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Aerospace & Defence Review

II/2024

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Cover : IAF's Suryakiran Aerobatic Team and its Hawk Mk.132 (Photo by Phil Camp)

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Admiral Arun Prakash says....

Missing a maritime doctrine

India–Maldives Row Frames the need for India's Long Neglected Marine Doctrine

The incipient tensions between India and its tiny neighbour, Maldives, simmering for over a decade, finally came to a head when three junior ministers of the island nation's government made crude and disparaging remarks on social media about Prime Minister Narendra Modi's visit to the Lakshadweep islands. Once New Delhi conveyed its displeasure over this gross impropriety, the Maldivian government distanced itself from the remarks, and President Mohamed Muizzu "suspended" the errant ministers before departing for his maiden visit to Beijing.

While it may be tempting to dismiss this contretemps as a "storm in a teacup," there are a few dimensions to this episode, with implications that go beyond the transgressions of juvenile politicians. They could serve as lessons for the future.

First, the strategic dimension. The Maldives archipelago, consisting of 27 coral atolls dispersed north–to–south over 900 km of the southern Indian Ocean, with an exclusive economic zone of nearly a million square km, is an important element in India's maritime security matrix. While the Indian Navy (IN) has taken cognisance of this in formulating its doctrine and deployments, our decision–makers have continued to suffer from a "continental fixation", and in the absence of a national security strategy, our maritime initiatives have remained random and sporadic. As far back as 1945, India's "oracle of maritime wisdom," K M Panikkar had pronounced that "an exclusively land–based defence policy for India will, in future, be nothing short of blindness... India's freedom will hardly be worth a day's purchase if Indian interests in the Indian Ocean are not defended." He had accurately predicted: "That China intends to embark on a policy of largescale naval expansion is clear enough... with her bases extending as far south as Hainan, China will be in an advantageous position..." It also bears recalling that the British had maintained a Royal Air Force base on Maldives' Gan Island since 1942, which they vacated with reluctance only in 1976 and then moved 200 miles south to their Indian Ocean territory of Diego Garcia.

Second, our diplomatic approach to Maldives (and perhaps other neighbours) needs scrutiny. Politics in Muslim majority Maldives has been influenced, as much by hyper nationalism and religious fervour, as by the India–China rivalry. Alarms should have rung in the MEA as early as 2011 when the relationship actually started fraying. A blunt signal was the peremptory cancellation of a contract to develop Male's international airport awarded to Indian conglomerate GMR, driven ostensibly by Opposition charges of "compromise of national sovereignty". But some questions remain unanswered: Did New Delhi receive a warning of emerging hostility from its Male representatives? If so, was anything done to stem the slide in relations?

While China's politico–economic seduction, coupled with Pakistan's

An innocuous tweet of PM Modi started a storm

religious incitement, using the "Islamic card", has no doubt played an important role in alienating Maldives, there is room for introspection on India's part too. Given its population of just half a million, Maldives is Asia's smallest country and hyper–sensitivity to "big–brotherly" attitudes is to be expected. Anecdotal evidence suggests that Indian diplomats often arouse resentment, especially in neighbourhood capitals, by their condescending attitudes, over–emphasis on India's cultural dominance and projecting a "viceroy's" rather than envoy's image. When coupled with India's ongoing churn, wherein communal "hate speeches" are often seen going unchecked, the overall picture for neighbours could not be an attractive one.

Third, as India and China vie for influence in the Indo–Pacific, we need to shift exclusive focus from border disputes to the larger geopolitical competition. In the Indian Ocean Region, China suffers from the "tyranny of distance." For example, Male is about 6,000 km from the nearest Chinese port of Hainan and only 700 km from Kochi. To reach Male, a ship, at 15 knots, would take just a day and a half from Kochi and more than 10 days from Hainan.

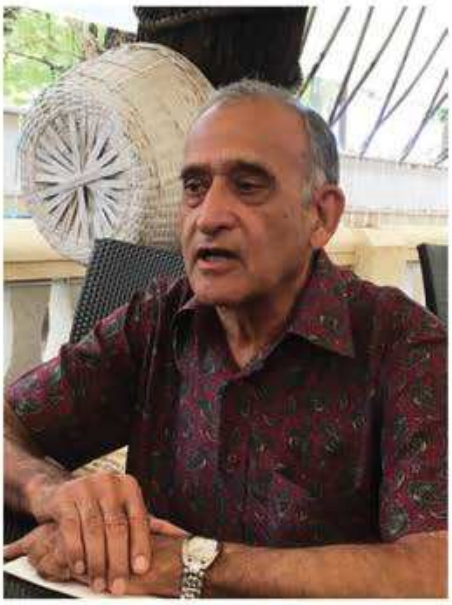
The distinct advantages of having a friendly neighbour next–doors should have become obvious to Maldivians during the 1988 abortive "coup d'etat", the 2004 tsunami, and the 2014 drinking water crisis, when the Indian Navy was the "first responder" in each case. One is confident that India's good–neighbourly attitude will endure, regardless of transient diplomatic hiccups.

However, China being the world's largest trading nation, has its own compulsions. Its economy and industry, being overwhelmingly dependent on the uninterrupted passage of seaborne trade, have rendered the country's Indian Ocean sea lanes akin to a "jugular vein," to be protected at all costs. It is to this end that Beijing has developed potential maritime footholds in the Indian Ocean Region, like Hambantota in Sri Lanka and Gwadar in Pakistan, and leased a military/naval base in Djibouti. Herein lies the imperative of checkmating India to enlist Maldives as an IOR ally.

As a final corollary to the Maldives episode, one would urge better exploitation of the potential of maritime diplomacy – not as a substitute, but as a vital instrument of conventional diplomacy. The "diplomatic role" is the second of four roles assigned by the Maritime Doctrine to the Indian Navy, its larger purpose being, "to favourably shape the maritime environment in furtherance of national interests, in consonance with the foreign policy and national security objectives."

For decades, the Indian Navy would receive urgent requests from maritime neighbours, for training, naval presence, advisers and hardware. Very often, we had to disappoint them, due to bureaucratic impediments, and lack of funding. Finally, in 2005–06, the Naval HQ, on its own, created an organisation headed by a two–star admiral devoted to foreign cooperation. Patrol boats, aircraft and helicopters, withdrawn from the navy's own inventory, were transferred to Sri Lanka, Maldives and Myanmar. This maritime diplomacy has had long–lasting and salutary consequences.

Prime Minister Narendra Modi had, in 2015, coined the slogan, "security and growth for all in the region," whose acronym SAGAR has become a foreign policy catchphrase, representing broad regional maritime cooperation. However, there is no document amplifying the vision underpinning SAGAR. Perhaps, it is time to flesh out SAGAR as a new and comprehensive maritime doctrine that will lend direction and purpose to regional diplomacy — both maritime and conventional.



In the photo above is Admiral Arun Prakash
All images from Twitter/X

Lt Gen Kamal Davar says...

.....Raging turmoil in Myanmar poses security threat to India's NE

The turmoil in neighbouