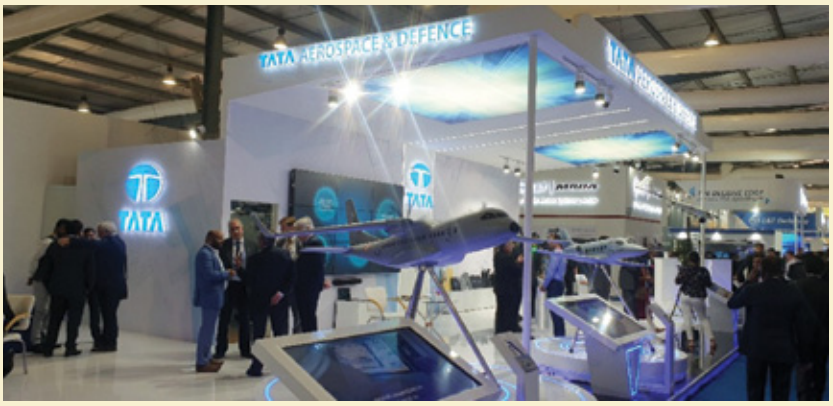
States had wide representation at the expo, with 10 state pavilions and stalls set up, including one for Gujarat, and the two Defence Industrial corridors in Uttar Pradesh and Tamil Nadu. The wide variety of the weapons, components, platforms, services indicates the depth of the capabilities of domestic defence manufacturing sector and its future potential.

Seminars formed a cornerstone of the Defexpo platform for all stakeholders to connect and engage with each other. Representatives from governments, armed forces, R&D institutions, industry and investor communities came together to identify opportunities for business growth, emerging challenges and areas of convergent interest.

India reached out to the global community through these seminars, held in hybrid mode. At the US-India Business Council (UIBC) and Society of Indian Defence Manufacturers (SIDM) seminar on 'New Frontiers in US-India Defence Cooperation: Next Generation Technology, Innovation & Make in India', US companies were invited to set up manufacturing units in India and develop technology collaborations with Indian industry. The "Aatmanirbharta in Defence R&D - Synergistic Approach" organised by Defence Research & Development Organisation (DRDO) indicated the growing integration of research and development with industry and armed forces requirements. In another path breaking initiative, FICCI and Headquarters-Integrated Defence Staff (HQ-IDS) jointly held a seminar on "Aatmanirbhar Bharat & Make in India: Roadmap for the Armed Forces". This represented a unique instance where Armed Forces and private industry came together to balance the demand and supply side aspects of Indian Defence manufacturing.

DefExpo 2022 was not restricted to business participation. The live demonstrations held at Sabarmati Riverfront entertained people of all ages, including those connected through virtual platforms. Breathtaking combat free falls by Armed Forces, daring displays by the elite Marine Commandos (Marcos) and Para Commandos and various combat manoeuvres on sky, land and water left indelible impressions on the spectators. Patriotic and martial tunes bid farewell to

TASL wins Raksha Mantri Award



Tata Advanced Systems' Advanced Loitering System (ALS-50) has been awarded the prestigious Raksha Mantri's Awards for Excellence in Defence and Aerospace Sector 2021-22, for Innovation, in Large Scale Companies category. Tata Advanced Systems Limited (TASL) displayed the Advanced Loitering System (ALS 50) for the first time at the event and TASL is producing such a system for IAF, under contract and it can vary the capability to address requirements for other forces in the country and for export.

Samar air defence system with clever use of AAMs in the SAM role!

LM Canada and Garuda Aerospace MoU on UAS solutions

Garuda Aerospace and Lockheed Martin Canada CDL Systems have signed a Memorandum of Understanding (MOU) to integrate Garuda Aerospace's Made-In-India drones with Lockheed Martin Canada CDL Systems' advanced Uncrewed Aerial Systems (UAS) software solutions for defense and commercial purposes. The companies are committing to exploring expanded partnership opportunities - working closely to build a strong data processing capability and develop joint algorithms which will cater to a wide range of drones and various drone-based service applications in sectors such as defence, agriculture, mining, large scale mapping and industrial inspection.

Agnishwar Jayaprakash, Founder and CEO, Garuda Aerospace, stated, "I'm delighted and thrilled to be working with Lockheed Martin Canada CDL Systems. This partnership will give Garuda Aerospace a strong competitive edge to cement market dominance in several sectors."

Airbus first foreign OEM to receive QMS

The Airbus Defence and Space Quality Management System (QMS) for the C295 aircraft has received approval from the Directorate General of Aeronautical Quality Assurance (DGAQA), the Indian regulatory authority for aeronautical quality assurance. This is the first time a QMS of a foreign aircraft manufacturer has been approved by DGAQA.

VEM signs MoU with HAL

Signing of MoU for 20 Units of CFL Assembly

Hindustan Aeronautics Limited (HAL) and VEM Technologies Pvt Ltd signed an MOU for production and delivery of 20 Units of Centre Fuselage Assemblies (CFL) for Light Combat Aircraft (LCA) Tejas Mk1A. VEM handed over the first ever "Centre Fuselage Assembly for Light Combat Aircraft – Tejas" to Hindustan Aeronautics Limited (HAL) on 26 July 2021. The dedicated line established by VEM for the productionisation of Centre Fuselage for LCA Tejas is expected to deliver good volumes to HAL to meet the present and the future orders from Indian Armed Forces which is likely to go up from current confirmed order of 83 Tejas Aircraft. At Defexpo, VEM also received the contract from HAL towards indigenous design and development of infrared radiation suppression system (IRSS) for the Light Combat Helicopter (LCH).

Centum in strategic alliance with Rafael

Centum Electronics Limited announced a strategic partnership with Israel headquartered Rafael Advanced Defense Systems Limited. As part of the MoU, both the companies will exclusively collaborate in the field of electronic warfare systems for the Indian Army, Indian Navy, Indian Air Force, Indian Coast Guard and other government agencies. The MoU envisages development and indigenous production of the futuristic light weight electronic warfare systems in lower frequency bands and life cycle support of the existing electronic warfare systems.

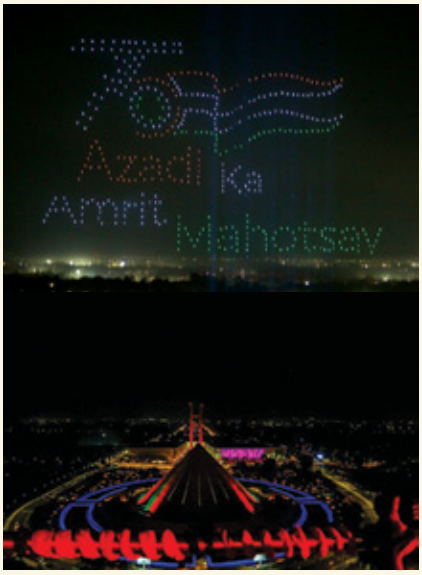
setting sun each evening in a joint band display by the three Services.

"The seeds of various defence initiatives sown at the Defexpo 2022 promise to bear everlasting fruits in future contributing to India's quest for self-reliance and propel the Nation into a top defence exporter where everyone has a role to play" stated India's Ministry of Defence.

Sabarmati River Front live demos at Defexpo

As part of Defexpo, live demonstrations by the Army, Navy, Air Force, Coast Guard and DRDO, showcasing land, naval and air procedures, and systems in action was held daily late afternoon onwards at Sabarmati River Front. The joint live demonstrations included combat freefall, Sarang helicopter aerobatics, slithering from helicopter into a boat, high speed boat runs and neutralising enemy posts, etc.

Ship visits were organised for the public by Indian Navy and Indian Coast at Porbandar. Another highlight of the event was the biggest-ever drone-show by IIT Delhi start-up Botlabs, which is an iDEX winner. Around 1,600 drones lit up the sky during the show which was a public event.



Boeing highlights its "By India, For India" commitment

Boeing featured its range of advanced defence capabilities at Defexpo 2022 and highlighted the company's commitment to India's Aatmanirbhar Bharat vision, having recently announced a potential economic impact of $3.6 billion over 10 years to the Indian economy with the F/A-18 Super Hornet as India's carrier-based fighter and continued investments in manufacturing, engineering and technology transfer, sustainment, training and skilling and infrastructure. The economic impact would be over and above Boeing's current offset obligations and plans in the country.

Boeing India's exhibit with the theme "By India, For India" highlighted strategic investments the company has made in India's aerospace and defense ecosystem to build services local infrastructure, capabilities, workforce development and partnerships, while harnessing the strength of Indian talent and its large and growing network of more than 300 supplier partners.

"India's defence sector is poised for growth and offers significant opportunities for Boeing with our proven portfolio of products and services, offering unmatched operational capabilities to India's defence forces across the entire mission spectrum and through their product lifecycle," stated Salil Gupte, president, Boeing India. "Boeing is committed to supporting and enabling this progress with a vision to be to bring the best of Boeing to India and take the best of India to the world."

At Defexpo, Boeing highlighted existing defence programmes with the Indian Navy and Indian Air Force such as the C-17, P-8I, AH-64E Apache, and CH-47F Chinook, and outline sustainment, training and performance-based logistics solutions for India's armed forces to support the lifecycle of their fleets and increase mission readiness. Also showcased at the show was the advanced capabilities of the F/A-18 Super Hornet Block III and F-15EX.

"Boeing continues to partner closely with customers and local industry to support the defence modernisation of India's armed forces," stated Alain Garcia, vice president, Boeing Defense, Space & Security in India. "With our keen focus on sustaining, training, localisation and partnerships, we are committed to support India's existing and future defense requirements".

Boeing also showcased the advanced multi-role capabilities of the F/A-18 Super Hornet Block III as "the best choice to meet the Indian Navy's carrier-borne fighter jet requirement" and highlighted the industrialisation benefits of Boeing's offer. Visitors were able to fly the Boeing F/A-18 Super Hornet Block III on a simulator and learn more about its ability to conduct a wide range of missions, carrier-based aviation, and superior capabilities.

India presently operates 11 C-17s, 22 AH-64 Apaches (with six more on order), 15 CH-47 Chinooks, 12 P-8Is, three VVIP aircraft and two Head of State aircraft.

Boeing accelerates MRO localisation with Indian partners

Boeing announced a significant expansion of its partnerships within the Indian MRO ecosystem over the last year, having concluded considerable work agreements and deliveries with diverse indigenous partners across the public as well as private sectors, including with AI Engineering Services Ltd., Horizon Aerospace, and Air Works Group. The localisation of Maintenance, Repair and Overhaul (MRO) to support Indian customers promptly and efficiently, remains a top priority for the company.

In 2021, Boeing launched the Boeing India Repair Development and Sustainment (BIRDS) programme in its effort to help develop India into a regional MRO hub, enabling engineering, maintenance, skilling, repair and sustainment services of defence and commercial aircraft right here in India, for India. Under the initiative, Boeing has strategically collaborated with:

- Air Works, to recently complete Phase 32 heavy maintenance checks of six P-8I maritime patrol aircraft for the Indian Navy.
- AI Engineering Services Limited (AIESL), for MRO of the Boeing 777 VIP aircraft operated by the Indian Air Force, and the P-8I aircraft fleet operated by the Indian Navy. Additionally, the company is exploring collaboration in repair and overhaul of landing gear and other commercial common 737NG equipment fitted on the P-8I fleet.
- Horizon Aerospace, for MRO of the three key Boeing defence platforms in India, the P-8I operated by the Indian Navy (IN), and VIP 737 transport fleet operated by the Indian Air Force (IAF).

"Our planned strategic collaboration with indigenous companies under the BIRDS hub programme enables us to provide significant value-add to our customers locally by enabling faster turnaround, exceptional operational capability and mission readiness for the Indian armed forces. This also marks as an important step as part of our commitment to the Government of India's Aatmanirbhar Bharat vision of making India a regional MRO hub" stated Surendra Ahuja, managing director, Boeing Defence India.

Over the last one year, Boeing has continued to add two suppliers every month. Its network today includes over 300 supplier partners that are an integral part of its global supply base. Over a quarter of this number are Micro, Small and Medium Enterprises (MSMEs). These Indian companies are manufacturing and exporting systems and components for some of Boeing's most advanced products from India to the world. Boeing's investments with these partners span skilling, research and technology, and manufacturing.

TASL delivers 200th CH-47 Chinook Crown and Tail cone to Boeing

Tata Advanced Systems Limited (TASL) has successfully delivered the 200th Crown and Tail-cone for Boeing's CH-47 helicopter. Manufactured by TASL in Hyderabad, the parts of the CH-47 helicopters will be integrated at Boeing's facility in Philadelphia. TASL has delivered the Crown and Tail-cone for CH-47 Chinook helicopters for the US Army and other international customers. The CH-47 Chinook is an advanced multi-mission helicopter operated by the US Army and 18 other defence forces around the world. In June 2017, TASL had also delivered the first crown and tail cone parts for one of the 15 CH-47 Chinook helicopters for delivery to the Indian Air Force.

Boeing India and MIDHANI explore collaboration

Boeing India announced it will assess and collaborate with Mishra Dhatu Nigam Limited (MIDHANI) to develop raw materials for standards aerospace parts and components in India. Indigenous availability of special aerospace materials and alloys has been identified as crucial for creating a self-reliant aerospace and defence industry in India. The availability of essential aerospace materials is the first step in securing the supply chain, and aligns with the Government's vision of Aatmanirbhar Bharat.

Dynamatic Technologies completes first F-15 former assembly

"This is the first aero-structure, for the latest and most advanced F-15 manufactured in India, a significant milestone for the Indian aerospace and defence industry. This is enabled by innovation and forward-thinking processes, the newest version of the legendary F-15 fighter incorporates the most advanced systems available globally, including next-generation design and technology built on a digital thread", said officials.

F-15EX model on display at Defexpo 2022

VAYU Interview with

Alain Garcia, Vice President, India Business Development, Boeing Defense, Space & Security and Global Services

VAYU: Boeing currently supports the Indian Navy with a fleet of 12 P-8Is. What makes the platform suitable to support the Indian Navy's objectives in the Indo-Pacific region?

A. The P-8s Indian variant, referred to as P-8I, is an aircraft designed for long-range anti-submarine warfare (ASW), anti-surface warfare (ASuW), and intelligence, surveillance and reconnaissance (ISR) missions. The P-8 delivers highest levels of quality, reliability and operability. A true multi-mission aircraft, it is defined by a unique combination of state-of-the-art sensors, proven weapons systems, and a globally recognised platform. Notably, the Indian Navy was the first international customer for the P-8 and today operates the largest non-US fleet. In fact, on 19 December, it will be a decade since the first P-8I was delivered to the Indian Navy – a significant milestone in our growing relationship with the navy.

Since the induction of the P-8I in the Indian Navy, Boeing has been supporting the fleet to ensure high rates of mission readiness. With its 12 P-8Is, the Indian Navy is rapidly increasing its capability to seal and protect its vast coastline – while also playing a greater role in regional maritime security. In addition to unmatched maritime reconnaissance and anti-submarine warfare capabilities, the P-8I has been deployed to assist during disaster relief and humanitarian missions. The patrol aircraft is an integral part of the Indian Navy's fleet and has surpassed 35,000 flight hours since it was inducted in 2013. We believe that the Indian Navy may have a requirement for more P-8Is as also more Harpoons and we stand ready to support them.

A formidable part of the Indian Navy's fleet, the P-8 is a proven system with more than 140 aircraft in service that have executed more than 400,000 mishap free flight-hours around the globe. Along with the Indian Navy, the P-8 family includes the US Navy, the United Kingdom's Royal Air Force, Royal Australian Air Force and Royal Norwegian Air Force. Militaries that have selected the P-8 include the Royal New Zealand Air Force, Republic of Korea Navy and German Navy. The P-8's performance and reliability delivers confidence in an uncertain world—in any condition, anywhere, anytime.

The P-8 combines the most advanced weapon system in the world with the cost advantages of the most operated commercial airliner on the planet. The P-8 shares 86% commonality with the commercial 737NG, providing enormous supply chain economies of scale in production and support. Boeing's expertise in commercial fleet management and derivative aircraft sustainment also provides customers with greater availability at a lower operational cost. The P-8 is engineered for 25 years/25,000 hours in the harshest maritime flight regimes, including extended operations in icing environments.

VAYU: What are the advantages of using the 737 as a platform for P-8?

A. The platform has a reliability of greater than 99% and a world-wide base of support, parts and training. Based on the Next Generation 737-800, the P-8 leverages the commonality of the platform, roughly 86%, to reduce support and training costs over the life of the aircraft as well as utilise the world-wide availability of parts. Even before delivery, the P-8 benefits from the fact that it is a modified 737. Built using the same in-line production processes as the commercial 737s, the P-8 has benefitted from those production line efficiencies, which have largely contributed to an overall 30% cost savings and 50% reduction in production time. That translates into savings for P-8 customers and has also resulted in Boeing's ability to deliver P-8s on or ahead of schedule.

VAYU: Are there any Indian suppliers contributing to the P-8I programme?

A. For both the P-8I and P-8A, we work with a number of Indian companies, including Avantel, Dynamatic Technologies, Hindustan Aeronautics, Bharat Electronics, Electronics Corporation of India, Rossell Techsys, Fokker Elmo Sasmos, and TATA Advanced Materials. They provide a variety of items such as structures, wiring harnesses, composites and electronics.

VAYU: Boeing is also offering the carrier fighter F/A-18 Super Hornet Block III to the Indian Navy. What are the advantages the platform offers which cater to the requirements specific to the Indian Navy?

A. The F/A-18 Super Hornet Block III is specifically designed, from its inception, for carrier operations. One of the main benefits of this is that the aircraft has the ability to fold its wings, allowing for better utilisation of deck space on the aircraft carrier. Boeing has conducted thorough study and analysis that optimises the number of Super Hornets that can fit aboard INS Vikramaditya and INS Vikrant, as well as optimises the cyclic operations from those carriers leading to

high sortie generation rates. Boeing has also developed a capability specifically for the F/A-18 Super Hornet Block III that will allow for the faster movement of the aircraft between the flight deck and hangar deck without having to remove or modify any part of the aircraft. This capability is compatible with the current elevator/lift configuration aboard Indian aircraft carriers.

Another important fact to note is that the two-seater carrier compatible variant of the Super Hornet offers several unique advantages to the IN including flexibility, higher utilisation of the fleet, and the ability to embark certain missions from the carrier that benefit from having the second crew member. Additionally, two-seater F/A-18 Super Hornets can be used as trainers (ashore and on the carrier) and as fully capable fighters, operational from carrier and from land bases. Thus, IN will get tremendous flexibility and a higher asset utilisation rate due to the carrier compatible variant of the two-seater variant of the F/A-18.

The F/A-18 Super Hornet has a very attractive lifecycle cost too. It not only has an affordable acquisition cost, but it costs less per flight hour to operate than any other tactical aircraft in production in the US forces inventory. This is possible because the fighter is designed for ease of maintainability and offers impressive durability with the life of the airframe up to 10,000 hrs. Boeing's sustainment programme, "By India, For India", is built on the success of existing programmes that the company is executing for the Indian Air Force (IAF) and IN today. These programmes will enable us to develop select capabilities to sustain the Super Hornet out of India.

The Super Hornet is powered by the GE F-414 engine that has clocked cumulatively more than 5 million hours. The same family of engines is powering India's indigenous Light Combat Aircraft inducted by the IAF. The commonality in engines would create scale efficiencies for potential sustainment opportunities in India in the future.

The Block III's networking allows the F/A-18 Super Hornet to interface with other assets of the IN. For example, F/A-18s of the IN can potentially share data with P-8Is of the IN or P-8 of US Navy and Royal Australian Air Force to significantly improve the capability of the partner countries for helping secure the Indo-Pacific. Recently, there have been tremendous advancements in unmanned systems that are to be used in a naval aviation environment. In the coming days, as IN inducts such systems, both the single-seat and two-seat versions of the Super Hornet on the IN carrier will allow interfacing with unmanned carrier-borne systems more effectively.

VAYU: There is an increasing focus from the government on Make in India for the aerospace and defence sector. Do you have any plans to support Make in India for the F/A-18 Super Hornet?

A. Boeing plans to continue to strengthen its Make in India initiatives, building on a successful track record of contributing to India's indigenous aerospace and defence ecosystem. As part of this effort, Boeing anticipates $3.6 billion in economic impact to the Indian aerospace and defence industry over the next 10 years, with the F/A-18 Super Hornet as India's next carrier-based fighter. The economic impact would be over and above Boeing's current offset obligations and plans in the country. The strategy includes five key pillars:

1. Supply Chain Development and Manufacturing: The new plan builds on Boeing's sourcing of $1 billion annually from over 300 Indian suppliers of parts, assemblies and services. Boeing has added several new Micro, Small and Medium Enterprises (MSMEs) suppliers in support of our commitment to Aatmanirbhar Bharat, and they account for over 25 percent of our suppliers in India. The plan also envisages potential for additional manufacturing opportunities, including the F/A-18's Outer Wing and Nose Barrel component manufacturing and assembly. Additionally, Boeing is reviewing several hundred other machined assemblies that could be placed with Indian suppliers.

2. Engineering and Technology Transfer: Boeing envisions working closely with industry and the US and Indian governments to share technology and transfer work of the F/A-18 fighter jets in India, based on interest and business case. Boeing will also leverage investments made in the Boeing India Engineering & Technology Centre (BIETC) and its talented pool of 3,000+ engineers and innovators in Bengaluru and Chennai to drive growth and innovation, and advance work in materials, manufacturing technologies and methods, and the "Digital World." As a part of "Digital World," new manufacturing processes have been established, and Boeing has unlocked the potential of the Full-Size Determinant Assembly (FSDA) approach for its customers. With the F/A-18, Boeing will continue to explore opportunities to bring FSDA-related advanced technologies to the Indian defence industry.

3. Support and training: Boeing will collaborate with the Ministry of Defence and Indian industry to develop long-term and self-reliant sustainment solutions for the Super Hornet fleet to deliver increased aircraft availability and mission readiness. This will be done by leveraging the existing industry ecosystem across key support areas such as On and Off Aircraft Maintenance, Sustaining Engineering, Fleet Operations Support, and Training, and by leveraging the local Maintenance Repair & Overhaul (MRO) capabilities that Boeing Defence India is building.

4. Investments: Boeing India employs 4,000 employees directly, and over 7,000 are employed by key suppliers in India. Boeing's joint venture with Tata, Tata Boeing Aerospace Limited, manufactures aerostructures for Apache attack helicopters for global customers out of Hyderabad. In addition, foreign direct investment (FDI) of $200 million has been made by Boeing towards setting up a 43-acre state-of-the-art engineering and technology campus under construction in Bengaluru. This campus will be the largest Boeing-owned facility of its kind outside the US.

5. Impact by Hornet Industry Team: The diversity and strength of the Hornet Industry Team, comprising of General Electric, Northrop Grumman and Raytheon, has the potential to deliver significant benefits to Indian industry. These industry leaders have proven their commitment to India by collaborating with Indian entities and delivering on Aatmanirbhar Bharat objectives. The F/A-18 will enhance collaboration with Indian industry by facilitating knowledge transfer and promoting autonomy in operating and maintaining India's fleet of F/A-18 aircraft. Further, this knowledge transfer may also provide opportunities for India to support F/A-18 fleets around the world through manufacturing and sustainment.

IAI announces a new subsidiary located in India

Israel Aerospace Industries (IAI) has opened a new subsidiary located in New Delhi India, Aerospace Services India (ASI). IAI's investment in Aerospace Services India is a strong demonstration of IAI's support for the Indian government's 'Atmanirbhar Bharat'- Make in India vision. This also shows the commitment to the strong partnership between IAI and DRDO in developing and supporting advanced systems for the Indian armed forces. Boaz Levy, IAI's President and CEO stated, "Aerospace Services India is leveraging top technology, innovation, and talent to deliver customer satisfaction so that they can focus on their mission. IAI has a well-established operation in India, working with various partners and customers in the Indian market. Through the years, IAI has pursued a flexible and adaptive business policy to comply and respond to PM Modi's 'Self-Reliance' vision."

Boaz Levy, IAI's President and CEO

IAF CAS Air Chief Marshal Vivek Ram Chaudhari visited IAI India Group booth at Defexpo and was introduced to IAI and HAL "Make in India" Flight Refueller Aircraft (FRA) converted from Boeing B767.

IAI highlights commitment to India's defence ecosystem

IAI India Pvt Ltd, a subsidiary of Israel Aerospace Industries Ltd., showcased its advanced technologies, air-defence systems and ground-combat solutions at Defexpo 2022. Boaz Levy, IAI President and CEO stated, "IAI is proud and excited to be exhibiting at this year's Defexpo, emphasising our commitment to the local Indian defence ecosystem. We have been innovating and delivering state-of-the-art technologies that have expanded our partnerships and collaboration with India's industry-leading companies in both the public and private sectors. For the last three decades, we have been jointly developing tailor-made, cutting-edge solutions to meet India's unique challenges. As a trusted partner in India, IAI's elite technological solutions are deployed throughout the Indian defence forces. As we celebrate thirty years of friendship with India, we are re-pledging our commitment to India's self-reliance campaign and seek opportunities to further advance the 'Make in India' vision. We look forward to meeting our friends and partners while exhibiting our cutting-edge technologies to the Indian, Asian, and global markets during this prestigious defence exhibition."

IAI India Pvt Ltd showcased a wide array of aerial systems, including its Medium Altitude Long Endurance (MALE) strategic Unmanned Aerial Systems (UAS) Heron TP, and its most advanced UAS to date, the Heron MK II. In addition, IAI exhibited its unique Vertical Take-Off and Landing capabilities with the WanderB VTOL, developed by IAI's BlueBird Aero Systems subsidiary, alongside IAI's advanced tactical loitering-munition designed for both ground and naval units, the Mini Harpy. IAI's long-range artillery weapons systems, the LORA precision strike surface-to-surface missile, also showed IAI's strike capabilities. IAI's Zibar family of all-terrain tactical utility vehicles was shown alongside IAI's future armoured fighting vehicle – the Carmel. IAI also exhibited its TERRA radar and M19 and MOSP sensor payloads, among other advanced systems. "IAI is excited to highlight its technologies and deep-rooted partnerships with India's defence ecosystem", stated the CEO.

IAI's latest member of Heron UAS family: Heron MK II

One of IAI's highlights at Defexpo 2022 was the state of the art, latest technology Heron MK II UAS, a member of the Heron family of Unmanned Aerial Systems (UAS) which has been serving armed forces in Asia and worldwide for decades.

The Heron MKII UAS is interoperable and compatible with legacy Heron family systems. This is an important force multiplier for all existing and future Heron family customers. With a new airframe and wings tuned to maximise performance, Heron MK II sets new mission capabilities, efficiencies and autonomy standards.

With a comprehensive payload suit, Heron MK II supports multiple payloads operating over a broad spectrum. Different payloads onboard enable the collection of reconnaissance, surveillance, and intelligence in real-time, covering large areas of interest. Using dedicated sensors, the system can perform standoff reconnaissance (with the M19 payload) over a long distance (up to 100 km) or persistent surveillance over a wide area (Wasp payload). Heron MK II can also carry maritime surveillance radar, synthetic aperture radar (SAR), electronic surveillance measures (ESM), and communications intelligence (COMINT). By operating up to six sensor payloads simultaneously, Heron Mk II provides a complete, multi-modal intelligence gathering capability on a single platform.

Heron Mk II also incorporates an integral wideband satellite communications link and a fully digital line-of-sight datalink, serving multiple payloads simultaneously and allowing the platform unrestricted operational envelope over long distances, sea, land and mountainous terrain. Switching between the different datalinks can optimise the mission to become covert, secure and resilient.

In addition to streaming live sensor data to the ground segment, Heron Mk II also has servers onboard, providing users access to large amounts of raw or processed sensor data collected throughout the mission and stored onboard.

Since its introduction in 1994, the Heron family has been operational in Asia and over 20 other customers worldwide, accumulating well over 2,200,000 flight hours. The dimensions of the Heron Mk II has been increased to a 9.7-meter-long fuselage and a wingspan of almost 17 meters, providing a larger space for internal and external payloads, including underwing stores such as lifeboats, without degrading performance.

Start of the art, cutting edge avionics enable flight and mission autonomy, supporting flexible payload integration with a wide range of Heron family payloads and customer furnished systems and applications. The system conforms to open architecture, with separate flight control and mission management systems. This enables the manufacturer and users to maintain optimal upgrading cycles and avionic systems flexibility throughout the UAS life cycle.

The new powerplant is optimised for the mission profile defined by the new platform. The aviation certified engine delivers 160 hp, significantly over the 115 hp provided on the legacy Heron. This engine was designed and tuned specifically for IAI's requirements, contributing to a high climb rate and efficient operation at low and high altitudes. With this engine, Heron Mk II can operate efficiently and reliably at altitudes up to 35,000 ft. The powerful engine also provides sustained power for a maximum airspeed of 145 knots and a faster ascent, improving the drone's rate of climb by more than 50 percent over legacy systems. The maximum takeoff weight (MTOW) has increased to 1,430 kg including a useful payload of 470 kg which represents an impressive increase from the legacy Heron's 1,270 kg MTOW. The Heron Mk II can deliver a mission endurance of over 30 hours on station.

Another forte is its ability to endure adverse weather, with deicing systems enabling Heron Mk II to cross stormy weather it may encounter on its flight, over mountains and sea. Special attention is given to protecting the communications, navigation and flight systems from jamming

and spoofing, protecting the GPS and datalinks against jamming, deception, interference and cyber-attack. The platform maintains self-awareness throughout the flight, preventing location deception, unauthorised intervention, or hostile takeover of the autonomous platform.

With a stronger and wider fuselage, Heron Mk II is more adaptive to multi-payload configurations, offering a spacious payload bay, an integral satellite communications terminal, and separate flight and mission computers, allowing users to introduce changes in the mission system while maintaining airworthiness flight-control functions intact. Autonomous takeoff and landing and multiple redundancies for flight and mission-critical systems are fully supported, based on proven and robust automation, multiple sensors and systems. The new design is certified to international standards, preparing it for the new generation.

An important capability offering unique operational flexibility for the Heron MK II is the remote operations, enabling operators to land, taxi, turn off and restart the propulsion system, refuel (if needed) and take off without needing ground segment or flight line maintainer/operator personnel. The entire operation is commanded remotely via a secure satellite data link leveraging the system's all-in-one unit for comprehensive security.

Advanced Ground Segment

A modern mission control centre comprising six flat-screen displays supports the Heron Mk II UAS on its missions. All sensor feeds, and workstations are constantly recorded to support mission debriefing and post-mission review and analysis of every part of the mission and flight phase and supports connectivity with users' central intelligence processing centers via local networks or cloud.

The ergonomic workstations and flat screens are designed to maximise the crew's comfort inside the shelter. The integrated training system enables the training and rehearsal of operators under all weather conditions, simulating the weather conditions, platform behavior, terrain, payloads and targets without the need to risk airframes under rough flight conditions.

The Ground segment can operate remotely from a central location. Given the ability of Heron Mk II to operate in remote areas controlled over the satellite datalink, UAS can be controlled from a central location, managing multiple platforms and missions. The Mission Operation, Intelligence and Centre (MOIC) provide the tools and information for mission planning, management, and debriefing, at a theatre or national level. Supporting many UAS in multiple orbits in a centralised way enables users to allocate, train and qualify mission operators, sensor operators and analysts optimally. Mission control utilises advanced automated and autonomous processes, allowing the operators to control the platforms in four steps: taxi, takeoff, flight and landing.

The modern map based graphical touch based control reduces complex procedures into a few touches and clicks. This interface enables mission operators to plan and execute complete missions, retask or change flight plans, focus on a specific area of interest, or respond to user needs, enabling the operators to focus on the mission and leave the flight control to the machine.

IAI provides comprehensive support for customers and users of the Heron family. The company offers customers full in-house support for all maintenance levels, enabling the customer to support the system without the manufacturer's assistance.

IAI is cooperating with defence public sector company Hindustan Aeronautics Ltd pursuing a broad activity in the field of UAS. Under this cooperation, the two companies pursue localisation and expansion of current and future UAS system integration and production under the Indian government's new policies of moving to local sourcing and acquiring the platforms and weapon systems for the armed services. Expanding the cooperation with HAL enables both sides to meet the new regulation by ensuring the transfer of technology and manufacturing know-how. As for product support, IAI has expanded its cooperation with the private sector company ELCOM Systems Pvt Ltd to provide UAS Maintenance, Repair and Overhaul (MRO) for all operators of IAI's UAS in the Indian subcontinent.

Based on the successful operational record of the Heron UAS with all Indian military services, the new Heron MK II is positioned to introduce new operational capabilities, deepen Indian participation and continue the proud Heron legacy.

Article and photos: IAI

HAL at Defexpo

Dr Ajay Kumar, Defence Secretary, inaugurated the HAL Indigenisation Stall at Defexpo 2022.

HAL's participation focussed on technological excellence and indigenisation initiatives, under its business verticals such as fighters, trainers, transport aircraft, helicopters, engines, systems and avionics besides projecting the company's futuristic programmes. HAL had a dedicated 'Indigenisation Exhibition Stall' at Hall-2 for active participation and interaction of Indian industry partners. More than 200 imported items planned to be indigenised with private industries were displayed in this stall to attract Indian industry. Twenty six already indigenised items were displayed for understanding and encouragement of private industries.

Dr Ajay Kumar, Defence Secretary, MoD inaugurated the HAL's dedicated Indigenisation Stall on the first day of DefExpo. Launching of a document on indigenisation success stories of HAL, handing over of "Project Sanction Orders" of Positive Indigenisation List (PIL) items to the Indian Private Partners, handing over of approvals/clearance certificates to the industry partners for items indigenised and launch of Indigenisation - Supplier Relationship Management (ISRM) portal were planned.

HAL's Light Combat Helicopter 'Prachand' was showcased in the Outdoor Display area during the show. HAL also exhibited the scaled models of LCA, LCH, LUH, ALH, Do-228 and HTT-40 during the show. Some of the avionics/ accessories/ components/ products such as Indigenous Engine & Flight Display Unit (EFDU), Mission Computer & Interface Computer, Digital Map Generator (DMG), FBW DAU (Fly by Wire Data Acquisition Unit), E-FDR (Enhanced Flight Data Recorder), Gunner Pilot Control Unit (GPCU), Automatic Identification System (AIS), Solid State Data and Video Recording System (SSDVRS), Full Authority Digital Engine Control System (FADEC), Integrated Control Computer (ICC), ICCATS-Jaguar, APU, GTSU-127 etc. were on display at the HAL stall.

Further at the India Pavilion (HEC), HAL displayed 29 products of which 17 are scaled models and 12 were through display posters and product videos. Scaled models of HTT-40, ALH (WSI), IMRH, LUH and RUAV were showcased during the show. Other products included Main Landing and Nose Landing gears of ALH, Air Starter Turbine–AMCA, Digital TGT Amplifier (TGTA), Ring Forgings, Shape Memory Alloy Ferrule Rings, Solid State Cockpit Voice & Flight Data Recorder, HPTR BLADE-AL31FP ENGINE, Main Rotor Blade (ALH), TACAN, VOR ILS and Air to Air Heat Exchanger.

HAL releases orders worth Rs 52 crore at Defexpo 2022

Laying major thrust towards indigenisation, Hindustan Aeronautics Limited (HAL) released Project Sanction Orders to domestic Indian Partners to the tune of Rs 52 Crore, at the event.

Dr Ajay Kumar, Defence Secretary, handed over the Orders to Industry partners at a programme held at the HAL Stall, in the presence of Mr C B Ananthakrishnan, CMD, HAL. The domestic Indian partners will now manufacture the LRUs which were being imported till now. The Indian industry partners will indigenously design and develop parts like Infra-Red Radiation Suppression Systems, Engine Air Intake Particle Separator, Emergency Flotation System and Night Vision Goggles for Light Utility Helicopter and others.

HAL and LMW in MoU

HAL's LCA Tejas Division signed an MoU with Lakshmi Machine Works Limited (LMW) to manufacture 40 sets of Air Intake Assembly for LCA Tejas MK1A. The MoU was signed by Mr K Ravi, General Manager, LCA Tejas Division and Mr Chanabasappa S S, Head of Business Development, LMW.

HAL and IAI in MoU

HAL signed an MoU with Israel Aerospace Industries (IAI) Limited for leasing, operation and maintenance of fixed wing UAVs to the Indian Defence Forces. Through this MoU, HAL and IAI will collaborate on a prospective programme of Leasing of UAV systems to Indian Defence Forces. The MoU was signed by Mr Deepak Singhal, GM, AMD Nashik and Mr Moshe Levy, Executive VP, MAG Malat, IAI.

HAL and L&T in MoU

HAL's LCA Tejas Division signed an MoU with Larsen & Toubro Ltd for manufacturing 22 sets of Wing Assembly for LCA Tejas MK1A. The MoU was signed by Mr K Ravi, General Manager, LCA Tejas Division and Mr Laxmesh BH, VP & Head-Missiles & Aerospace Business of L&T.

HAL to support MRO of RD33 Mk Engine of MiG 29/KUB

Hindustan Aeronautics Limited (HAL) signed an MoU with the Indian Navy for positioning of HAL team at Naval Aircraft Yard, Goa for supporting maintenance and repair of RD 33 Mk Engine of MiG 29K/KUB aircraft and imparting specialised training at Naval Institute of Aeronautical Technology (NIAT) Kochi. The MoU was signed by Mr D Maiti, Chief Executive Officer, MiG Complex and Rear Admiral Deepak Bansal, Assistant Chief of Naval Staff (Air Material) in the presence of Mr C B Ananthakrishnan, CMD, HAL, Vice Admiral Sanjay Mahindru, Deputy Chief of Naval Staff, AVSM, NM, Indian Navy and other HAL senior officers.

Raksha Mantri presents ASDO Certificate to HAL

Raksha Mantri Mr Rajnath Singh handed over the Air System Design Organisation (ASDO) Certificate to Hindustan Aeronautics Limited during Defexpo. This in recognition of HAL's quality systems and will enable faster certification of HAL manufactured helicopters. Dr D K Sunil, Director (Engg. and R&D), HAL received the Certificate during the event.

HAL is the first DPSU to receive CEMILAC's Design Organisation Approval as per the new Design Organisation Approval Scheme (DOAS) pursuant to IMTAR-21 requirements.

Prime Minister Modi unveils HTT-40

Prime Minister Mr. Narendra Modi unveiled HTT-40, an indigenous trainer aircraft designed and developed by Hindustan Aeronautics Limited (HAL), at the India Pavilion during Defexpo in Gandhinagar, Gujarat on 19 October 2022. Raksha Mantri Mr. Rajnath Singh, Chief Minister of Gujarat Bhupendrabhai Patel were among those present on the occasion.

The HTT-40 would be used for basic flight training, aerobatics, instrument flying and close formation flights whereas its secondary roles would include navigation and night flying. It is a testament to the cutting-edge technology designed to meet primary training requirements of the Indian defence services. The HTT-40 has completed all systems tests, all PSQR performances, hot weather, sea level and cross wind trials and user assisted technical trials. It demonstrated rain water resistance. Provisional clearance for airworthiness of the aircraft is received from Centre for Military Airworthiness and Certification (CEMILAC).

HAL receives DcPP Certificate from DRDO

Hindustan Aeronautics Limited (HAL) received a Development cum Production Partner (DcPP)/ Production Agency (PA) certificate for ABHYAS - High Speed Expendable Aerial Target (HEAT) System from DRDO at a programme held on the sidelines of Defexpo. Mr C B Ananthakrishnan, CMD, HAL received the certificate from Dr Samir V Kamat, Secretary, Department of Defence R&D and Chairman, DRDO.

The Aircraft Division of HAL is the first DcPP/PA identified organisation under ADE-DRDO's new scheme for procurement of complex system. HAL had formally handed-over the first batch of two units of High-speed Expendable Aerial Target (HEAT) System ABHYAS to Aeronautical Development Establishment (ADE) recently. The successful completion of this first batch order has enabled HAL to become a Development cum Production Partner (DcPP)/ Production Agency (PA) for bulk supply of this target Aircraft and explore potential export opportunities giving significant boost to "Make in India" initiative for the defence supplies.

HAL award for Excellence in Defence and Aerospace Sector

Defence Minister Mr Rajnath Singh presented awards for Excellence in Defence and Aerospace to Hindustan Aeronautics Limited (HAL) in the Institutional and Individual/Team categories on the sidelines of Defexpo 2022. HAL received "Raksha Anveshan Ratn" award for development of Indigenous Automatic Flight Control System (AFCS) for the Light Combat Helicopter (LCH) in the Institutional category and for design and development of Radio Altimeter with high range and accuracy for Su-30MKI aircraft in the Individual/ Team category. HAL also received "Raksha Srijan Ratn" award for design and development of Auxiliary Power Unit (GTEG-60) for AN 32 aircraft in the Individual/Team category. HAL CMD, Mr C B Anathakrishnan and officials received the awards from the Defence Minister during the Bandhan programme at Defexpo.

BEL showcases capabilities at Defexpo 2022

BEL showcased state-of-the-art products and systems spanning every domain of its business.

The products and systems on display during Defexpo 2022 were clustered as 'Air Defence & Surveillance', 'C4I Systems', 'Artificial Intelligence-based Products', 'Non-Defence & Diversification Products', 'Radar Systems', 'Communication Systems', 'Airborne Products & Systems', 'Homeland Security and Cyber Security', 'Futuristic Technologies', 'Missile Systems', 'EO & Laser-based Products', 'Outdoor Display Products' and Indian pavilion. In addition, BEL also showcased its R&D capabilities by launching/demonstrating some of its new products/technologies.

BEL's display in the area of "Air Defence & Surveillance" included Hexacopter, Tethered UAV, Robotic Surveillance and D4 Anti-drone Systems. The display in the area of C4I Systems included C4I technologies, Combat Management Systems and Navigational Consoles.

BEL showcased its 'Radar Systems' including Battle Field Short Range Active Electronically Scanned Array (BFSR-AESA) Radar, Air Defence Fire Control Radar, Mountain Fire Control Radar, Weapon Locating Radar, etc. BEL's display in the area of 'Communication Systems' included High Capacity Radio Relay, Manpack High Frequency Software Defined Radio (SDR), Point to Multi Point Radio, SDR Hand Held Naval version and a whole lot of other products.

BEL signs MoU with MIL

Bharat Electronics Ltd signed an MoU with Munitions India Limited (MIL), a defence PSU, to jointly address the requirements of Indian defence and export markets in the areas of ammunition, explosives and related systems. The MoU aims at leveraging the complementary strengths and capabilities of BEL and MIL and strengthens the spirit of the Make in India initiative of Government of India, for achieving self-reliance in the defence sector.

BEL signs MoU with YIL

BEL signed an MoU with Yantra India Limited (YIL), a defence PSU for co-operation in the areas of ammunition hardware and military grade components to jointly address the requirements of Indian defence and export markets. The MoU aims at leveraging the complementary strengths and capabilities of BEL and YIL and sharing of manufacturing and test infrastructure/resources for the production of arms and ammunition and related systems.

BEL, Triton Electric Vehicle (TEV) sign MOU

BEL signed an MoU with Triton Electric Vehicle (TEV), for manufacture of Hydrogen Fuel cells by BEL with technology transfer from TEV, to meet the requirements of Indian market and mutually agreed export markets. The MoU aims at tapping the demand for clean energy solutions for various applications including for E- Mobility, by leveraging Government of India's thrust for adoption of clean energy fuels for applications in transport, energy storage etc.

DRDO displays 430 strategic and tactical weapon systems

Defence Research and Development Organisation (DRDO) displayed a wide range of 430 products encompassing the strategic and tactical weapon systems, defence equipment and technologies. It showcased the advancements in technologies made by its laboratories as well as its partnerships with the industry, in recent years while representing a high level of indigenousness in advanced and futuristic defence products and technologies that contribute towards Aatmanirbharta in defence.

DRDO showcased several initiatives to deepen its strategic partnerships with industry, and academia. These included initiatives such as Technology Development Fund, Dare to Dream, DIA- Centres of Excellence and other similar schemes to support academia, Start-ups, MSMEs and large industries to continuously upgrade technology readiness levels of present and futuristic technologies in the country. All these DRDO led initiatives have led to operational readiness of many Indian industries, especially in the areas of systems, radars, sonars, missiles, aircraft, etc. some of which were displayed at the DRDO Pavilion.

At Defexp2022, DRDO provided numerous static displays, live demonstrations, seminars as well as immersive experience zones spread across three locations including the Mahatma Mandir Convention & Exhibition Centre, Helipad Exhibition Centre, and Sabarmati River Front.

The venue for DRDO Pavilion was Hall No. 10 of Helipad Exhibition Centre. It was segmented in 17 display zones of various classes including Immersive Zones and Experience Zones to showcase 376 products. These 17 zones were namely Engines & Propulsion, Aerospace & Aeronautics (UAVs, fighter aircraft, aircraft for surveillance etc.), Sensors, Devices & Advanced Electronics, Naval Weapons & Systems (EW systems and Sensors), Armoured Vehicles & Land Systems, Armament, Guns & Ammunition, Materials, Missiles (Cruise, MBRLs, AAM, ATGM & MRSAM), BrahMos, Industry Partners in R&D (17 Partners-3 Start-ups &14 MSMEs), Soldier Support and Dual Use Technologies (Soldier support, LS products, Fire protection, Firefighting, Fuel & Energy, Food products etc.), Experience Zone (Simulator, Virtual Reality and Audio-Visual), Software AI & Cyber, Academic Zone, Academic Outreach, Industry Outreach and Public Interface.

This year, several technologies developed for land based, naval and air-based systems were showcased through experience zones – a closed room immersive cinematic experience. In a first, Advanced Combat Aircraft (AMCA) simulator was also made available to experience, among other augmented and virtual reality naval, land and air product simulators. A holographic deck providing a 3D experience of over 30 defence products was presented at the hall to gain insights into the intricacies of weapon designs.

Over a sprawling 1200 sq mtr outdoor display, 18 Outdoor static exhibits (actual products) were put on display at the Helipad Exhibition Centre. These included Border Surveillance System (BOSS), Laser Fence System (LFS), IRDE Tableau, BrahMos Air Version Missile, Mobile Autonomous Launcher (MAL) for BrahMos, CBRN Water Purification System, Infantry Combat Vehicle with Composite Hull

(CICV), Advanced Composites Modular Bridge System (ACMBS), 155mmX52 Cal Advanced Towed Artillery Gun System (ATAGS), CBRN Water Purification System, CBRN Recce Vehicles, 70 T Tank Transporter, Wheeled Armoured Platform (WhAP), Prahar Missile, Rudram III Missile, Quick reaction Surface to Air Missile (QRSAM), Medium Range Surface to Air Missile (MRSAM), Mounted Gun System (MSG) and Unmanned Ground Mobile Platform (UGMP).

DRDO presented live demos as well as static displays of equipment at the Sabarmati River Front. 5 Live demo of DRDO equipment were put on display namely – Portable Diver Detection Sonar (PDDS) with Electro Optic System (EOS), Imaging Sonar 'CHITR', Autonomous Survey Vehicle – Inland, Autonomous Survey Vehicle -Coastal (ASV- Coastal) and Weapon Mounted Surface Vehicle. Whereas 6 static displays of DRDO equipment presented were AIR Independent Propulsion System, Virtual Reality based counter measure deployment simulator, TAL Torpedo, Portable Diver Detection Sonar, Wet End Unit, Counter Drone System for IN – D4 Radar, Soft Kill System and Hard Kill System, and Passive IRSS Device.

And finally, the India Pavilion in the Helipad Exhibition Centre displayed a combined strength of DRDO along with public and private sectors. DRDO put its 22 products on static display. These high-value products were displayed in the form of actual products and will include – VIBHAV- Anti Tank Point Attack Munition, VISHAL- Anti Tank Bar Mine, PRACHAND- Anti Tank, 9 x 19 mm Machine Pistol- ASMI, Mine Field marking Equipment Mk II, Light Tank, Daksh Defuser, MBT Arjun Mk-1A, Light Machine Gun, Pralay, QRSAM, Carbine-5.56x 45 mm, AIP System- Air Independent Propulsion, TAPAS, ASTRA Mk-I, LCA Mk2 amongst others.

Over the span of the exhibition, the participants and attendees witnessned a string of major events, seminars, and discussions. Among these one such event was Bandhan designed to handover licenses of DRDO developed technologies to the industries. Defexpo2022 saw 15 LAToTs and 10 technologies to 12 industries in its Bandhan event.

Bharat Forge taking big strides

Bharat Forge in MoU with General Atomics, USA

Bharat Forge Ltd. has signed a Memorandum of Understanding (MOU) with General Atomics, US, a global leader in the research, design, and manufacture of a diverse portfolio of electromagnetic and advanced power and energy technologies. Under the terms of the MOU, Bharat Forge and General Atomics' Electromagnetic Systems Group (GA-EMS) will collaborate for Lithium-Ion Battery System for naval platforms/submarines to address the requirements of Indian Navy. The parties have also agreed to partner with each other in the area of permanent magnet motors.

Mr. Baba Kalyani (CMD, BFL) with Mr. Rajnath Singh

Speaking on the occasion, Mr. Baba Kalyani, Chairman Kalyani Group stated, "We have been relentlessly working towards bringing niche technologies in the country with the aim of making Indian self-reliant in defence verticals. GA is a market leader for in-service Li-Ion Battery solutions for naval platforms/submarines and our partnership with General Atomics is a firm step in the direction to develop Make in India solutions for Indian Navy and setting up a strong defence technology and manufacturing vertical within India."

Kalyani Group's Mounting Artillery Gun System 8X8 HMV unveiled

Kalyani Group's MGS 8X8 HMV was unveiled at Defexpo by Dr. Samir V Kamat, Secretary R&D and Chairman Defence Research and Development Organization (DRDO). The MGS 8x8 is a 155mm/52cal Mounted Artillery Gun System, the only artillery gun in the

Mr. Baba Kalyani (CMD, Bharat Forge) with Dr. Samir V Kamat

world with the capability of firing from Zone 1 to Zone 7. With a diverse operating temperature range and capability to fire in extreme diverse weather conditions of - 4 to 45 degrees. The gun comes equipped with quick shoot and scoot capability with a high degree of accuracy and consistency. The 8x8 has a high chamber volume of 25 litres, with future provision of up gunning.

Kalyani M4 vehicles for UN Peacekeeping Missions

Bharat Forge Limited has dispatched 16 Made-In-India Kalyani M4 vehicles to the Indian Army for United Nations Peacekeeping deployment. The Kalyani M4 is a state-of-the-art Armoured Personnel Carrier that provides 'unprecedented levels of protection' to the occupants against high Kinetic Energy threats including severe mine blasts and grenades. The Kalyani M4 is a Quick Reaction Fighting Vehicle (Heavy) indigenously manufactured by Bharat Forge Ltd and is capable of carrying an infantry platoon in full combat gear. The Kalyani M4 successfully completed a series of extreme vehicle trials in some of the toughest environments in India. The trial were conducted in the freezing terrains of Leh and Ladakh, and the unforgiving deserts of Rann of Kutch.

Speaking on the occasion, Mr. Baba N. Kalyani, Chairman, and Managing Director, Bharat Forge Ltd stated, "We are proud to be delivering the Made in India Kalyani M4 for UN Peacekeeping missions. This encourages us to work for the benefit of our armed forces and it reinforces our commitment to harness our Prime Minister's vision for Atmanirbharat and self-reliance in the defence sector."

Mr. Amit Kalyani, Deputy Managing Director, Bharat Forge Ltd added, "Keeping crew safety and vehicle performance as paramount factors, Kalyani M4 has been ergonomically and aesthetically designed to allow the crew to perform their duties in an optimum manner."

The Kalyani M4 can enhance the required combat power in minimum time in all types of terrain with the help of a combat radius of approximately 800 kms. It is equipped with modern military-grade power terrain will all-time situational awareness. "The Kalyani M4 today is the best mobility platform available in the world and variants such as the ambulance and command post vehicles have been delivered to the Indian Army in the past" stated company officals. Recently, Army's northern command inducted the Kalyani M4 to its fleet of armoured vehicles under an emergency procurement amid the China-India border standoff. The vehicle can withstand three 10 kg TNT charges under the wheels and one 50 kg IED blast at one side.

BEML at Defexpo

BEML Limited participated in a big way by showcasing its products at an indoor and outdoor pavilion with the theme "Path to Pride".

BEML exhibited its Sarvatra Bridge System, an armoured crew protected vehicle like Medium Bullet Proof Vehicle (MBPV Mk-II), Track Width Mine Plough (TWMP-T90) and Bulldozer with Hydrostatic Transmission drive technology (BD-50HST) in its outdoor stall. BEML also exhibited its range of products like High Mobility Vehicle (HMV) Engine, HMV Transmission, BMP tank Transmission, T-72 tank Transmission,

Unmanned Aerial Vehicle (UAV), GSLV mockup Structure, QRSAM Motor Casing etc in its indoor hall.

Apart from this, BEML is manufacturing Armoured Recovery & Repair Vehicle on Arjun platform in association with CVRDE, Mechanical Minefield Marking Equipment - Mk -II, built on BEML 6x6 an Atmanirbhar product in association with R&DE Engineers, Truck Mounted Excavators, High capacity engines for DRDO, Autonomous Ground Vehicles (Tracked &Wheeled), Mounted Gun Systems in association with AWEIL and armoured cabin for BEML HMV vehicle with DRDO etc.

BEML's main focus at Defexpo was to display its capability, promote defence products, export opportunities for the defence equipment in foreign countries, interact with probable customers to understand their requirements for supply of customised specific products under Aatmanirbhar Bharat Abhiyan mission and to explore collaborations with foreign companies. Also, BEML signed MoUs with major international and domestic players in the defence space during event.

BEML exploring market opportunities to expand international foot-print

The India-Africa Defence Dialogue (IADD) was held on the sidelines of Defexpo 2022 in Gandhinagar, Gujarat with a theme 'India-Africa: Adopting Strategy for Synergising and Strengthening Defence and Security Cooperation', a host of foreign delegations held detailed discussions with BEML's top Management to explore possibilities for partnership and exports. Among them was a delegation from Togo which was headed by Col.Kassawa Kolemagah, Chief of Army Staff, a team from Argentina led by Brigadier Major Hugo Eduardo Schuab, Dy Chief of General Staff of Airforce and a delegation from Bahrain headed by Rear Admiral Salah Mohamed Hijres, Dy. Commander Naval force met with BEML.

Delegation from South Sudan consisting of H. E Chol Thon Balok, Deputy Minister of Defence & Veterans' Affairs, and other members along with Mr. Ajit Kumar Srivastav, Director (Defence), BEML Limited.

BEML is exploring the international market opportunities for its products such as armoured personnel carrier, wheeled armoured vehicle, armoured recovery vehicle, variants of high mobility vehicle, Sarvatra Bridging System, Heavy Recovery Vehicle, Prime Mover with Trailer 20 and 50 tons, Aircraft Towing Tractor, Medium Bullet Proof Vehicle among other products.

UK spearheads new defence industry JWG to strengthen defence collaboration

Defence industry organisations from India and the UK have come together to create a new Defence Industry Joint Working Group (JWG) for more effective cooperation. The initiative is supported by the UK Government. The inaugural meeting of the UK-India Defence Industry Joint Working Group was held on the sidelines of Defexpo 2022 in Gandhinagar, Gujarat. Defexpo saw representation from 20 UK defence companies and the UK industry is already integrating Indian defence suppliers into their global supply chain, manufacturing defence equipment not just for India but for the world.

The Joint Working Group is part of an ongoing initiative between the two countries to strengthen the defence and security partnership through industrial collaboration. The UK recently issued its first Open General Export License (OGEL) in the Indo-Pacific region to India, shortening delivery times for defence procurement.

The Royal Air Force (RAF) recently conducted a subject matter expertise exchange with Defence Research and Development Organisation (DRDO) during the visit of Eurofighter Typhoon, Voyager and A400 in New Delhi and also held joint-flying exercises with the Indian Air Force (IAF).

Alex Ellis, British High Commissioner to India, stated, "A stronger UK-India defence relationship is an essential element of the British and Indian governments' Comprehensive Strategic Partnership. The British Government and industry presence at Defexpo is further proof of this, as is our support for co-creation of next generation capabilities that will be fully owned by India. The UK supports Prime Minister Modi's ambitions of Make in India, Make for the World."

Mark Goldsack, Director, UK Defence and Security Exports, stated, "This is another step in the growing defence relations between the two countries, who are working to establish a portfolio of collaborative projects to support the development of new technologies and capabilities as agreed under the 2030 Roadmap. The UK sees it is in its own interest that India becomes self-reliant in its defence needs. The UK is a world leader in critical defence technologies such as jet engine developments and electric propulsion technology. We are keen to share this expertise with India supported by our respective industries."

Major General David Eastman, Assistance Chief of Defence Staff, Capibility & Force Design, United Kingdom seen here in discussion with the Vayu Team; discussed issues related to Bilateral Defence Cooperation. "The UK has offered advanced core technologies to India, capable of creating an indigenous, ITAR-free jet engine owned, manufactured and exported by India. The UK India 2030 Roadmap commits to partnership on India's indigenous combat air programmes, including LCA Mk-II and AMCA".

Rolls-Royce showcases solutions at DefExpo 2022

Rolls-Royce presented its mtu solutions for naval and land defence at Defexpo. In focus was the company's state-of-the-art mtu propulsion and automation solutions for naval vessels, including Series 8000 engines for large surface vessels, Series 4000 engines for submarines and the new comprehensive mtu NautIQ ship automation portfolio, consisting of reliable, efficient and future-proof control and management solutions, from bridge to propeller. A new addition to the portfolio was the Equipment Health Management System mtu NautIQ Foresight, which monitors and analyses the technical condition of the complete vessel and enables predictive maintenance to help customers achieve maximum vessel availability and minimum fuel consumption. Also on show was the Integrated Platform Management System (IPMS) mtu NautIQ Master, a fully integrated turnkey automation solution for complex projects.

Rolls-Royce's Power Systems business unit has a strong presence in India with its Pune-based MTU India business that supports sales and servicing of mtu engines.

Its engines power many vessels of the Indian Navy and the Indian Coast Guard, with service teams present at several locations along the Indian coastline. An mtu engine with a power output of around 1000 kW powers India's first indigenously designed and built Arjun Main Battle Tank. Rolls-Royce Power Systems offers solutions for a wide range of different applications, including governmental, power generation, Commercial and Industrial (C&I), mining, rail with a growing focus on sustainable solutions.

The company's Engineering and Research Centre (EARC) in Pune supports global programmes for design, development and data analytics, and is today the second largest R&D site for the Power Systems business after Friedrichshafen, Germany. A team of engineers in Mumbai are also contributing to further developments for mtu naval automation technologies.

Rolls-Royce and combat engine co-development

Rolls-Royce has reiterated its commitment to support India's vision of self-reliance in defence, through collaboration opportunities to co-design, co-develop and co-produce fighter jet engines in the country. The company familiarised customers and potential partners with its offerings for naval defence, including full-electric propulsion solutions and the power-dense MT30 marine gas turbine for aircraft carriers, frigates and destroyers at the recently concluded Defexpo.

Mr. Kishore Jayaraman, President, India & South Asia, Rolls-Royce, stated, "As India takes steps to realise its vision of 'self-reliance' in defence, we believe we are well positioned to help leapfrog this journey through meaningful partnerships for co-creation of engine technologies. True self-reliance will come when such a partnership not only results in Intellectual Property (IP) ownership in India, but shared creation of capabilities in-country to indigenise defence technology in the future."

Alex Zino, Director, Business Development & Future Programmes, Rolls-Royce, stated, "The UK is a natural ally for India, and it is heartening that the two countries have pledged greater cooperation in defence. India can leverage the combined strength of its own scientific talent and resources along with the UK's technology experience to accelerate its combat engine development program. We, at Rolls-Royce, are committed to support such a partnership. Our rich history of engine technology development for both civil and defence engines, particularly in the gas turbine-based aero-engine segment, makes us a partner of choice to collaborate and co-develop defence technology in India."

With more than 16,000 military engines in service with 160 customers in 103 countries, the company is a powerful player in the defence aerospace engine market. In India, it has a robust ecosystem of Indian partners, engineering talent, supply chain, digital, service delivery and manufacturing capabilities, making it a "natural partner of choice for engine development".

BAE Systems at Defexpo

With its strategy of 'co-creating for a self-reliant India', BAE Systems showcased existing relationships with Indian industry; the company demonstrated how its defence capabilities and technology solutions were best suited to strengthen India's national security by advancing the growth of the country's indigenous defence manufacturing ecosystem.

Ravi Nirgudkar, BAE Systems' Managing Director India, Bangladesh, Sri Lanka stated, "BAE Systems looks forward to participating at DefExpo as India is an important and key strategic market for us. Our presence at the show focuses on reflecting our commitment to India's 'Make in India' initiative and to demonstrate our industry-leading, advance defence capabilities – across land, air and sea. As a founding partner of defence manufacturing in India, we also look forward to meeting key stakeholders and industry partners to discuss ways to support India in its modernisation journey, alongside bolstering its indigenous defence production capabilities."

BAE Systems' continuous support to India's 'Make in India' initiative and its growing partnership with the local defence industries was demonstrated through the digital representation of the M777 Ultra Lightweight Howitzer (ULH), which is providing Indian Army with tactical and strategic mobility alongside reliable fire support in the most hostile environments. 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 125 guns to the Indian Army.

Another important digitally represented defence capability was the APKWS laser-guided rocket, the most cost-effective laser-guided munition in its class that transforms an unguided 2.75-inch (70 millimeter) rocket into a precision-guided rocket, giving rotary- and fixed-wing military aircraft a low-cost surgical strike capability.

Additionally, BAE Systems' maritime capabilities at DefExpo was showcased through Bofors 40 Mk4 Naval Gun and Bofors 57Mk3 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". 3P Ammunition and BONUS munition was also on display.

BAE Systems signs agreement with PTC Industries

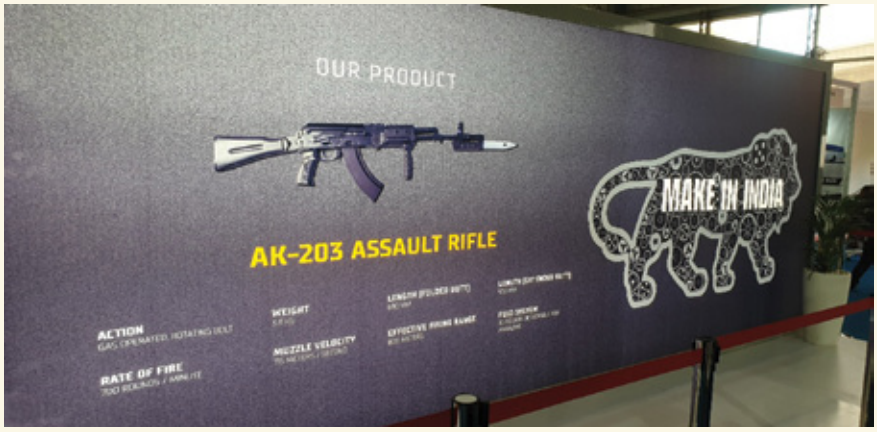
BAE Systems & PTC Industries signed an agreement to manufacture titanium castings for the Indian 155mm M777 Ultra-Lightweight Howitzer (ULH) at PTC Industries' production facility in Lucknow, Uttar Pradesh, India. The agreement aims to produce the complex lightweight titanium castings, developing the tightly controlled fabrication process and ensuring the same parts can be manufactured in any future production of the M777 howitzers for India. The first sub-systems will be produced by the end of 2022, and there is a plan to progress manufacture of all three of the major structures (Saddle, Cradle, and Lower Carriage) that form the basis of the gun. Indian suppliers which participate in the M777 programme can earn a role in the overall BAE Systems global supply chain through their performance.

BAE Systems also has a 52-Calibre 155mm barrel for the ULH, which it is willing to manufacture in India, further expanding Indian artillery capability from this battle-proven system. This would make India the first customer to have a 155mm 52-calibre platform under 5,800kgs in weight.

Rosoboronexport discusses production/ sale of AK-203 assault rifles

Rosoboronexport participated at Defexpo 2022 as a co-founder of Indo-Russian Rifles Private Limited, a Russian-Indian joint venture established to produce Kalashnikov assault rifles in India.

"Rosoboronexport has the world's largest portfolio of completed, on-going and future defence production projects in India. The joint venture Indo-Russian Rifles Private Limited, in which Rosoboronexport and the Kalashnikov Concern are participating from the Russian side, is fully in line with the Government's Make in India initiative and Defence Acquisition Procedure (DAP) 2020 rules," stated Rosoboronexport Director General Alexander Mikheev. "The Korwa Ordnance Factory is ready to start manufacturing Kalashnikov AK-203 assault rifles by the end of 2022. Our plans include 100% localisation of the production of legendary Russian assault rifles in India. In addition, in the future, the joint venture may increase production and modernise production facilities to manufacture advanced rifles based on the Kalashnikov assault rifle platform."



"Kalashnikov AK-200 series assault rifles have successfully passed the test programme, are supplied to government customers in Russia, and are also exported to partners who impose higher requirements on small arms. These assault rifles have retained all the advantages of the traditional AK pattern: reliability, durability and ease of maintenance. Kalashnikov AK-200-series assault rifles are in line with all current trends in small arms technology. They are fitted with integral Picatinny rails for convenient and easy mounting of sights and tactical accessories, enabling the effective use of weapons in various conditions. The rifles have a folding stock. In addition, a number of other ergonomic solutions have been incorporated into them to optimise operation. In particular, they feature a redesigned fire selector and a modified receiver cover. This gives the users the opportunity to fully realise their shooting skills, regardless of their anthropometric data and the availability of a variety of personal gear, outfit and uniforms" said representatives at Defexpo.

Boeing demonstrates MUM-T with MQ-25

Boeing has digitally demonstrated a new open autonomy architecture for MQ-25 that will allow the US Navy to increase mission effectiveness by integrating manned-unmanned teaming (MUM-T) capability at speed and scale. Boeing's MUM-T demonstration included Northrop Grumman's E-2D Advanced Hawkeye command and control aircraft, Boeing's P-8A Poseidon maritime patrol and reconnaissance aircraft and Boeing's F/A-18 Block III Super Hornet fighter jet.

Boeing's 1st upgraded AH-64E to RNLAF

Boeing has delivered the first AH-64E Version 6 or v6, Apache helicopter featuring improved performance, sensors and software to the Royal Netherlands Air Force (RNLAF). As part of a Foreign Military Sale through the US Department of Defence, Boeing received a contract in 2019 to remanufacture 28 RNLAF AH-64 D-model Apaches to the advanced AH-64E v6. Delivery for the final E-model Apache to the country is targeted for 2025.

IAI to supply DroneGuard ComJam systems

Israel Aerospace Industries (IAI) has been awarded a contract to supply DroneGuard ComJam systems for the long-range detection and disruption of Unmanned Aerial Systems (UAS) to an Asian country. The contract comprises several dozens of mobile systems.

IAI delivers F-16 aerostructures and 200th F-35 wing

During a ceremony held at Israel Aerospace Industries' (IAI) wing assembly line, IAI delivered Lockheed Martin with the first sets of F-16 aerostructures manufactured at IAI's recently reopened assembly line, including the F-16 Conformal Fuel Tanks. In addition, the 200th F-35 fighter aircraft wing set, produced by IAI, was also delivered. IAI is scheduled to produce a total of 811 pairs of F-35A wings, with a potential value of over $2 billion by 2034, following a contract signed in 2011.

NGC Litening pod on USN Super Hornets

Northrop Grumman Corporation's Litening advanced targeting pod has successfully completed its first test flights on the US Navy's F/A-18 Super Hornet. The Navy selected Litening to replace the legacy targeting pods on the F/A-18 fleet in early 2022.

BAE Systems EW for F-15E/F-15EX

BAE Systems has received a contract from Boeing to produce additional Eagle Passive Active Warning Survivability Systems (EPAWSS) for US F-15E and F-15EX Eagle aircraft – providing state-of-the-art situational awareness and self-defence capabilities. This contract brings the total contract value for EPAWSS production to $351 million. The Low Rate Initial Production (LRIP) lot 2 contracts will initiate the production of additional EPAWSS systems and spares and the delivery of units for test and development.

BAE Systems enhanced GPS tech for F-15s

BAE Systems has received a $13 million contract for advanced Global Positioning System (GPS) technology to protect US F-15E aircraft from GPS signal jamming and spoofing. The company's Digital GPS Anti-jam Receiver (DIGAR) will ensure the reliability of military GPS systems for aircraft operating in challenging signal environments.

LM's highest powered laser to date for US DoD

Lockheed Martin delivered to the Office of the Under Secretary of Defence for Research & Engineering OUSD (R&E) a new benchmark: a tactically-relevant electric 300 kW-class laser, the most powerful laser that Lockheed Martin has produced to date. This 300 kW-class laser is ready to integrate with the DOD demonstration efforts including the US Army's Indirect Fires Protection Capability-High Energy Laser (IFPC-HEL) Demonstrator laser weapon system.

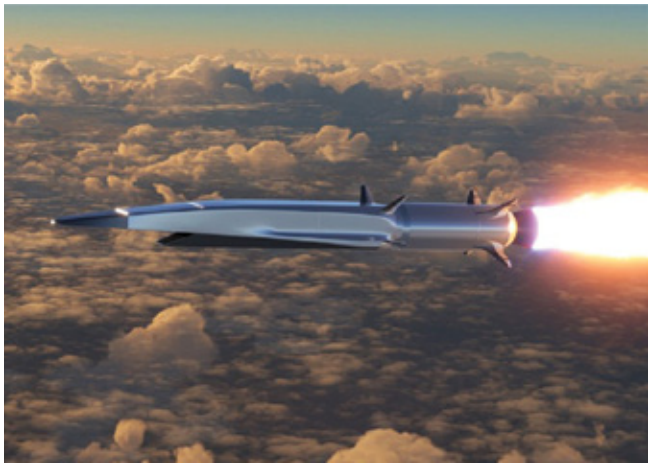
Lockheed Martin for 12 MH-60R Seahawks for RAN

The US Navy has awarded Lockheed Martin a firm-fixed price contract to produce an additional 12 Sikorsky MH-60R Seahawk helicopters for the Royal Australian Navy (RAN). Procured via the US Government's Foreign Military Sales agreement, the new aircraft will add a third 'Romeo' squadron of capability to the RAN's Fleet Air Arm. As part of the Australian Government's Project SEA 9100 Phase 1 (Improved Embarked Logistics Support Helicopter Capability), the 12 new MH-60R aircraft will create a common fleet of maritime helicopters supporting all of the RAN's air capable platforms.

French Navy in delivery of H160 for SAR

The French Navy has taken delivery of the first of six H160s that will perform search and rescue (SAR) missions. In 2020 the French Armament General Directorate (DGA) signed a contract with Airbus Helicopters, Babcock and Safran for the delivery of four H160s in a search and rescue (SAR) configuration. In 2021, the DGA confirmed an option for two more H160s.

USAF selects Raytheon and NG for HACM



Raytheon Missiles & Defense in partnership with Northrop Grumman has been selected to develop the Hypersonic Attack Cruise Missile for the US Air Force. HACM is an air-launched, scramjet-powered hypersonic weapon designed to hold high-value targets at risk in contested environments from standoff distances. The Air Force plans to deliver a HACM capability with operational utility by fiscal year 2027.

Gulfstream delivers 500th aircraft in G650 family

Gulfstream Aerospace Corp announced that the 500th Gulfstream G650 and G650ER customer delivery was made at Gulfstream's Appleton, Wisconsin, completions facility. Combined, the G650 and G650ER have amassed more than 120 city-pair world speed records, including both polar and westbound around-the-world records.

Rolls-Royce delivers 1,000th BR725 to Gulfstream

Rolls-Royce has delivered the 1,000th BR725 engine to its customer Gulfstream Aerospace Corp. The BR725 engine exclusively powers Gulfstream's ultra-long-range Gulfstream G650 and Gulfstream G650ER business aircraft. Since its entry into service in 2012 the G650 aircraft family has established a "reputation for excellent reliability, efficiency and speed, all combined with an outstanding environmental performance".

Vertical Aerospace to lift off with a new aircraft

Vertical Aerospace, a global aerospace and technology company that is pioneering zero-emissions aviation, saw its VX4 eVTOL (electric vertical take-off and landing) aircraft take off from the ground for the very first time recently. It becomes the first British company to start flight tests with a new aircraft in over 20 years, with its full-scale, piloted prototype.

Embraer delivers 1700th E-Jet

Embraer has reached a new milestone on the E-Jet programme, the delivery of the 1700th production aircraft. The Aircastle leased E195-E2 was handed over to KLM Cityhopper at a ceremony at Embraer's facility in São José dos Campos. E-Jets have enjoyed global success in the fleets of 150 airlines and leasing companies from more than 50 countries since the first aircraft entered revenue service in 2004. The E195-E2 is part of a family of new generation E-Jets that offer the "quietest, lowest polluting, and most fuel-efficient aircraft in the under 150 seat market".

Airbus delivers its 500th A350

225 million passengers, more than 900 routes and over 400 orders in the backlog. At the end of September 2022, Airbus celebrates its 500th A350 delivery with an aircraft for Iberia. With this milestone, the A350 Family is "continuing to spread its wings to all corners of the world".

Nexter and Thales unveil RAPIDFire turret

"Designed to protect platforms from low-level air threats, including drones, RAPIDFire is one of the only air defence systems that can autonomously and automatically acquire, identify and destroy a threat using target designation data provided by a combat management system. With a ready rack of 140 rounds of ammunition, corresponding to about 30 interceptions, the system offers effective firepower against drones and swarms of drones, avoiding attrition of surface-to-air missiles in the event of a saturation attack" say the manufacturers.

Safran launches VIGY 4 optronic system

Drawing on feedback from users of its many products in remote theaters of operations, Safran Electronics & Defense is launching VIGY 4, a new optronic sight for surface ships, to meet the needs and expectations of naval customers. This sight is the latest addition to the company's family of naval optronic systems, which also includes the VIGY HD and PASEO XLR. VIGY 4 features advanced observation and fire control capabilities to meet the requirements of medium-displacement ships such as offshore patrol vessels and corvettes, while VIGY HD is more suited to vessels such as coastal patrol boats and PASEO XLR to first-class vessels rang.

Alaska Airlines for 52 Boeing 737 MAXs

Boeing and Alaska Airlines have announced that the carrier is expanding its 737 MAX fleet with an order for 52 airplanes, exercising options for an additional 42 737-10 and 10 737-9 jets.

IAG orders more A320neo's

International Airlines Group (IAG) has confirmed an order for 37 additional A320neo aircraft, following shareholder approval. The latest order follows earlier agreements for 22 A320neo Family (17 A320neos, 5 A321neos) announced in March and June 2022, taking the total for the year to 59 single aisle aircraft.

IAG approves Boeing 737 order

International Airlines Group (IAG) has announced that its shareholders approved an agreement with Boeing to order a total of 50 737-8-200s and 737-10s, plus 100 options.

Thales CLRV for Luxembourg Army

The Luxembourg Directorate of Defence has announced the procurement of 80 armed command, liaison and reconnaissance vehicles (CLRV) to provide the Luxembourg Army with a modern, secure and interoperable solution that will enable the country's armed forces to continue to perform their missions effectively. To counter new threats and demonstrate unity with their NATO allies, the Luxembourg armed forces are in the process of modernising their capabilities in order to increase operational capacities under all circumstances and conduct all types of military reconnaissance missions.

Sikorsky and DARPA's autonomous Black Hawk

Sikorsky and the Defence Advanced Research Projects Agency (DARPA) have successfully demonstrated to the US Army for the first time how an uninhabited Black Hawk helicopter flying autonomously can safely and reliably perform internal and external cargo resupply missions, and a rescue operation.

Australia for 24 C-130J-30s

Australia has requested to buy twenty-four C-130J-30 aircraft with four each Rolls Royce AE-2100D turboprop engines installed; twenty-four Rolls Royce AE-2100D turboprop engines with Quick Engine Change Assembly (QECA) and propellers installed (spares); sixty Embedded Global Positioning System/ Inertial Navigation System (GPS/INS) (EGI) security devices, airborne (48 installed, 12 spares); thirty-two AN/ALQ-251 Radio Frequency Countermeasure (RFCM) systems, etc.

Finland for 150 GMLRS

Finland has requested to buy one hundred fifty M30A1 Guided Multiple Launch Rocket System (GMLRS) Alternative Warhead (AW) (Steel Case), or M30A2 Guided Multiple Launch Rocket System (GMLRS) Alternative Warhead (AW) Missile Pods with Insensitive Munitions Propulsion System (IMPS), or a combination of both; and two hundred fifty M31A1 GMLRS Unitary (GMLRS-U) Warhead (Steel Case), etc.

Bell completes USMC AH-1Z POR

In a ceremony at the Amarillo Assembly Center, Bell Textron celebrated the delivery of the 189th AH-1Z Viper to the US Marine Corps, completing the Programme of Record (POR) for the latest version of the storied H-1 platform. Bell completed the UH-1Y POR of 160 aircraft in 2018 bringing the combined H-1 POR to 349 aircraft.

P&W GTF A321neo's for Shenzhen Airlines

Pratt & Whitney announced that Shenzhen Airlines has selected Pratt & Whitney GTF engines to power its inaugural fleet of six Airbus A321neo's. Shenzhen Airlines has also selected an EngineWise Comprehensive service agreement for long-term engine maintenance.

Belgium for 120 AMRAAM for F-16/F-35

Belgium is to buy one hundred twenty AIM-120C-8 Advanced Medium Range Air-to-Air Missiles (AMRAAM); and ten AMRAAM C-8 Guidance Sections. Also included are spare AIM-120 control sections and containers; AIM-120C Captive Air Training Missiles (CATM), etc.

1st Bell 407GXi in Israel

Bell Textron announced the delivery of the first Bell 407GXi for an Israeli customer. This delivery marks the 31st country to become the home of a Bell 407GXi.

Updates from the World of Airbus

Cargo Copter at robotic military exercise

A sub-scale demonstrator of a future Airbus multi-mission unmanned aerial vehicle demonstrated its capabilities during a large robotic exercise organised by the Portuguese Navy and NATO, which brought together military forces, universities and selected industry partners. By taking part in this exercise, the "cargo copter" operated in a dense robotic environment, validating the concept's usefulness, particularly its modular design for easy, flexible and rapid swap-out of payloads and batteries.

The demonstrator was developed by Airbus' UAS New Programmes group in collaboration with the company's X-Works rapid prototyping team. A system-of-systems approach was applied with the goal of meeting military mission requirements that range from cargo transportation and ISR duties (Intelligence, Surveillance, and Reconnaissance) to serving as a communications relay and a combat force multiplier.

Airbus, Diehl Defence and HENSOLDT IRIS-T SLM for Ukraine

Together with its partners HENSOLDT and Airbus, the general contractor Diehl Defence delivered a combat unit of the ground-based air defence system IRIS-T SLM to Ukraine. After the signing of the contract for this combat unit in June 2022, this rapid fulfillment of the delivery obligation is an exceptional industrial performance of the partners. Diehl Defence is the general contractor and system integrator for IRIS-T SLM and also delivers the launcher as well as the missiles. HENSOLDT contributes the multifunctional radar TRML-4D. The Integrated Battle Management Software Fire Control (IBMS-FS) for the tactical operation centre is from Airbus.

C295 1st demo flight with SAF

Airbus C295 is next in the race towards a more sustainable military aviation among Airbus Military Air Systems, following the first demo flight with SAF performed by Airbus A400M last summer. With a load of 29% blended SAF in its two engines, the C295 performed a successful first flight in Seville which helped to pave the way towards the final goal: to achieve 100% SAF capability for Airbus military aircraft and the decarbonisation of military aviation.

AerCap for 30 A321 P2F conversions

AerCap Holdings announced it has placed firm orders for 15 Airbus A321-200 Passenger to Freighter (P2F) aircraft conversions and an option for a further 15 A321P2F conversions with Elbe Flugzeugwerke GmbH 'EFW'. The aircraft are from AerCap's A321 passenger portfolio and are expected to begin delivery in 2023 through 2025.

THC HCare In-Service contract for 20 H145

The Helicopter Company (THC), established by the Public Investment Fund (PIF) as the first helicopter services provider licensed to operate commercial flights in the Kingdom of Saudi Arabia, has signed an HCare In-Service contract to cover their fleet

of 20 five-bladed H145 helicopters. The fleet of H145s was ordered in December 2021 and will be deployed across the Kingdom of Saudi Arabia for Helicopter Emergency Medical Services (HEMS); five have been delivered and the remaining 15 are expected to be completed by the end of 2024.

DRF Luftrettung orders 2 Airbus H145s

German Helicopter Emergency Medical Services operator DRF Luftrettung has ordered two additional H145 helicopters and signed a contract covering the whole fleet with a tailored HDataPower pack from Airbus Helicopters' Connected Services suite of data services. The two H145s are in addition to the current fleet of 15 H145s and three H135s already ordered in 2020. All 20 helicopters will be delivered to the customer by the end of 2024; 11 of them have already been delivered to the customer.

SAF Aerogroup Hcare for 5 Super Puma's

SAF Aerogroup has signed via its subsidiary Aero Support Force an HCare In-Service support contract to cover their fleet of four H215 family helicopters and one H225 helicopter, operated by their subsidiaries Starlite Aviation and SAF International. The HCare In-Service package has been tailored to SAF Aerogroup's specific operational needs, providing them with parts availability by-the-hour services to optimise the fleet's maintenance and performance. SAF Aerogroup, again via its entity Aero Support Force, has also signed a second contract.

NAMMO updates

Nammo to develop 120mm ammunition for K2 MBT

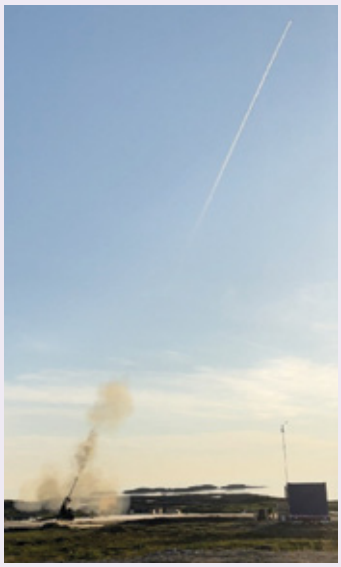
Nammo has secured an agreement to develop new and modern 120mm ammunition for Hyundai Rotem Companies' K2 main battle tank. The first test shots have already been fired. "This is a major milestone for Nammo. The agreement with Hyundai Rotem Company (HRC) enables us to integrate and further develop our modern ammunition portfolio for the K2 main battle tank (MBT). This means more powerful ammunition for NATO countries using the K2, including Norway", stated Audun Dotseth, Vice President Large Caliber Systems at Nammo.

The agreement between the two companies has an initial value of $5 million for the R&D part, and likely more than $100 million if Nammo ends up producing and delivering 120mm ammunition to K2 users. Poland recently signed a contract to procure close to two hundred K2 tanks, in a deal where HRC will deliver a total of 1000 K2 MBTs with successive contracts. Norway is currently in the final stage of choosing a new MBT for its Army – the K2 is one of two candidates.

Initially, Nammo will start the work on integrating its current 120mm ammunition to ensure a high safety standard as well as perfect compatibility with the K2 MBT. In the mid- to long term, Nammo together with HRC also expects to finalise the development of a programmable fuze. This will enable the K2 MBT to use rounds with different scenario dependent modes, with airburst as one such option.

The first successful test shots with the new airburst ammunition were fired at Rena firing range during winter test and trials in Norway. To facilitate further development and testing procedures, an identical gun with the one used by the K2 MBT, delivered by Hyundai Wia, will be permanently set up by HRC at Nammo's Raufoss test centre.

Boeing, Nammo complete long-range ramjet artillery test



Boeing and Nammo have successfully test-fired a ramjet-powered artillery projectile, further demonstrating the viability of one of the US Army's modernisation priorities – long-range precision fires. During the test at the Andøya Test Center in Norway, a Boeing Ramjet 155 projectile was fired out of a cannon and its ramjet engine ignited successfully. It demonstrated flight stability with a well-controlled engine combustion process. "We believe the Boeing Ramjet 155, with continued technology maturation and testing, can help the US Army meet its long-range precision fires modernisation priorities," stated Steve Nordlund, Boeing Phantom Works vice president and general manager. "This successful test is evidence that we are making great progress."

The long-range test at Andøya follows years of research, development and testing by Boeing and Nammo of ramjet technology, including more than 450 static or short-range tests. Boeing Phantom Works and Nammo have been working together under a strategic partnership to jointly develop and produce the next generation of boosted artillery projectiles. In July 2019, the Boeing-Nammo team was awarded a contract under the US Army's XM1155 programme to develop and mature the Ramjet 155 projectile. In May 2021, the team was awarded a Phase II technology development contract.

Ramjet 155 uses an engine in which the air drawn in for combustion is compressed solely by the forward motion of the projectile at supersonic speeds. Considered a hybrid between guided artillery and missiles, the programme has an objective of a common round design that can be used in L39 and L58 cannons.

MBDA updates

ASRAAM impresses in RAF's major missile training exercise

The UK's Royal Air Force (RAF) successfully conducted their largest ever mass firing of the MBDA ASRAAM missiles over the sea in the Hebrides Air Weapon Ranges. Over the space of 10 days, pilots from eight different squadrons successfully launched a total of 53 missiles at target drones. The Missile Practice Camp was the largest mass firing of ASRAAM from the Typhoon FGR4 and F-35B Lightning II. Typhoon pilots from 1(F), II(AC), 6 and IX(B) Squadrons based at RAF Lossiemouth, as well as from 3(F), and 41 Test & Evaluation Squadron at RAF Coningsby, worked with Lightnings from 207 and 617 Squadrons based at RAF Marham in the event.

PGZ and MBDA's Mala Narew

PGZ and its subsidiaries, PIT-RADWAR, JELCZ and WZU, working hand-in-hand with MBDA have been making rapid progress on the short-range air defence (SHORAD) solution, known as "Mala NAREW", with the first two Polish iLaunchers of the system already in Poland undergoing integration and trials ahead of delivery to the customer. This project aims to deliver rapidly two SHORAD-class fire units equipped with CAMM missiles, integrated with SOLA radar stations and the Polish C2 system.

Nexter and MBDA present the new NARWHAL

The NARWHAL is a remotely operated 20mm naval turret that can be integrated just as easily onto small patrol boats as onto frigates. Equipped with state-of-the-art optronics, including a day/night sight and a laser range finder, it is effective at more than 2,000 metres thanks to its 20M621 gun. The NARWHAL is already a commercial success, in service with six different navies. To meet their needs and those of future customers, engineers are working to add new capabilities and options that enhance its operational effectiveness.

The NARWHAL turret is paired with a manual target designator: the Short Range Pointer (SRP), designed by the German firm Hensoldt. With this easy-to-use tool, an onboard operator can quickly designate a target to the NARWHAL by pointing a laser beam.

Navantia delivers corvette AL-DIRIYAH to Royal Saudi Naval Forces

Navantia has delivered the second of the five corvettes built for the Royal Saudi Navy Forces (RSNF) in its shipyards at the Bay of Cadiz, the construction 547, named AL-DIRIYAH, in a ceremony held at its San Fernando facilities.

AL-DIRIYAH has been delivered to the Royal Saudi Navy three years after its first cut of steel (May 2019), meeting demanding deadlines despite the health pandemic and global supply stress. The corvette is one of the most competitive and capable vessels in its segment, as it has been confirmed in the sea trials undergone in the Bay of Cadiz.

The commissioning ceremony took place in accordance with military protocol. An inspection commission (made up by members of RSNF and Navantia) has boarded the corvette to carry out the mandatory review. At the end, the ship's flag was raised, after which the Saudi Navy transferred command of the corvette to the commander of AL-DIRIYAH. Navantia Chairman has given Vice Admiral Al-Ghofaily the ship's bell as a ceremonial gift.

In the event, Vice Admiral Al-Ghofaily highlighted that "Alsarawat and many other RSNF ambitious acquisition programmes are a clear commitment of the Royal Saudi Naval Forces toward fulfilling the strategic goals of the kingdom vision 2030 by creating a new era of sophisticated and efficient naval capabilities to face the challenges of today and tomorrow while increasing the strength of National domestic military industry".

He emphasized that he commissioning marks the final and major milestone of her manufacturing life that lasted for 38 months during which best technologies were devoted to her construction and integration with the leading-edge combat systems. Since last January, the ship has gone through intensive sea trials to become, today, ready and fully capable to perform her assigned missions protecting the Kingdom of Saudi Arabia and defending its interests. He added that such significant achievement "is a clear indication of Navantia's capabilities and its determination to attain remarkable success in Alsarawat project".

His excellency Vice Admiral Al-Ghofaily expressed his "sincere gratitude and appreciation to His Majesty the Custodian of the Two Holy Mosque King Salman bin Abdulaziz, His Royal Highness Prince Mohammed bin Salman bin Abdulaziz, Crown Prince, Deputy Prime Minister and Minister of Defence, and His Royal Highness Prince Khalid bin Salman, Deputy Minister of Defense, God bless them all, for the endless support that they always give to the Royal Saudi Naval Forces".

Spanish Secretary of State for Defence stated that "this ship is an excellent example of the quality of the Spanish shipyards, of the industrial and commercial cooperation between our countries, which has guaranteed the economic activity of more than a hundred companies and 6,000 jobs in the Bay of Cadiz". "To the corvette AL-DIRIYAH, to her officers and crew peace, fair sea and winds".

The AVANTE 2200 programme

The AL-DIRIYAH corvette has a length of 104 meters, a beam of 14 and seating for a total of 102 people between crew and passengers. The contract for the construction of five corvettes entered into force in November 2018 and, since the launch of the first unit (July 2020), Navantia launched the five units with a period of four months between each one of them, which meant achieving this milestone in a record time of three years.

The corvettes are based on the AVANTE 2200 design, adapted to the requirements of the RSNF, offering advanced performance, excellent work at sea, high survivability, and ability to operate in extreme temperatures.

Simultaneously, around 500 crew members of these corvettes are completing the education and training process at the Navantia Training Centre (NTC) in San Fernando.

In addition to the corvette contract, Navantia agreed with SAMI (Saudi Arabian Military Industries) to create a joint venture in Saudi Arabia, an alliance that allows Navantia to position its integrated systems and technologically advanced solutions in the Arab market and area of influence and is aligned with the company's internationalisation strategy.

The contract assumes a global workload of around seven million hours and 6,000 jobs over five years. Of these, more than 1,100 are direct employees, more than 1,800 collaborating industry employees (more than a hundred companies participate at the programme) and more than 3,000 indirect employees generated by other suppliers.

The programme includes, in addition to construction, the Life Cycle Support for five years from the delivery of the first ship, with an option for another five additional years, the last ship of which must be delivered in 2024.

It also includes the provision of various services, such as integrated logistics support, operational and maintenance training, provision of Education and Training Centres for the Combat System and Platform Control System of ships, Life Cycle Support and ship maintenance systems at the Jeddah Naval Base.

Courtesy: Navantia

Royal Navy and Japanese naval forces train together

Richard Gardner reports from London

(Photo: Crown copyright RN22)

A recent joint exercise in UK waters had a historic significance as it involved the Royal Navy and Japanese Maritime Self Defence Force working together in a European environment for the first time. The patrol ships HMS Mersey and HMS Enterprise linked up with JMSDF ships Kashima, which trains officer cadets, and the general–purpose destroyer Shimakaze off Portland Bill in the South of England.

The two Japanese warships were on Overseas Training Cruise 2022 exercising with allied navies along the way. This included working with the new UK aircraft carrier HMS Prince of Wales, which was leading a NATO exercise off the Spanish coast. After the two Japanese warships arrived off the UK's Dorset coast they undertook various exercises, concentrating on communication activities and orchestrating coordinated manoeuvring of the ships operating in close proximity. It had been intended to allow for an exchange of crews to experience life aboard each other's vessels while underway but deteriorating weather ruled out boat transfers.

Commenting on the joint activity Lt Cdr Nicholas Radue, Executive Officer of HMS Mersey, stated, "It was a pleasure being able to train with the JSDF in UK waters. Exercises like this not only provide excellent training opportunities for our respected fleets but also strengthen the bond between our two countries. We wish them fair winds and following seas in the rest of their deployment."

After the initial training period the two Japanese ships split up, with the Shimakaze docking at Portsmouth for a five day visit, while the Kashima continued into the Thames Estuary before sailing up the River Thames into the heart of the City of London, passing Tower Bridge to enjoy a high-profile berth alongside HMS Belfast and opposite the Tower of London. HMS Belfast, the last big-gun RN cruiser, is now a tourist attraction and served in Japanese waters in 1945 as a major asset in the British Pacific Fleet. After its visit to London the Kashima and Shimakaze continued further exercises with the RN, including with the dedicated specialist navigation training ship, HMS Severn.

A spokesman for the Japanese Self Defence Force said that the training cruise visit to the UK was a direct result of last year's deployment of the UK Carrier Strike Group to the Asia Pacific, which saw the flagship HMS Queen Elizabeth call on Yokosuka, near Tokyo. He said, "Defence cooperation between Japan and the UK, which has a long history and tradition, evolved to a new level last year with the CSG visiting Japan. Japan-UK defence cooperation contributes not only to the security of Japan but to ensuring peace and stability in the Indo-Pacific region and the international community, as well as addressing global challenges."

The Royal Navy has increased its presence in the Pacific, most visibly in 2021 with the carrier group deployment, but also with the commitment of the patrol ships HMS Tamar and HMS Spey to the region for the next five years. It is intended to hold more RN joint exercises with other regional navies as part of an enhanced Western effort to counter ever-expanding Chinese influence and military activity in the wider Indo-Pacific area. The UK's cooperation with Japan is also expanding into new defence and industrial developments, including new air combat systems.

Tanks of the future

KF51 (Photo: Rheinmetall)

2022 has become the best year in recent times for armoured technology with emergence of several charismatic next generation platforms and projects to meet the future requirements of ever evolving collaborative combat environments. While, Leclerc XLR, Leopard 2A7+ and K2NO/PL/M proudly present themselves as representative of future backbone of their respective users, the year will be even more memorable for three new technology demonstrators shining bright amidst the crowd of other metal beasts. We are talking about GDLS AbramsX, KF51 and KNDS EMBT- all feature unmanned turrets.

AbramsX

The GDLS AbramsX broke cover at the AUSA 2022. The technology demonstrator addresses several shortcomings in existing Abrams fleet. Though US Army likely will keep using M1A2 Abrams SepV3/V4, it paves way for integration of several new upgrades to existing one. With a combat weight of just around 54T it has become lighter than any of its cousins! The platform is equipped with ARDEC XM360 120mm gun which is lighter than M256 and has low recoil in comparison. It features Kongsberg Protector RS6 30mm remote weapon system which allows to engage soft skin platforms with an adequate means. It also has a 7.62mm co-axial machine gun. AbramsX can launch four Switchblade 300 loitering munitions as well! SAFRAN Paseo provide the Gunner's Panoramic Sight (GPS) and Commander's Independent Thermal Sight (CITS). Both the gunner and commander can scan the battlefield independently without rotating the turret. The sophisticated multi-spectral

sensors allows a complete 360-degree view around the tank. The 'Katalyst Next Generation Electronics Architecture' enables easy upgrades of sensors, weapons, communications etc. The AI enabled battle management system allows deployment of unmanned aerial system (UAS) and unmanned ground vehicle (UGV). This it paves the way for man-unmanned teaming (MUM-T). Eying the crew safety the ammunitions are stored into a sealed compartment. For the enhanced protection Trophy APS is integrated, meanwhile GDLS eyes a new system for the protection against 'top-attack' guided weapons. However, the most interesting feature of it will be the hybrid electric power train. It's based on Cummins Advanced Combat Engine (ACE) and uses Advanced Combat Transmission (ACT) from SAPA. It allows a seamless quieter mobility with reduced fuel consumption.

KF51

The KF51 Panther is the evolution of legacy variants of Leopard series main battle tanks integrating mobility, lethality, situational awareness, survivability and battlefield management to the highest degree possible. This new platform is designed in accordance with NGVA standards to sustain the battlefield of the future. It is equipped with a new 130mm smoothbore gun. The new "Future Gun System" enables a 50 percent longer kill range than contemporary 120mm one. Thus the armament will provide the platform a superior firepower even in long-range engagement. Panther will be provided with the next generation KE rounds and programmable multi-purpose HE munition. In a prolonged engagement, the continuous high rate of fire will provide unimaginable advantages.

The main weapon is complemented with a 12.7 mm co-axial machine gun for midrange support and defence. The air-defence is provided by the 7.62mm Natter remote-controlled weapon station (RCWS). This will work against enemy UAV as well. The RCWS can be customised with other armaments as well for different requirements. However, the most spectacular feature of the package is integration of four HERO 120 loitering munitions. Thus UVision enables the platform to engage the non-line-of-sight (NLOS) threats as well. According to Rheinmetall the Panther employs a ground-breaking, fully integrated, comprehensive, weight-optimised survivability concept. In addition to classic measures, the Panther's digital architecture enables on and off-board survivability, with active, reactive and passive protection technologies. The fully digitised NGVA architecture allows integration of additional sensors for early detection of enemy threats. It is configured with a pre-shot detection capability, enabling to strike first. Rheinmetall TAPS (Top Attack Protection System) provides high degree of protection against even top-attack enemy anti-tank guided missiles (ATGM). However, the most compelling feature of this system is capability of defeating KE threats (APFSDS)! As additional defensive measures, ROSY obscureness system is integrated. Adequate measures have been taken to neutralise threats from mines. Most importantly, as a precaution against ever increasing threat of cyber warfare, it is designed to operate in a contested electro-magnetic spectrum.

The gunner and commander sights are provided by EMES and panoramic SEOSS 2 respectively. Both are equipped with stabilised daylight and IR optics with integrated laser range finder. Thus both can identify and engage threats independently, this provides the tank a hunter-killer capability. Thanks to the see through armour technology, the crew can enjoy 360° view around the platform in their large display screens without opening the hatch which not only enhances the situational awareness but survivability as well. The 59T platform is reported to be equipped with a 1500hp engine. Thus an excellent power

KF51 (Photo: Rheinmetall)

to weight ratio is achieved for smoother mobilisation. Besides, the comparatively lower weight and smaller architecture of the turret allows better accessibility to bridges and tunnels than other modern heavier Western tanks.

The Panther with its modern BMS and software-defined communication is claimed to dominate what Rheinmetall calls as "multi-domain collaborative combat". The fully digitised NGVA architecture allows for seamless cross-platform sensor-to-shooter links.

EMBT

The KNDS EMBT is a concept platform integrating redesigned Leclerc turret to new Leopard 2A7 chassis. It was first time unveiled during Eurosatory 2018. However, at that time it was just a symbolic representation of easy integration of French and German systems. But the example with a massive evolution signifies the revolution in armoured technology and preparation for the future development of Main Combat Ground System (MCGS). The primary weapon is CN120-26 120mm L52 smoothbore gun with an auto-loader. But if needed, ASCALON 140mm can be integrated as well. The next generation telescoped ammunition will make the MGCS a lethal mobile behemoth. The main gun is complemented by a co-axial 7.62mm machine gun. The secondary weapon system is a Nexter remotely operated ARX 30 which is equipped with 30M781 MPG 30mm auto-cannon for better protection against both the ground and aerial threats especially against UAV. Augmenting further, there is another 7.62mm RWS co-axial to commander sight. The EMBT offers dynamic multilayer defensive mechanism in form of passive and active protection system.

Nexter-Lacroix Galix is a soft-kill mechanism which launches projectiles which generate smoke screen masking visible and infrared (IR) domains against hostiles. The fully automated system is comprised of variety of sensors and laser warning receivers (E-LAWS) for adequate measurement. In addition of it, Rafael Trophy is also integrated which is a hard-kill measures against enemy ATGM. The commander sight is weaponised. The tank features a 360° local situation awareness system. The platform is equipped with the Multi-Threat Detection System (MTDS) which detects radar and RF sources. Metravib Pilar V Acoustic Gunshot Detector provides real-time detection and identification of enemy firing. MMI (Man/Machine Interface) is a very important aspect of the new development. A wide array of sensors, AI and BMS allows the System Operator to manage the tank in a collaborative combat scenario. It is a 62.5T platform, but thanks to 1500hp powerful MTU 883 EPP engine achieved a smooth mobility. The digital control allows drive-by-wire, which is a prerequisite for automated driving operations and manned/unmanned teaming (MUM-T).

How they are changing everything: In all three platforms there are some common features. All are developed to address long-standing beefs in predecessors. They are envisaged to use more powerful gun system with auto-loader. All three emphasise on digitisation and cross platform sensor-to-shooter links. Situational awareness and multi-layer protection are given utmost priority. AbramsX however leave others two behind pioneering the new hybrid power pack.

What they mean for India: India eyes a new generation main battle tank which will be equipped with next generation armaments, advanced situational awareness, dynamic protection, augmented UAV capability, integrated digitisation for seamless communication between other friendly manned and unmanned platforms and an excellent mobilisation. These TD can disseminate essential assessment for India's own development of the Future Ready Combat Vehicle (FRCV). These platforms will go through several new modifications in coming years, especially the EMBT which likely to be the basis of Franco-German future MGCS. There are many things to learn and moreover to be concerned of possible shortcomings in apparently shiny whistles and bells. Evolution of the revolutionary technology for indigenous means has been started. It's time India kept pace with the new era.

By Sankalan Chattopadhyay
(Twitter @vinoddx9)

EMBT (Photo: KNDS)

Sanicole F-35: The rehearsal

During the 43rd International Sanicole Airshow that took place in Hechtel-Eksel (Belgium) on 10 and 11 September 2022, visitors witnessed the European debut of the USAF F-35A Lighting II demo team. It was for the very first time that an audience in Belgium saw the F-35 in full action. The F-35 will be replacing the Belgian Air Force's F-16s in the foreseeable future.

The F-35A was piloted by Major Kristin 'Beo' Wolfe. Major Kristin 'Beo' Wolfe is the Commander, F-35A Lightning II Demonstration Team, 388th Fighter Wing, Hill Air Force Base, Utah. On 9 September, the F-35A Lightning II official first rehearsal flight was flown by Major Kristin 'Beo' Wolfe and after the rehearsal flight, Lockheed Martin Chief Test Pilot Al Norman provided a briefing. Next, Colonel Nico Claessens, Belgian Air Force Director of F-35 Capabilities, hosted a briefing. Afterwards, Major Kristin 'Beo' Wolfe was escorted by a police motorcade from Kleine-Brogel AB to the Sanicole airfield for various interviews.

Photos and text: Joris van Boven and Alex van Noije

Sanicole 2022

The International Sanicole Airshow is a household name in Belgium as one of the most awarded airshows in Europe. An airshow with a rich history since 1977. An annual spectacle for young and old that brings aviation in all its different dimensions to the fore. International Sanicole Airshow honours this rich aviation heritage and combines the power and magic of flying to inspire young people.

Every year, Sanicole organises one of the most anticipated activities in Limburg. The Sanicole Airshow attracts 40,000 visitors each year. It can even be said that Sanicole Airshow is the biggest and most awarded airshow of the Benelux. In previous years, the Sanicole airshow was held on Friday evening and Sunday afternoon. The 2022 edition changed that, as the sunset airshow was on Saturday 10 September and the daytime airshow was on Sunday 11 September 2022.

Highlights of the Sanicole airshow included a USAF F-35 demo, Saudi Hawks (demo was canceled after one flypast due to a thundercloud), Turkish Stars, Belgian F-16 show by VRIESKE and a show by a Belgian A109. The next Sanicole show will be in 2024 starting from 7–8 September 2024.

Sanicole background

The Sanicole airshow at the airport of Leopoldsburg (Belgium) has grown over the years from a small event to a true spectacle. The name Sanicole that is linked to the air show has a special background and has nothing to do with the place names or the location of the event. The name Sanicole was invented by the Belgian Lucien Plees. This man is the founder of the flying club at Leopoldsburg airport in the municipality of Hechtel-Eksel in northern Belgium. Plees was the owner of a sanitary facility in Korpsel at the time of its foundation. The name Sanicole is a combination of the word sanitary and the name of his daughter Nicole. When the Sanicole Airshow was held for the first time, the event did not represent much. The size of the show contrasted sharply with what the event is today. The air show started to grow in size when Gilbert Buekenberghs started to interfere with the organisation. The Sanicole Airshow grew in the 1980s into a large air show that earned its place in the list of leading air shows. This was quite a special achievement at the time,

because almost all successful air shows in Europe were not commercial at that time. Most air shows are usually organised by the Air Force or another branch of defence in most of the countries. The first international participants to participate in the Sanicole Airshow came from countries such as the Netherlands, France and England. The Sanicole Airshow soon got the brand of an international airshow and the name was changed to International Sanicole Airshow (abbreviated: ISA). The ISA is nowadays one of the most important airshow that is held annually in Belgium.

The Sanicole Airshow remained the only annual air show in Belgium after tightening up safety rules. People have not been idle in Belgium over the years, because the Sanicole Airshow has become a leader internationally when it comes to safety, quality and innovation in the aviation world. The biggest reward the organisation can receive for the effort made came in 2010. The Sanicole Airshow was then named the best European air show and was rewarded with the Paul Bowen Award by the European Airshow Council. Since 2011, the Sanicole Sunset Show is also being organised annually. Except when the Belgian Air Force has it's national air show at the nearby Kleine-Brogel AB. This event is held with an afternoon/sunset/nightshow night and a daytime show. During this year's night show, spectators could be seen photographing and filming during sunset. Over the years, the Sunset Show has also developed into a full-fledged event. During this air show, traditionally many flares and also fireworks are used by the planes and helicopters against the often dark skies and the weak evening light; this provides a spectacular opportunity for visitors to click pictures.

The planes and helicopters that participate in the Sanicole airshow usually fly from the Kleine-Brogel military airbase not far from Leopoldsburg. Leopoldsburg does not have the right infrastructure, as a result of which many military aircraft cannot fly from this airport.

Report by: Joris van Boven and Alex van Noije

Falcon Autumn 2022

Air Assaults over The Netherlands

When temperatures start to drop, daylight hours are declining, the leaves start to lose their green colours and falling down the trees, one knows autumn has started. In this time of year an energy boost is given to the Dutch army Lucht Mobile (Air Mobile Brigade) and the air forces Dutch Helicopter Command (DHC) when they join forces for the annual "Falcon Autumn" exercises. Also this year when Falcon Autumn 2022 marked the agenda for the first 3 weeks of November.

Falcon Autumn

The exercise has a tradition to be one of the larger scale army and helicopter exercises in Europe. Last year the usual participating ground forces and helicopters were joined

by C-130 Hercules aircraft, Belgian F-16's and German Tornado's together with C-160 Transall aircraft. Another sample was the exercise in 2018 which was a joined effort with the German army and focussing at the Dutch-German partnership in "Division Schnelle Kräfte" (Rapid Forces Division) a joined troop contingent which can be deployed worldwide in 7 days for smaller groups and maximum 20 days for larger groups. Therefore it was no surprise that, besides other international participants, Germany included hundreds of (para) troopers and around 8 NH-90 helicopters to make the whole exercise in 2018 a firm trainings edition. The Falcon Autumn exercises are executed throughout The Netherlands, however each edition concentrates at several dedicated training regions.

2022

This year's edition was planned and organised by the 11th Lucht Mobiele Brigade (LMB) similar to Air Mobile Brigade and the Dutch Helicopter Command. When these 2 units work together, they continue for the duration of the exercise as 11th Air Manoeuvre Brigade (AMB). The exercise included more than 1000 ground troops, and a total of 37 helicopters. DHC was represented in the exercise with 4 CH-47F MYII CAAS Chinooks, 2 AS-532 U2 Cougars, 2 NH-90's and 4 AH-64D Apaches. Next to German ground forces, additional participation came from US Army Europe, with their 12th Cavalry Air

Brigade (CAB) from Ansbach, Germany and the 1st Polish Army Brigade. The US Army helicopter contribution consisted of 8 CH-47F Chinooks, 8 UH-60M Black Hawks and 6 AH-64D Apaches, while the Polish had 2 Mi-8T's and 1 Mi-8MT Hip present in the exercise. The helicopters were all based at The Peel Air Base, a reserve base in the south-east of The Netherlands with no aircraft assigned to. The daily flight activities had normally a first leg for the helicopters towards the Arnhem region. Here you have Deelen Air Base where sling loads could be attached as well as a forward arming and refuelling Point (FARP). Nearby you could

find another Dutch FARP location of 3 tank units at the Ginkelse heath and another US arranged FARP at the Arnhemse heath. Due to moves to other exercise areas, some of the FARPS were re-positioned during the exercise, like to Prikkendam up in the north of The Netherlands. Each flying day, the FARPS were frequently visited by the helicopters. Often at the end of their first mission when picking up new troops, vehicles and other supporting equipment, the helicopters made a visit to the FARP's to refuel. The FARP's were on a 7 minute status alert, meaning they should be able to receive a helicopter within 7 minutes after its call. Upon arrival at the FARP, only the pilot remained in the running helicopter, while the co-pilot positioned next to the helicopter to control the so called "hot-pit" refuelling process. The rest of the crew could only embark the helicopter again after refuelling was finished, to keep the process as safe as possible.

AASLT

The Falcon Autumn Air Task Force (ATF) commander Lt Col Roy Hemmelder, explains that the start of the first week of the exercise was used for familiarisation flights. This was immediately continued in an initial level 5 Air Assault (AASLT) manoeuvre, in which a combination of firepower, speed and surprise element was practised, near the water locks of Ossensluis. Troops and equipment were dropped of in the farmers oriented area to take over and secure these "critical" public facilities. Two days later formations of helicopters, flying in several waves, extracted the troops out of the field to fly them back to the Peel Air Base. The second week the actions moved further north and finally concentrated at the airfield of Drachten which had to be taken by surprise during the night. Helicopters crews had to rely on their Night Vision Goggles

(NVG) to execute the missions after dark, while flying in formation. After the airfield was in control of the deploying troops, Drachten became a complete Forward Operating Base (FOB) with all kinds of support means. From here several helicopter supported raids were conducted, to defend or take over the control of other critical objects in the area as defined in the various exercise scenarios. To make the exercise realistic, the helicopter crews and troops had to face various simulated threats during their mission. One of these was a Man-Portable Air-Defence (MANPAD) system unit with their Stinger Weapon Platform (SWP) which were acting as opposite force in the field, forcing the crews to respond immediately to overcome the threat.

Lt Col Hemmelder, normally the commander of 300 squadron from Gilze-Rijen Air Base flying the Cougar, mentioned that the last week of the Falcon Autumn exercise brought earlier trained elements together in a large AASLT at former Naval Air Station Valkenburg, to finalise Falcon Autumn 2022.

Text and photos: Peter ten Berg

Royal International Air Tattoo 2022 in pictures

The Republic of Korea Air Force demonstration team Black Eagles made their second visit to Europe ever, after also displaying at RAF Fairford in 2012. The team flies eight indigenously developed KAI T-50 Golden Eagle advanced jet trainers in a striking colour scheme. Their formation flying is very tight as is shown here.

In July, the Royal International Air Tattoo was held at RAF Fairford in Gloustershire, Great Britain. This event is the largest military airshow in the world and is normally held every year. However, due to Covid this was the first edition after three years, so many people welcomed the return of the many military jets, helicopters and other participants.

Held since 1971, the International Air Tattoo became Royal in 1996. In 2003, the show received largest attendance with no less than 535 aircraft participating in the show. In recent times, the world situation has changed obviously, so these numbers are not possible anymore. But still, some 200 military and former military aircraft from all over the world plus a few dozen civilians were admired on the ground and in the air this year. The UK was suffering from a heatwave during the show weekend, which was tough for the crowds but lots of free water and lots of sunshine during the displays made for a great weekend. The themes of this year's edition were 'Training the Next Generation' and the United States' Air Force's 75th anniversary. A very special guest this year was actor Tom Cruise, who recently starred as fighter pilot in Top Gun: Maverick.

We present a pictorial review of the show.

Text and photos by
Patrick Dirksen, Frank Mink and Joop Zandbergen of Tristar Aviation

The newest fighter of the Royal Air Force and Royal Navy is the Lockheed Martin F-35B, locally known as Lightning II. This fifth generation fighter has short take-off and vertical landing (STOVL) capabilities, which it shows here. Because of this, the aircraft can operate from aircraft carrier and short landing strips, next to regular runways. So far 27 of 48 ordered Lightnings have been delivered, with plans to order up to 138 aircraft

A Czech Mi-171Sh, NATO reporting name 'Hip', taking off for a spectacular aerial demonstration. The Czech Air Force inherited 33 Mi-17 'Hip's dating from the USSR era when Czechoslovakia split up in 1992. In 2005 a large portion of these were replaced by 16 improved Mi-171Sh. This is the most advanced export version of the Hip that can also be armed and used for assault. For this it can be equipped with the same weapons suite as the Mi-24/ Mi-35 'Hind'. Below the cockpit window an armour protection plate can be seen

This BAe Hawk not only clearly shows it is coming from Finland, it also sports special marks celebrating 40 years of Hawk operations by the Ilmavoimat or Finnish Air Force. Is it part of the official demonstration team called the Midnight Hawks, who fly four Hawks. The name of the team comes from Midsummer Eve when they fly a display literally after midnight, as it doesn't get dark at their homebase Kauhava in that period of the year

If the glass nose doesn't speak for itself enough, the badge on the nose of this Antonov An-30 saying "Patrula Aerofotogrammetrica" explains the role of this remarkable and rare aircraft. The Romanian Air Force still operates two of the almost 50 year old veterans, NATO reporting name 'Clank', for the Open Skies programme

The crew of this Italian C-130J Super Hercules understand what photographers want and keep their aircraft very low after taking off. Although not part of the airshow itself, this way the support aircraft becomes an attractive addition to the already impressive line-up.

By now a well-known sight, the Bell-Boeing CV-22 Osprey, but still a very strange-looking aircraft or helicopter. USAF Special Operations Command has one squadron of those hybrids based at RAF Mildenhall in Suffolk

The famous Royal Air Force Aerobatic Team the Red Arrows fly the BAe Hawk and often use smoke in the colours of the British flag. They are seen here flying in formation with the single RAF Voyager in VIP livery, also sporting the British flag, that has been dubbed 'Boris Force One' by the British public after former Prime Minister Boris Johnson

A Mil Mi-17 'Hip' and Mi-35 'Hind' of the Czech Air Force doing what almost looks like ballet during a demonstration flight. Recently the CzAF announced they will transfer their complete fleet of Mi-24 and Mi-35 helicopters to the Ukraine, to support their battle against Russia, as they were planning to replace them by new Bell AH-1Z Vipers soon anyway

Although participants are mostly active military aircraft, some historic aircraft are also included. The Swedish Air Force Historic Flight showed three of their aircraft, a Saab 32 Lansen, a Saab 35 Draken and this Saab 37 Viggen. This last one, an Sk.37 (for Skol or trainer) version, is a twin seater painted in the distinctive Swedish splinter camouflage which was mainly used during the Cold War

The German Luftwaffe recently announced it will order more Eurofighter EF.2000 jets. Some of these will be of a still to develop ECR version, intended to replace the Tornado ECR fleet. In the meantime the venerable Tornado, designed by Germany, Italy and the United Kingdom in the seventies, is still going strong. Here it shows its topside with the swing wings in full forward position

The two solo aircraft of the Red Arrows performing a close crossing. The British Aerospace Hawk T.1 has been fully retired by the British forces earlier this year, only exception are the aircraft used by the Red Arrows. These are planned to soldier on for another few years, by cannibalising the rest of the stored fleet

This Hungarian JAS.39C Gripen flew a stunning display, with the spectacular fuel 'dump and burn' as highlight. Seemingly on fire, this technique is used to dump fuel in an emergency situation, where a quick landing is needed but the aircraft is still too heavy to safely land

F-22's exercising all over Europe

Early August this year (2022) a USAF squadron of the 5th generation fighter aircraft, the F-22 Raptor, made their presence in the European theatre for a long term deployment. The 12 Raptors belonging to the 90th Fighter Squadron, part of the US Pacific Air Forces (PACAF) command 3rd Wing based at Joint Base Elmendorf-Richardson, Alaska, USA, arrived at RAF Lakenheath to continue their journey to temporary end station Lask Air Base, Poland some days later. Being in Poland the unit, nicknamed "The Dicemen", became the 90th Expeditionary Fighter Squadron to fulfil a deterring role while contributing to the NATO Air Shielding mission at NATO's east flank. Although the Raptors had a main role in the Air Shielding operations out of Lask Air base, some aircraft also left their detachment in Poland a few times to cooperate and train with NATO allies in other European regions. In September the 90th EFS had some of their jets deployed to Orland Air Station, Norway. For a week the crews trained together with Norwegian F-35's and Finnish F/A-18's to enhance partner force interoperability and increase domain awareness and survivability in an ever-evolving threat environment according

the Agile Combat Employment (ACE) concept up in northern Norway. Later on, a couple of Raptors made a short visit to Spangdahlem Air Base, Germany.

By mid-October 4 F-22's flew from Lask to at Leeuwarden Air Base, The Netherlands, for a multiple day stay. Lt Col Michael "Popey" Kendall, 90th EFS commander, already announced a few days earlier at Lask to forward deploy some of the F-22's to the Dutch base. Here they would exercise with Dutch F-35's, together with USAFE F-35's and F-15's from RAF Lakenheath in a reserved exercise air space over the North Sea. "Here will be more space available to execute some larger training operations, than in the current crowded airspace over Poland", as Lt Col Kendall explained. RAF Lakenheath had also some of their F-15E's and F-35's deployed to Leeuwarden AB, while additional Lightning II's and Eagles operated out of their British home base. Next to the combined F-22, F-35 and F-15 missions, the exercise also integrated into the running "Steadfast Noon" exercise and saw combined training with Dutch, Belgian, Polish and Turkish F-16's and German Tornado's which operated out of Volkel (NL), Kleine Brogel (B), Noervenich (D) and Spangdahlem (D) air bases. The exercises were supported by American, German, Italian tankers as

well as from the "Multinational Multi Role Tanker Transport Unit" based at Eindhoven, NL.

Although the exercise was scheduled for 2 weeks, the F-22's did leave earlier for Lask Air Base, because of other operational reasons. A week later several Raptors of the 90th EFS arrived at Souda Bay, Greece for another ACE training. Lt Col Kendall expected that the European F-22 detachment of the 90th EFS may last some more months, however the missions length is always subject to be determined. With the likely longer stay in the European theatre, it will be no surprise that the 5th gen fighters may show up at other locations to exercise with other allies or for ACE like training concepts.

Text and photos: Peter ten Berg

The unit made a special 90th Expeditionary FS in Poland detachment badge

In honour of the unit's history, the 90 FS badge displays its original "aero squadron" name as it was in 1917

Badge for the F-22, F-15 and F-35 exercise between USAF and The Netherlands AF, at Leeuwarden Air base October 2022

City centre heliport Paris-Issy

Vertical ops near the Eiffel

Founded in the 3rd century at the banks of the river Seine, Paris had found itself an ideal geographic location which worked as a magnet to businessmen and artists. Ever since, the city developed itself into nowadays capital of France and plays an important role in centres like finance, commerce, fashion, science and arts. With an approximate population of 2.2 million inhabitants and even up to 12 million when including its direct surrounding areas, Paris must rely on sufficient and adequate travel facilities, both for local and international connections. Therefor it is no surprise that Paris facilitates three major international airports, being Charles de Gaulle and Le Bourget in the north and Orly in the south, next to several smaller civil and military airfields around the city. Amongst them there is only one air facility with the unique status providing direct access to the city centre; heliport Issy-les-Moulineaux.

Issy

The 6 hectare wide site is located alongside Paris busiest car city-ring and Seine river, in the middle of an multi-national oriented office building area and only 3 kilometres away from the iconic Eiffel tower. The limited space of Issy-les-Moulineaux is only suited for helicopter operations, for which about 15,000 movements, take-offs and landings are counted annually. The heliport which has six hangars and some small office buildings, houses about 18 civil aviation companies, all offering services in the field of rotor activities. Companies like Helifirst, TAF Helicoptere and Mont-Blanc Helicopteres are samples that offer services ranging from sightseeing tours, group and private air travel and aerial video- and photography and can be found at the heliport of Issy.

Governmental ops

The Heliport of Issy-les-Moulineaux is not only used for civil and commercial flight activities. The base houses also some governmental organisations which execute their flight operations out of this city station. A branch of the "Gendarmerie des Transport Aériens" (Police Air Transport) is situated at the Heliport using mainly Airbus EC-135 helicopters for observation and monitoring flights over the city. Furthermore Issy is a base station for the "Groupement d' Hélicoptérs Sécurité Civile" (Helicopter Group Civil Security - GHSC) part of the Ministry of Internal Affairs. The heliport at Issy, which is addressed by the GHSC as air base Dragon75, is equipped with two helicopters, normally an Airbus EC-145 and/or a H-145. The operations include missions for emergency support, evacuation, protection as well as rescue. Therefore their tasks involve transport of rescue or other specialised teams. During incidents they can have investigate, monitor and coordinators role and further they provide non urgent medical inter-hospital air transport. The urgent Helicopter Emergency Medical Service (HEMS) flights with a physician and nurse onboard are executed by the "Services d'Aide Médicale Urgente" (urgent medical service-SAMU) and for the Paris region they are performed out of the hospital of Creil. The Sécurité Civile helicopters at Heliport Issy are operational on a 24/7 base.

Quartorze Juillet

Although the main office of the French Ministry of Defence is only a few hundred meters located from the heliport, Issy sees only occasionally military flights. The majority of such flights are conducted to and from the nearby Versailles located military air force base 107 of Villacoublay. However, around July 14th (Quartorze Juillet) when France has its annual revolution celebration and honours the current military services, Issy is often used with all the flight activities during the day.

Highlight of all the festivities is a large air parade over Paris' main street, the Champs-Élysées, which is overflown from the Arc de Triomphe towards Concorde square. The first half of the morning defile sees all French fixed wing assets, while the second part is dedicated for the military and governmental helicopter units and services. Large formations of helicopters show the current types from the French air force, army, navy and governmental services. In the afternoon, more than a dozen helicopters also participate in a static display and can be viewed from nearby by the public in the Paris city park of "des Invalides", in the direct vicinity of the Eiffel tower. With its perfect city centre location, Heliport Issy makes the base an ideal stop for the participating helicopters in between the morning air parade and the afternoon static display for refuelling.

The unique location and the diversity of commercial and governmental users of this small heliport in a city of millions, makes a successful combination and gives therefor its essence of existence.

Photos and text: Peter ten Berg

Historical aircraft on night display

The military flight activities at the Royal Netherlands Air Force base of Soesterberg, which go back to 1913, came to an end in 2008 when the base was closed. Earlier, the base was home to Dutch fighter and transport aircraft next to national helicopters and the guest detachment of USAFE fighter aircraft of the 32nd Tactical Fighter Squadron (TFS). In that same period one could also find the "Militaire Luchtvaart Museum" (MLM = Military Aviation Museum) in an aging former casern only a few kilometres away from the air base. After the air base closure, the Dutch defence decided to erase a new "National Military Museum" (NMM) at the abandoned location and opened in 2014. The aviation collection provides an interesting overview of the air force in general next to a specific focus to the aviation of Soesterberg.

Inside the NMM museum you can find several aircraft which played a major role in the Dutch aviation history, like Fokker and Koolhoven propeller fighter aircraft of the period up to 1940. The time line continues with jet engine powered aircraft like the Thunderjet, the Hawker Hunter, NF-5 Freedom Fighter, F-104 Starfighter and the current F-16. Furthermore an international aspect can be found in the collection including an F-102A "Delta Dagger", an F-4E "Phantom II" and an F-15 "Eagle". These last aircraft were in service with the United States Air Force in Europe (USAFE) and operated out of Soesterberg air base, or as the Americans preferred, "Camp New Amsterdam". From 1954 until 1994 the USAFE had based here the 32nd TFS. When the cold war tensions had vanished around

1990, the USAFE withdrew various units out of Europe, including the 32nd TFS with their "CR" tail coded aircraft.

Locating the National Military Museum at the former premises of Soesterberg Air Base, was without doubt a decision with strong symbolic motives. Next to the aircraft of the USAFE, the base had seen many Dutch Air Force squadrons operating until the finally closure in 2008. During the final operational years the air base was home of 334 squadron with Fokker F-27 Troopship transport aircraft, 298 squadron with CH-47 Chinooks and 300 squadron with Cougar helicopters. 300 squadron had also a few Alouette III's in use, mainly for VIP flights which also included the use for the Royal family living in the nearby located royal palace of Soestdijk.

The complete collection of NMM aircraft is larger than the ones that can be seen in the museum. For aviation minded visitors, a small static display line of aircraft can be found outside the museum. A surplus of the collection is kept in storage in a nearby depot. During special activities, depot aircraft are occasionally taken outside and added to the static display. One of the storage highlights is the F-4E in original 32 TFS unit markings. Fine detail includes the orange coloured tail tip, connected to the Royal Dutch Family of "Orange".

Recently the NMM provided a few visitors entrance to a small outside static of aircraft on display after normal opening hours. The F-4, a TF-104G, a NF-5B and a T-37 could be viewed and photographed during sunset and later.

Text and photos: Peter ten Berg

Falcon Autumn 2022

In the weeks from 31 October to 18 November 2022, the exercise Falcon Autumn 2022 took place in the Netherlands. More than 1000 soldiers took part in this exercise who were also supported by 37 helicopters. During Falcon Autumn, the Dutch armed forces train together with other countries to prepare for large-scale airborne operations in which various units of both the air force and the army work closely together. The participating soldiers were from the 11th Airmobile Brigade and the Defence Helicopter Command from the Netherlands, the United States Army Europe based in Germany and the Polish armed forces.

Participants and Experiences Helicopter Operations (by Air Commodore Robert Adang Commander DHC)

The Defence Helicopter Command (DHC) is the unit of the Royal Netherlands Air Force where all helicopters are assigned. Air Commodore Robert Adang has been the commander of the DHC since 2018.

Robert explains which units of the DHC and from abroad participate in the Falcon Autumn exercise. The exercise is normally an exercise which is on the agenda of the Dutch armed forces once a year. From the DHC perspective, this time the exercise was not only an exercise with the Airmobile Brigade, but also with the international partners. It was the first time in many years that we built a bare base from scratch to a fully operational site. The 37 participating helicopters fly from the former reserve air base De Peel (ICAO: EHDP) and are stationed there on the runway of this airport according to Adang. Air traffic control during this exercise is provided by personnel from Gilze-Rijen Air Base who have a mobile control tower on De Peel. Adang explains that more than 600 soldiers are based at the air base in Limburg during this exercise. Building a base like this one still needs lessons to be learned. According to Adang, the war in Ukraine has shown how important the logistics chain is. Setting up and secure operational areas such as an air base on this scale has therefore an enormous training value for the air force.

During the last days of the exercise, Adang tells about the units that participate in the exercise and where they come from during the raid on the former naval airfield Valkenburg. Gilze-Rijen Air Base is home to the Boeing AH-64D Apache attack helicopter (301 Squadron), the Aerospatiale AS532U2 Cougar transport helicopter (300 Squadron) and the Boeing CH-47F Chinook heavy transport helicopter (298 Squadron). The NH-Industries NH90 NFH maritime combat helicopter (860 Squadron) is stationed at Naval Air Base De Kooy in Den Helder. Adang explains when the 11th Airmobile Brigade cooperates with the Defence Helicopter Command, they together form the 11th Air Maneuver Brigade (11AMB). The 11AMB is fully deployable worldwide within twenty days. Smaller parts of the brigade can operate independently within 48 hours. Air maneuver can be used in all types of operations: offensive, defensive or stabilizing, but also aid at natural disasters.

Adang talks about the American units that participate in the exercise with their helicopters. The United States Army Europe is a large American army unit that is permanently based in Europe. With its presence, the United States wants to deter aggression and reassure allies and partners of their commitment to peace and stability according to the Air Commodore. The majority of the American units are stationed in the south of Germany, says Adang. The US Army helicopters participating in Falcon Autumn come from the 12th Combat Aviation Brigade (12CAB) which is based in Germany. The Boeing CH-47F Chinook helicopters originate from

Illesheim in southeastern Germany and are part of the 1st Battalion, 214th Aviation Regiment as part of the 12CAB. The Boeing AH-64D attack helicopters are assigned to the 1st Battalion, 3rd Aviation Regiment which is also part of the 12CAB. Just like the Chinooks, these helicopters are also stationed at Illesheim. The Sikorsky UH-60M Black Hawk helicopters come from Wiesbaden in southwest Germany where they are part of the 1st Battalion, 214th Aviation Regiment which is part of the 12CAB.

The Poles participated in the exercise with a number of Mil-Mi 8M and Mil-Mi 8MTV-1 helicopters, says Adang. The Mi-8T is the standard troop transport version of

this legendary helicopter. The Mi-8MTV-1 is the version of the Hip that can be armed. The Mi-8 which is also referred to as the Hip is a helicopter that originated in the Soviet Union. It is one of the most produced helicopters in the world. The Polish unit participating in Falcon Autumn is the 25th Air Cavalry Brigade (25 Brygada Kawalerii Powietrznej) from Leznica-Wielka in central Poland. In addition to these helicopters, a company of ground troops from the Polish Airmobile Brigade also participated in the exercise. According to Adang, the Poles have also made huge progress during the exercise. Working with the Americans was easier than with the Poles, according to Adang, because the American standard is also the European standard. The Poles,

Air Operations (By: Lt Col Pilot Roy Hemmelder DetCo of the Royal Netherlands Air Force)

During the Falcon Autumn exercise, Lieutenant Colonel Pilot Roy Hemmelder is the DetCo of the participating air forces. Roy is the squadron commander of the 300 Squadron at Gilze-Rijen Air Base and is also a pilot on the Aerospatiale AS532U2 Cougar helicopter. For me, it's the biggest exercise we've done in recent years. We have been able to get little or almost no exercises in the past two years due to the corona pandemic. But I do notice that these kinds of exercises are very important for the degree of training of the units so that

on the other hand, are still on their way to develop their skills to that standard. That is precisely why it is so important that a partner such as Poland participates in these scenarios, Adang adds. They were involved in the exercise as new participants and have now finally taken the lead over the second helicopter formation during a deployment here in the last week, according to Adang. This is very important, Adang continues, because there is a great need from NATO for multi-deployable helicopter units that are immediately deployable everywhere, regardless of where they come from. So the steps the Poles have taken is proof that this exercise works and that helicopter crews can rely on each other because they understand each other well. Adang ends his story with the fact that he is very proud of the results he and his team achieved during the exercise.

we can be maximally deployable. What we notice is that especially the international cooperation in the exercise is again the most important factor. This exercise is about cooperation on an international level, but also about cooperation on a national level. It is about collaboration between people and resources. Think of different helicopters and operations on the ground that we have to coordinate with each other. Collaboration with partners is never self-evident. This is not just about the procedures we use together. It is also mainly about the people and the humanity of the participants in the exercise. We have noticed, for example, that it is very important for the American participants to work with the European partners. The Americans have a very different background than other European partners such as the Poles during this exercise. Despite the fact that we all use the same structure and processes, the difference often lies in the interpretation of this. It is precisely this that we can coordinate well with each other during these kinds of exercises.

An exercise like Falcon Autumn is completely prepared at the front by the organisation. They then look for international partners who want to participate in a training like this. For myself, an exercise starts with an operation order that I receive in which we have to deploy to a staging area. For this exercise we did that to the lieutenant general Best barracks at the Vredepeel in Limburg. There the units are then brought together for a potential conflict. You can now also see this happening on the eastern flank of Europe. You can see that there is now a troop build-up with a defensive character. As a NATO alliance, we are responsible for being the first to get our defensive tasks in order. Our first main task is to protect our own territory and that of our allies. In that respect, I see this exercise as a very realistic scenario in which our territory is attacked. We come here in our back area together with our international partners in an article five scenario and that we start the fight from there. We are going to reconquer our territory in order to protect what is dear to us.

In the first week, the participating units mainly practice working together. Troops get used to each other and coordinate their working methods. In the air this is done with different helicopters from different countries. In addition, there is cooperation between helicopters and units on the ground. The exercises of this first week come together in a large joint action at Ossesluis in Drenthe. Falcon Autumn is a real assault exercise that involves training in capturing locations deep in enemy territory. Deelen and the Peel are therefore the drop-out locations for the airmobile soldiers and the helicopters. During the exercise, scenarios are trained in which mainly strategic objects are attacked and captured. Think of local airports and lock complexes and/or bridges. These are usually also the targets for airmobile actions in a real scenario. The attack on the lock at Ossesluis was also a typical airmobile target. During this action, soldiers were dropped on two sides of the lock. In this case on the north side and on the south side of the water. The soldiers are dropped off by a large group of helicopters, sometimes several kilometers away from the complex that has to be captured. This is very realistic, because in a real scenario the troops would be a target for enemy defenses near the object.

During the first wave, there were also fierce firefights between the soldiers of the airmobile brigade and the enemy troops defending the lock. The soldiers on the ground were continuously supported by Apache attack helicopters during the assault. These helicopters were also kept busy during the attack, because the helicopters were continuously under fire from enemy anti-aircraft units in the vicinity of the locks. After the locks were taken, reinforcements and equipment were flown in with heavy transport helicopters during the second wave. The units had vehicles as a sling load which was dropped off near the already landed soldiers. After the attack, the soldiers

held a bivouac here at Ossesluis after the retreat was blown the next day. This logistical operation also requires a lot of coordination between all participating units.

During the last week of the exercise, the American participants will no longer participate. This certainly also has an impact on the course of the exercise, because as commander I have access to less deployable helicopters, Hemmelder said. In the course of the exercise we don't know what else we will face. As I said, we got the operations order at the beginning and we don't know what's to come, because the exercise can develop in all kinds of different directions. It is also a good thing that we do not know this course in advance, because this ensures that we as a team are as sharp as possible on what is to come. Sometimes we have really short reaction times and we fly very complex missions.

In order to keep the helicopters continuously deployable in the areas concerned, three Forward Arming and Refueling Point (FARP) locations were in use near Deelen. A FARP has only one goal and that is to keep the helicopters deployable for as long as possible, says Hemmelder. Placing a FARP close behind the lines allows helicopters to quickly refuel and rearm before flying back to the action. A FARP is basically a petrol and rearmament station for the helicopters in the field. The location of a FARP is chosen so that helicopters can fly to it quickly and often a FARP is in a place that is more difficult to spot so that the location remains hidden for as long as possible. The advantage of a FARP is that it can also be moved easily and quickly to a new location. Combat helicopters such as the Apache's in particular regularly use the FARP during Falcon Autumn. The helicopters often stay in the air for hours near the troops on the ground to provide fire support. With the help of the FARP, the helicopters can continue to provide fire support to the troops on the ground for a longer period. Training the FARPs is therefore a very important aspect during Falcon Autumn.

The FARP also requires training of all personnel involved. It's not just about the helicopter crews here. At the FARP a number of tankers are parked on heath next to the landing spots for the helicopters. There is also a mobile communication post of the Mobile Air Operations Team (MAOT) to guide the helicopters to their refuel spot on the FARP. FARP personnel are dressed in fire-resistant clothing and wear special balaclavas, helmets and safety goggles during FARP-ing. Sometimes the helicopters are completely switched off during refueling, but also often this is done with the so-called hot refuel, in which the helicopter is refueled with rotating rotor blades. During Falcon Autumn, FARP personnel also walked around the FARP armed. If necessary, the fortress must also be able to be defended against enemy attacks. The helicopter crews are also armed during the missions. For example, the pilots of the Apache's all carry a rifle with them in the cockpit. FARP personnel are bivouacked at a location close to the FARP. If one is not present at the FARP, one must be able to be at the FARP within seven minutes in order to handle the helicopters.

Text and photos:
Joris van Boven & Alex van Noije

USAF F-22 at Łask AB (PL)

Early August 2022, twelve Lockheed Martin F-22A 'Raptor' aircraft of the US Air Force 90th Fighter Squadron landed at the 32nd Tactical Air Base, Łask, Poland (ICAO code: EPLK); to support the "NATO Air Shielding" operations.

The 90th Fighter Squadron, based at Joint Base Elmendorf-Richardson, Alaska, USA (ICAO code: PAED); has the nickname 'Pair-O-Dice', which can be seen in the patches. It is assigned to the 3d Operations Group, 3d Wing, Elmendorf AFB, Alaska, Pacific Air Forces. The 90th Fighter Squadron trains in the fighter missions of offensive counter-air (OCA), defensive counter-air (DCA) and suppression of enemy air defences (SEAD), as well as strategic attack and interdiction.

On 12 October 2022, a media flight was organised by the Polish Air Force, NATO Allied Air Command and Sławek 'Hesja' Krajniewski. A Polish CASA-295 was prepared for two media flights. On both flights, twelve photographers were tied to the floor of the plane wearing a harness. With 4 photographers on the first row, 4 photographers on the second row and 4 photographers on the last row. During the morning flight, several aircraft showed up which included 2 American F-22s, deployed at Łask AB, 2 Polish F-16s, based at Łask AB, 2 Polish Mig-29, based at Malbork AB and 2 Italian Eurofighters, deployed at Malbork AB for an extended NATO Baltic Air Policing deployment.

During 1.5 hours the various formations flew between Łask AB and the Bełchatów powerstation, whereby the Łask runway was overflown a few times. After the mediaflight an interview with the 90 FS squadron commander was possible.

Lt Col Michael B. Kendall (callsign 'POPEYE') told us about the deployment to Poland and further temporary deployments to the 'Viking Belt' exercise in Norway and the 5th generation integration exercise at Leeuwarden AB in the Netherlands.

Prior to the European F-22 deployment, LockheedMartin F-35A aircraft of the 158th FW were based for 3 months at

Spangdahlem AB, Germany (ICAO code: ETAD). After the Russian invasion of Ukraine, the US Air Force announced that more 5th generation fighters (F-22, F-35) would move to Europe for longer term deployments (lasting several months).

USAFE's ability to support and integrate with NATO's air shielding missions continually hardens the alliance's solidarity, collective resolve, and ability to adapt to a dynamic warfighting environment. The Raptor is a critical component of the global strike Task Force, and designed to project air dominance, rapidly and at great distances to defeat threats. A combination of sensor capability, integrated avionics, situational awareness, and weapons provides first-kill opportunity against threats. The F-22 possesses a sophisticated sensor suite allowing the pilot to track, identify, shoot and kill air-to-air threats before being detected. It cannot be matched by any known or projected fighter aircraft, making it a highly strategic platform to support NATO Air Shielding.

90FS deployment into Europe: Early August 2022, the 90FS flew from Alaska to the United Kingdom and then further to Poland. Probably, the F-22s will remain in Europe until the end of the year 2022.

Deployment to Norway: There was a temporary ACE deployment to Norway, a so called Agile Combat Employment. And there was a participation in the 'Viking Belt' exercise.

Deployment to Spangdahlem: During the deployment to Lask AB, some hot-pit-refuel missions were flown to Spangdahlem AB in Germany. After landing, the F-22s were refueled and they left right after that.

Deployment to The Netherlands: From 16-19 October 2022, four F-22 Raptors forward deployed to Leeuwarden Air Base, Netherland. The landing on a Sunday afternoon, brought many aviation fans to the northern part of the Netherlands, to witness the arrival. On 19 October, the F-22s returned to Lask AB in Poland.

Various NATO missions: Besides missions with the Polish Air Force, missions were flown with USAF B-52 Stratofortresses, Turkish F-16s, French Rafales, Italian Eurofighters and US Navy EF-18G Growlers (temporarily deployed at Spangdahlem AB).

F-22A Raptor

The Lockheed Martin F-22A Raptor is an American single-seat, twin-engine, all-weather stealth tactical fighter aircraft developed for the United States Air Force. As the result of the USAF's Advanced Tactical Fighter (ATF) programme, the aircraft was designed as an air superiority fighter, but also has ground attack, electronic warfare, and signals intelligence capabilities. The prime contractor, Lockheed Martin, built most of the F-22's airframe and weapons systems and conducted final assembly, while Boeing provided the wings, aft fuselage, avionics integration, and training systems. The F-22 is a critical component of the Global Strike Task Force, and is designed to project air dominance, rapidly and at great distances to defeat threats. A combination of sensor capability, integrated avionics, situational awareness, and weapons provides

first-kill opportunity against threats. The F-22 possesses a sophisticated sensor suite allowing the pilot to track, identify, shoot, and kill air-to-air and cruise missile threats. In 2017, some USAF F-22 aircraft brought short visits to European airbases and in 2018 a deployment of F-22s took place to Spangdahlem AB in Germany. During this deployment in Germany, visits to various European airbases were made, like to Italy and Romania.

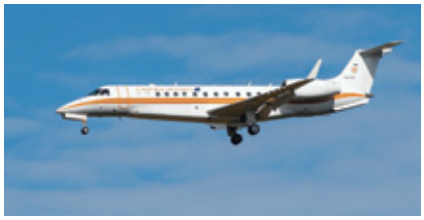
Report by: Joris van Boven and Alex van Noije
Photos: Joris van Boven

World leaders gather for Queen Elizabeth II funeral

One of five Boeing 747's landing at Stansted was of Qatar government

South African Air Force Boeing 737 BBJ on finals at Stansted

One of the C-32A's that arrived together with Air Force 1



The Cyprus Air Force took delivery of this ERJ-135 only 3 weeks before arriving at Stansted

The Japanese Air Force arrived with this Boeing 777, after a long flight from Japan

The Kuwait Government A-340 arrived on Sunday afternoon

Queen Elizabeth II was the beloved Queen of the United Kingdom and same say the world. After Elizabeth's father, King George VI, died on 6 February 1952, Elizabeth acceded to the throne of England that same day. The official coronation and crowning took place on 2 June 1953. After fulfilling her duties for more than 70 years, the Queen died on 8 September 2022 at the age of 96, ending the longest reign of a monarch in British history. Planning of the funeral already started several years ago, under the codename "Operation London Bridge". Everyone involved knew the importance of the event and the amount of effort it would take to get all the details right. It took a lot of precision to secure the extraordinary level of action required by all arms of the British state, including a vast security operation to manage unprecedented crowds and travel chaos that could happen.

The funeral took place 10 days after the Queen passed away, on 19 September 2022. Around 500 foreign dignitaries were attending the service at Westminster Abbey and descended on the United Kingdom's capital to pay their respects to the late monarch, as the country prepared to say goodbye in grand style to its head of state for seven decades. Leaders touched down over the weekend ahead of royal funeral and a reception hosted by the new King Charles III on Sunday night. The State funeral involved the biggest security operation the British capital had ever seen. The funeral of the only monarch most Britons have known was expected to bring central London to a standstill.

The foreign dignitaries that made it to the UK were asked to travel as much as possible on commercial flights, in order to prevent airports around London to become overloaded. The magnitude of extra flights, transportation from the airports into London and the security of the transport was immense. The main airport for arrivals was Stansted Airport, situated 40 miles north of Central London. Other airports used during the weekend leading up to the funeral were Gatwick Airport, Luton Airport, Farnborough Airport, Birmingham Airport and RAF Northolt. Due to different restrictions on size and number of aircraft,

The Morocco delegation arrived in a government Boeing 737 BBJ

The Nigerian government Falcon 900 arrived around sunset on the Saturday before the funeral

The Namibian government arrived with their Falcon 7X

The second Brazilian plane, a VC-2 (ERJ-190) arrived just after the Brazilian president

This South Korean Air Force B-747 has been in use for little over a year now replacing an older

With all the problems in their country the Ukrainian government still made it to this important event. They arrived in their Airbus 319

it was not possible to gather all of them in one place.

Invitations to the funeral were sent to heads of state of nearly every country in the world except Syria, Venezuela, Afghanistan, Russia, Belarus and Myanmar. Most of these for obvious reasons. Already on Friday, flights with foreign dignitaries started to arrive. Canada and Australia arrived with multiple planes, with Australia providing a ride to leaders of different countries within their region. With the limited space at some of the airports, for some it was just a quick drop off and go again with a return on the Monday after the funeral. For plane enthusiasts, this was an opportunity to see a rather large gathering of the "big boys". The Boeing 747 is not flying around with many airlines anymore nowadays. Stansted alone hosted five 747's in different configurations, including Air Force 1, which brought American president Joe Biden. Newer heavies came in the form of Boeing 777's, with India's VIP aircraft bringing President Droupadi Murmu and Foreign Secretary Vinay Kwatra. President Jair Bolsonaro arrived in an Airbus A-319 which was accompanied by an Embraer E-190. Unfortunately, he used the Queen's funeral more as a political platform for his re-election campaign and was more focussed on that during the weekend. The most significant contribution of hardware came from the United States. With the president arriving it is never a light visit. Already in the week leading up to the funeral, several transport planes arrived across the United Kingdom. A total of seven Boeing C-17A Globemasters arrived to bring various equipment, including a number of Sikorsky SH-3D Sea Kings from the Marines as well as the presidents' motorcade, including "the Beast". A further 3 Boeing C-32A's arrived together with Air Force 1 as well as a Boeing E-4B, which is always accompanying the president and acts as an Advanced Airborne Command Post.

The funeral and military procession before and after can be marked as a show of the power of British tradition and pageantry. No country other than the UK could put on such a spectacle. Not a single person out of step. Trumpets, drums, bagpipes, all heralding the end of an era.

Text and photos: Erik Bruijns

Brazilian Air Force VC-1 (or Airbus 319) brought the Brazilian president on Sunday morning

Boeing 777 of government of the United Arab Emirates was one of many heavies landing at Stansted

A Senegal government Airbus 320 arrived on Sunday afternoon

Biden arrived on the Saturday at the end of the day with the well known VC-25A, also known as Air Force 1

Embraer KC-390 'Millennium' at Eindhoven AB

On 10 September 2022, an Embraer KC-390 landed at Eindhoven AB (ICAO EHEH) in the Netherlands. This Embraer KC-390 company demonstrator was traveling in Europe and this time it stayed a few days in the Netherlands. The Royal Dutch Air Force ("Koninklijke Luchtmacht") is currently flying 4 Lockheed C-130 Hercules aircraft and the Embraer C-390M is the anticipated replacement of the Hercules, with 5 aircraft. On 12 September, a test flight was performed overhead the Netherlands with the commander of the Dutch Air Force, Lt-Gen Dennis Luyt onboard. The Netherlands is the 3rd European country to select the Embraer C-390, following Portugal and Hungary. For the Netherlands, the C-390 'Millennium' will not be the KC-390 for air-air-refueling as there is a large Airbus A330-MRTT fleet based at Eindhoven AB. The C-390 will be used solely as transport aircraft.

Text and photos:
Joris van Boven and Alex van Noije

Exercise Saber Junction

7th Army Training Command

United States Army 7th Army Training Command (7 ATC) is responsible for three brigades, five exercises and five organisations. It is headquartered at Tower Barracks in Grafenwöhr, Germany. Of its three brigades, the 2nd Cavalry Regiment is based at Vilseck. Its Stryker Brigade Combat Team deployed throughout Europe for training or based on operational requirement. The 41st Field Artillery Brigade is based at Grafenwöhr and provides for long range, precision fires. The aviation battalions report to the 12th Combat Aviation Brigade (CAB) which is headquartered at Ansbach. Its battalions and companies are stationed at Ansbach (1-3 ARB, AH-64D Apache and B/1-214 GSAB, CH-47F Chinook), Grafenwöhr (C/1-214 GSAB, HH-60M) and Wiesbaden (A/1-214 GSAB, UH-60M and E/1-214 GSAB, C-12U3, UC-35A). Annually, five exercises are conducted by 7 ATC. One of these being Saber Junction. Of the five organisations, the only Combat Training Center located outside the United States reports to 7 ATC. The Joint Multinational Readiness Center (JMRC) is based at Hohenfels and provides several Observer Coach Trainers (OCT) Teams to ground and aviation assets trained at the Grafenwöhr and Hohenfels training areas. Its 1-4 Infantry Regiment acts as opposing force. Team Falcon the aviation unit based at Hohenfels provides an OCT Team flying with the 'blue' units for both as well as provides opposing force flying red air missions.

Saber Junction

Saber Junction assess readiness of the US Army's land forces in Europe. One of these units is the 173rd Airborne

Brigade "Sky Soldiers" (173 AB) which is headquartered at Vicenza, Italy. Part of the brigade is stationed in Germany. Its main task is it to provide rapid (airborne) forces to the United States' European, Africa and Central Commands areas of responsibilities. Since 2020, the 173 AB reports to the headquarters Southern European Task Force (SETF). Exercise Saber Junction annually takes place in the August-September timeframe.

Saber Junction 2022

Saber Junction 2022 witnessed the 173 AB deployed to Hohenfels to conduct its annual training together with partner nations. This year's editions saw approximately 4,400 participants from Albania, Belgium, Bulgaria, Italy, Georgia, Hungary, Kosovo, Lithuania, North Macedonia, Romania, Slovakia, Turkey, United Kingdom and the United States. Joining 173 AB was the HQ SETF. Commanded by Col. Timothy Shaffer, Africa Director of Operations, the HQ team supported the Sky Soldiers while receiving valuable in the field training themselves.

The exercise was kicked off by paratroopers being dropped by USAF C-130 Hercules and C-17 Globemaster III transport aircraft. Either flying from Ramstein AB, Germany the 37th Airlift Squadron (C-130J.30) or Aviano AB, Italy (C-17A) the airlift squadrons flew several missions dropping paratroopers and equipment. The battalions of 12th CAB supported the fight with close air support and reconnaissance (Apache), air assault (Blackhawk and Chinook), medevac (Blackhawk).

Several scenarios can be trained on the large Hohenfels training area. This year it saw Romanian soldiers tasked to capture an airstrip and defend it until they were reinforced by the infantry

battalions assigned to the 173 AB. During a media day, the brigade demonstrated its air drop capability together with their 37 AS colleagues. Members of the Headquarters Battery, 4th Battalion, 319th Airborne Field Artillery Regiment, 173rd Infantry Brigade Combat Team-Airborne were dropped into the exercise area. After securing the perimeter, 37 AS air dropped a M1097 HMMWV (High Mobility Multipurpose Wheeled Vehicle - Humvee) vehicle with a M119 Howitzer. Unfortunately, due to weather circumstances the para drop was cancelled. It meant a bus ride from Ramstein to Hohenfels for the soldiers.

After their arrival at the drop zone, they continued their assigned mission. With the weather clearing, it was possible to drop the Humvee and the howitzer. It took roughly 15 minutes to the soldiers to remove the protective material and get it ready to fire the first shots. Later in the evening, a formation of three C-17's departed to Aviano AB to para drop the infantry battalions on the DZ. Meanwhile, 12 CAB was operation out of a Forward Armin and Refueling Point. Blackhawk and Chinook helicopters flew to other locations on the range. The next day, support missions were flown during the early afternoon, followed by an air assault mission in the late afternoon and evening.

The early afternoon mission saw a Chinook and three Blackhawks departing to the range which is referred to as the box. While a flight of four Apaches assigned to B/1-3 ARB "Warlords" was preparing for take-off a 'green' Lakota assigned to team Falcon arrived. Of the eight assigned UH-72's four were used by the OCT Team (green) with the other four camouflaged (yellow) helicopters being used to act as enemy Mi-24/Mi-35 Hind helicopters. The Apache pilots planned and executed their mission which was evaluated by the OCT's. After returning from the mission, the pilots received feedback on the things that went well and improvements which can be made. They can relay their lesson learned to their colleagues.

Saber Junction next year

This year the exercise ran from 29 August until 20 September. With another year of lessons learned, the 173 AB can continue its high state of readiness and share its knowledge and its experiences with allied (airborne) colleagues during other training events in Germany, Italy and Eastern Europe. Next year, they will return to Hohenfels facing new training objectives and train interoperability with other allied army units.

The author wishes to thank Maj. Hernandez 7 ATC and Maj. Ambelang JMRC for their hospitality and assistance.

Article and photos: Manolito Jaarsma
Instagram: Phantomaviation &
Twitter: @Phantomaviation

Air Marshal (R) Harish Masand says...

I learnt more than flying from them: PRATAP RAO

Perhaps a little late in life and my service career, I first met Pratap Rao when he was a Squadron Leader and serving as an Air Force Examiner in the prestigious Aircrew Examining Board (AEB) based at Hindan outside Delhi. I had just finished my flight instructors' training in the School by that name in Tambaram, Madras (now Chennai) in June 1974 and had been posted as a lowly and raw Category C instructor to the Air Force Academy (AFA) at Dindigul off Secunderabad. The Officers' Mess in AFA had not been commissioned till then and all of us single officers had been billeted in the Cadets' Mess. Within a few weeks of arrival at AFA, suddenly the Mess staff was abuzz with the news of an Air Force Examiner who had just arrived and was also accommodated in the Cadets' Mess along with all of us. Some of the senior unmarried instructors in the Mess also spoke in hushed tones about this examiner who had come, perhaps to evaluate their instructional abilities and categories, which concerned them more than a bit. While we, Category C instructors, were not truly affected unless we were picked at random to fly with him for standardisation purposes, we were still mindful of our behaviour in the Mess so as not to give any wrong impression to this senior officer. As a natural courtesy, we avoided using the community toilets and bath of the Cadets' Mess when he was around and till he had finished. Fortunately, I think our timings were different so we had no major problems on that issue.

Popularly known as "Mickey" Rao, as I learned from others, for reasons which I got to confirm much alter as to why he had acquired the pet name of Mickey, I soon bumped into him in the corridor of the quarters one early evening. Totally contrary to the mental image of an instructor-eating examiner, I found "Mickey Sir" to be very easy-going with a very soft voice and a perpetual hint of a smile. For some inexplicable reason, my mind immediately went to Paul Newman in the movie, Cool Hand Luke, even though Mickey Sir had

little resemblance to Paul Newman or his role as a convict in that movie. Certainly, there were no blue eyes but the inner strength and calmness came out clearly to me in that short meeting. My pet name, thereafter, for Mickey Sir was "Cool Hand Luke" or CHL for short which many others picked up and used particularly when he was commanding 101 Squadron. After a brief conversation in the corridor that evening in which CHL spoke little and in very soft tones, he invited me to his room where I spent a few more minutes essentially doing most of the talking by way of introducing myself, apart from a brief mention of Squadron Leader Bhadkamkar, who was obviously a friend of CHL, and with whom I had the pleasure of flying in Hasimara just after the 1971 War when he had visited the squadron as an inspector from the Directorate of Air Staff Inspection (DASI).

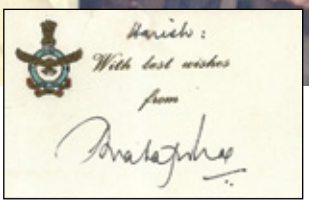
Our paths were fated to cross again soon and in July 1975, I landed up in 17 Squadron at Halwara on MiG-21Ms. Sqn Leader Mickety Rao was the senior flight commander of the Squadron under command of Wing Commander Jasjit Singh and I now had the opportunity to see CHL in action at close quarters for a longer period even though he was marking time to take over command of a squadron on promotion. I also had the good fortune of meeting Mrs Suman Rao at that time, though briefly since they soon moved next door to Adampur to command 101 Squadron. CHL Sir was imperturbable as ever while the entire Rao family seemed to carry the trait. Even Mrs Suman Rao always had a bigger smile than CHL and was ready to laugh at the slightest in everything in life or to make fun of something in a subtle way with tongue in cheek. Before they left 17 Squadron, I finally got the opportunity to fly with CHL Sir in a trainer for an Instrument profile which was the 13th, lucky though for me, exercise in the conversion syllabus. Before the sortie, CHL coolly just asked me if I knew what the profile was and when I said yes, he just said, "Let's go do it then". The tricky part in that profile, which I was doing for the first time, was an accelerating climbing turn through 180 degrees where you had to achieve the Mach number, the height and the turn precisely. If I remember correctly now, it was from 7 or 9 km to 11 km altitude through 180 degrees achieving a Mach number of 1.1 as you levelled out at 11 km while finishing the turn. CHL kept absolutely quiet throughout the sortie and when we landed, all he said in his typical laconic fashion was, "Get your flying hours and I will give you an MG". I see from my log book that this sortie was on 3 October 1975 and Mickey Sir left for 101 Sqn soon after that.

As I had described in one of my earlier articles on Jasjit Singh, I was to leave 17 Sqn as soon as I got my Ops status, an issue that Jasjit Sir was upset about. I am not certain but, perhaps, Mickey Sir had something to do with it since 101 those days was a training sqn for young pilots on MiG-21Ms (Type 96) and I was a Cat B instructor. So, in early December 1976 as soon as I got my operational status on the aircraft, I was transferred to 101 Sqn in Adampur. This was my second tenure in that squadron and base where I had spent a year in 1973 on Su-7s. This posting gave me the opportunity to work under Mickey Sir, and for Malini to properly meet both Mickey Sir and Mrs Suman Rao even though we had just visited 101 for the Squadron anniversary party in late November and had met them briefly. In Halwara, Malini had joined me much later after the Raos had moved on because of non-availability of married accommodation for almost a year till mid-1976. In between, I had also done a short temporary duty in Adampur as a member for a court martial earlier and had called on the Raos on my own.

Without any formal checks or delays, Mickey Sir immediately put me in charge of the training for young pilot officers converting on MiG-21Ms in the squadron with Flight Lieutenant "Charlie" Verma to assist me in this effort. He never interfered in the training programme that I formulated. This first included a revision of the technical information and Pilots Notes of the aircraft on the ground for a week or so before we commenced the conversion training for these pilots. All Mickey Sir did was fly with one of the younger pilots at random to see for himself what we taught these people. All this was done in a very easy and non-intrusive manner with never a frown on his face or any adverse comments. As a matter of fact, he was quite amused and laughed when he heard how Charlie had tried to install some financial discipline in the pupils by exhorting them to save more by putting more money in the provident fund than the minimum required. I had stayed away from this kind of talk since I was myself putting in the minimum and living hand to mouth while trying to live life to the fullest. That was hardly a financial management example for the younger folks. When Charlie asked the pupils what they were contributing, they shocked all of us with amounts that were many times more than any of us was contributing for a rainy day. Hearing their amounts after a long lecture by Charlie on this subject, all of us were actually in splits. He was also very patient with the trainee officers, who, like me in the earlier days, questioned the need for some patterns or training restrictions for them. I recall one trainee pilot who questioned the need for a standard circuit pattern for landing. When all explanations for the need, especially at the early stages, failed to convince him, CHL Sir told me to take him up for a trainer ride and let him come in for a landing from various non-standard points or timings. Sure enough, after messing up a few of these approaches, the trainee pilot never spoke on this issue again.

A similar and serene atmosphere seemed to prevail in the whole squadron, on the tarmac or dispersal as well as the Airmen's Mess and billets due to the calm and fatherly way Mickey Sir handled people under him. I never heard him raise his voice on anyone, much less shout, regardless of the issue or the mistake the person may have made. As a matter of fact, the way he treated everyone in the squadron, down to the lascars, everyone did their best to please the "CO Sahib" lest he ever lost his smile or cool. It never ever got to that stage, impurtable as he was. The men worked in a similar fashion willingly and happily to meet the tasks regardless of the hours with a smile on their faces and I never saw a grumpy face or heard a complaining voice. I thus learned that such equanimity comes from self-confidence and there were certainly no doubts on Mickey Sir's professional capabilities. The squadron flew well, meeting all its tasks as also serviceability targets, without any major problems or incidents that I ever heard of. Mickey Sir put his trust in his subordinates and nobody ever betrayed his trust or let him down. He just had innate faith that we would check everything very carefully on our own and perform while exercising due caution. Mickey Sir had also put me in charge of the Airmen's Mess for a few months and I used to be a regular in the Mess to check the rations, quality of food as also their finances. Dining with the men and sharing some time with them, all I heard were some jokes and light banter with never a complaint. Of course, there were suggestions for improvement in the facilities available and CHL Sir did whatever he could within the resources of the squadron and the base, through his great relations with the Commander, to address these issues. As I observed, even the AOC, Air Commodore Dennis LaFontaine, treated Mickey Sir and 101 Sqn well.

During the squadron anniversary functions, including the "Pagal Gymkhana", the spirit and enthusiasm to participate and do well in everyone was so evident. I carried this impression of the approach with its results, in terms of the output along with bonhomie, through my later career. Of course, it was difficult to emulate CHL in every aspect since that is something that came from within him and his inner resolve and strength. Not every individual is blessed with those qualities. Mrs Rao, in a very similar fashion, kept all the wives in fine spirits and got them to participate in every activity where they could contribute. I still recall how she convinced Malini to do a Charleston while also teaching one of the daughters, Amanda Daniels, to accompany her in the station party. The Rao's treated all of us with clear affection and the response with respect was natural and automatic. After meeting Malini and learning that she was a Bengali, CHL Sir started calling me "Harish Babu" in his inimical manner, something that he has carried till date even after Malini left us. Due to all this



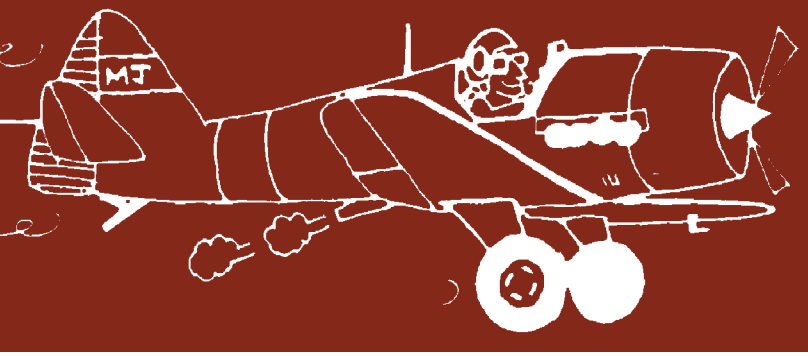
and their treatment, our relations have remained strong and continued even after Mickey Sir handed over command to "Rondy" Raina in July/August 1977 despite the long breaks in between meetings due to the different assignments and different paths we went on.

Many years later, I had the proud privilege of flying CHL Sir in a MiG-29 in Poona on 22 March 1989 when I was commanding 28 Squadron and he visited the station as Director Intelligence. As usual, he kept absolutely cool when I displayed a couple of my crazy manoeuvres and enjoyed the ride in that wonderful aircraft. During the customary tea party on Air Force Day in the Chief's house on 8 October1989, we had a sombre evening due to the loss of Joe Bakshi in a Mirage-2000 that morning during the display. Malini and I were standing under a tree, far from the crowd, when Rajiv Gandhi, the Prime Minister, walked across to us and spent over 30 minutes chatting, generally about flying but also the recent crash of Anatoly Kvotchur's MiG-29 at the Paris Air Show and Joe Bakshi's accident that morning. Nobody really disturbed us, not daring to barge in on the PM, but photographers had a field day, I think. Mickey Sir sent me a couple of those photographs with a note in his fine handwriting. I am attaching these with the note to show what an amazing hand he had, like everything he did. In mid-1990, while he was still D Int, he broke the news to me about having been selected as the next Military Naval & Air Attache (MN&AA) in Turkey just when I had finished over a year as Chief Operations Officer in Adampur as a Group Captain. Unfortunately, he moved on soon as the ACAS Inspections and while I was attached to Directorate of Intelligence at Air HQ for briefings and preparations for Turkey in early 1991, that was not to be and, finally, I didn't make it to Turkey. Anyway, that is another story unconnected to Mickey Sir though I did miss him as the D Int then. I did meet the Rao's frequently though when he became the AOC-in-C Western Air Command and then the Vice Chief, when I was handling the MiG-21Bis upgrade programme as the Director Aircraft Upgrade in Air HQ on the 4th Floor, a floor below him. Unfortunately, he retired in mid-1995 and was not around when I finally managed to have all the contracts signed on 1 March 1996. Soon, however, I caught up with the Rao's in Poona, where they had settled down after retirement, when I took over the station in January 1997. In that tenure, we spent a lot of time with the Rao's as well as the Palamkots, Macky and Naushad, since they got along well and were generally together.

Since then, somehow, fate brought us together on many occasions and we have always cherished the time they take out for us and we spend together. Generally, that meant a meal whenever we were in Poona even after I retired. Once, we had a chance meeting in De Gaulle airport when all of us were returning from the US and catching the same Air France flight back to India after a break in France for sightseeing. In that encounter, we were also fortunate to see ONJ, my favourite female vocalist, or someone who looked uncannily like her, in person at the airport while she was also waiting for her flight, perhaps back to the US. Air Marshal Pratap Rao and Mrs Suman Rao have always been wonderful hosts and Malini, later even Amrita, and I have always had fun times while visiting them. He still calls me "Harish Babu" in jest which keeps us reminded of our past association and, of course, of Malini without even mentioning her passing. I personally have had a great time with a commander, mentor and guide like Mickey Sir though I suspect I did give him some anxious moments at times. But, then Mickey Sir has always been unflappable enough to handle those moments like the Cool Hand Luke he is.

Pratap and Suman Rao

Ancient Aviator Anecdotes



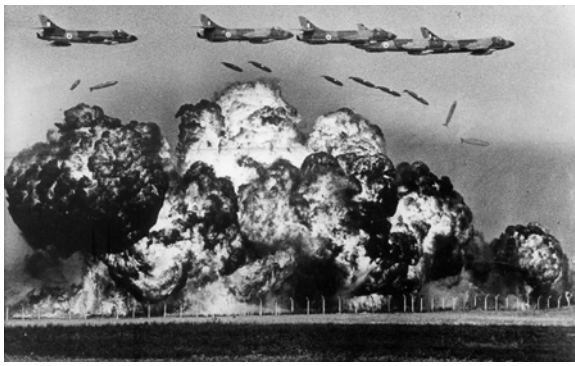
"The History Division of the MoD has decided to publish a book on "Winners of the MVC" and have requested the few surviving recipients of this gallantry award to provide a first person account of their individual activities in the 1971 Indo-Pak war in 300-500 words".

Air Vice Marshal CV Parker MVC VM (4346) F(P)

Air Vice Marshal C.V. Parker (Retd) holds a picture of the president conferring him the Maha Vir Chakra award in January 1972. In the backdrop are his medals and a picture of the Hunter aircraft he flew when he attacked Pakistan's deepest air-base in Peshawar (photo: Deccan Chronicle)

In 1971, as a Wing Commander, I was the Commanding Officer of No 20 Squadron AF, equipped with Hunter Mk 56A aircraft which had extended range. We had two such squadrons and both were relocated to Pathankot months before 1971 Indo Pak war. My squadron was tasked with counter air operations, targets of economic significance and close air support to our land forces; I trained my squadron accordingly. On the late evening of 3 December 1971 the PAF attempted a pre-emptive strike but all my serviceable aircraft were at safe night harbour at a rear base. I was alone in Pathankot with the young pilots and received the first mission orders to attack the PAF base at Peshawar at sunrise on 4 December 1971. This enemy air base had never been attacked before by our fighter aircraft. I was authorised to borrow two aircraft from our sister squadron till my own aircraft returned. I selected one of the two young pilots, briefed him, and we were airborne in the dark for a gun strike.

We routed low level and came in for the attack from the west destroying a single aircraft linked to a refueling bowser; my wingman hit a fuel dump. The airfield was being defended by a CAP of two or more Sabre aircraft who followed us on our return leg; in a brief aerial encounter I managed a fleeting attack on one while my own aircraft was also damaged but we both landed back safely at our base. Late that evening I took off alone for the PAF base at Mianwali armed with two special container bombs on my outboard pylons. Due to a technical malfunction, one of them fell off and I had to jettison the other. On 6 December 1971 I led a four aircraft gun strike on the PAF air base at Chaklala en route to the Attock Oil Refinery which was set on fire. On 7 December 1971 I led another four aircraft gun strike on the PAF airfield at Murid where we spotted only one aircraft but many vehicles which we destroyed. On 8 December 1971 Attock was revisited but the refinery was still a singed black area. On 10 December 1971 we switched to close air support and, in response to an SOS from our land forces I led a two aircraft bomb strike on an enemy gun position in the Chamb area which we neutralised. On 11 December 1971 I led an eight aircraft napalm bomb attack at last light in a forest area south of Akhnoor where enemy armoured vehicles had sheltered. On 12 December 1971 we received orders to return to a rear base for R & R while another squadron relieved us.



On our return to Pathankot after the cease fire on 16 December 1971, my MVC was announced which, added to the many honours and awards won by my officers and men, made No 20 Squadron the most highly decorated squadron in the IAF.

Text by Air Vice Marshal CV Parker, Secunderabad, October 2022
(Photo of Hunters for representational purposes only)

25 Years Back

From Vayu Aerospace Review Issue VI/1997

First of New 737s For Jet Airways

Jet Airways, India's largest private domestic airline—and one that is aggressively defining India's burgeoning aviation industry—took delivery on 2 November of its first purchased B-737-400. Jet Airways announced in December 1996 its intention to order six Next-Generation 737-800 and four 737-400 twinjets. The 737-400 delivered represents the first delivery in the stream. These airplanes will complement Jet Airway's existing fleet of 15 Boeing 737s previously acquired through leasing arrangements.

BA And Jet Air Global Check-Ins

British Airways and Jet Airways have announced a through check-in service at all Jet Airways destinations in India and on the British Airways global network. The new service is aimed at providing seamless and time-saving travel to passengers travelling to and from India - available from all Jet Airways destinations in India for passengers connecting on to British Airways flights from Mumbai.

Trishul SAMs Test-Fired

Developed under the Integrated Guided Missile Development Programme (IGMDP), two test-firings of Trishul SAMs took place on 25 November from the Chandipur Interim Test Range (ITR). In fact, these were the second and third Trishul's launched during the week, the first missile launch having taken place on 22 November.

The `Meghdoot' Team

The National Skydiving Team `Meghdoot' was inaugurated by the Chief of Air Staff, Air Chief Marshal SK Sareen, on 26 November at the Hindon airbase of the IAF. The team has been formed under the auspices of the Aero Club of India, the apex body governing all aero sports in the country. The ACI works under the charter of the Federation Aeronautique International, the apex body governing all aero sports in the world. The International Parachute Commission is the specialist body of the FAI providing Sports Parachuting.

Army Chetak Loss

Indian Army Aviation suffered another fatal air mishap on 14 November 1997 when a Chetak helicopter of 21 (I) R&O Flight from 4 Corps Army Aviation Base crashed in high mountainous terrain in the Kameng area of Arunachal Pradesh (NEPA). Taking off from Tawang, on board the Chetak were Mr. Somu the Minister of State for Defence, Major General Ramesh Nagpal, GOC 5th Mountain Division and the air crew, Major Pragyesh C. Sharma and Major Pradeep K. Agarwal. There were no survivors.

The New INS "Delhi" Commissioned

The Indian Navy has acquired another great sea borne asset, one which is bristling with various guided missiles, as also Sea King ASW helicopters. The new acquisition INS Delhi is the latest state-of-the-art, indigenously-built ship, commissioned by Admiral Vishnu Bhagwat, Chief of the Naval Staff, at Bombay on 15 November 1997. INS Delhi is essentially a guided missile destroyer with gas turbine propulsion and multirole capability, one of the three ships to be indigenously built under 'Project 15' which was conceived during the mid-'80s.

Germany Finally Orders Eurofighter

On 8 October, the German Bundestag finally cleared procurement documentation which formalises the German cabinet's approval of the Luftwaffe request to procure 180 Eurofighter 2000s. This was later endorsed in mid-November when the 1998 Budget was considered. First delivery of the 140 EF 2000s will begin in 2002, to be used for re-equipping JG-73 at Laage, and this Squadron will be followed by JG-74, JG-71 and JG-72. The further 40 EF 2000s will be delivered after 2012 to replace a wing of Tornado strike aircraft.

Turkish F-16s in Pakistan

During Pakistan's Golden Jubilee Anniversary celebrations, the PAF mounted an aerobatic display at Chaklala airport on 7 September 1997, flying various types including the F-16, F-7P, A-5 and Mirage III. As an expression of solidarity and gesture of good will, four Turkish Air Force F-16s also carried out an aerobatic display, led by Major Ibrahim Jan. The F-16s belonged to 181 Filo (Squadron) from Diyarbakir.

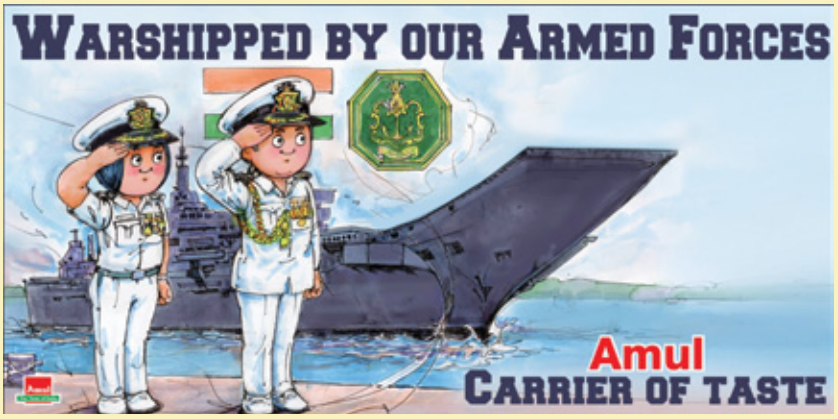
Italian Air Force to Acquire A319CJ

The Italian Air Force is to buy two Airbus A.319 Corporate Jets (CJs) to replace its two McDonnell Douglas DC-9 VIP transports. The service, which has been operating the two DC-9-32s since 1974, has signed a letter of intent to purchase the two A319CJs, worth some Lira 130 billion ($ 80 billion), for delivery in 1999. It has also placed an order with Dassault Aviation for two Falcon 900EXs to replace its decade-old Gulfstream IIIs.

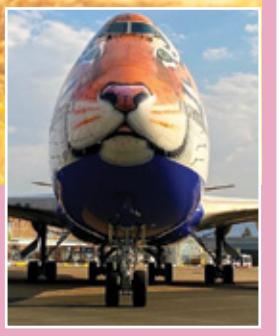
Tale Spin

Amul always top of the game!

India's first indigenous aircraft carrier Indian Naval Ship (INS) Vikrant was commissioned at Cochin Shipyard Limited (CSL) on 2 September 2022. By the evening, Amul ads were on display! "Utterly Butterly Delicious" for sure.




(Photo: @IndiainNamibia)



Nosejob anyone?

India's Prime Minister released wild cheetahs, which had become extinct from India, in Kuno National Park. The cheetahs, brought from Namibia, are being introduced in India under Project Cheetah. We love the paint job! An especially painted and customised jet did the honours by bringing the cheetahs to India.

Who would have known?

Air India says Air India Express and AirAsia India to be merged as single low-cost carrier. Seen here is an image taken in 2015 of an AirAsia India jet- who would have thought that in 2022 this would be apt and a reality? A full circle is on its way for the Tata Group and Air India.

From AAM to SAM

Seen at Defexpo 2022: IAF AAMs that normally equip most of its combat aircraft fleet have found a new role that of SAMs or surface to air missiles. We assume these have been replaced by more modern and upgraded versions for the IAF. So instead of junking them, bring them to life again but in a new avatar!

Afterburner

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

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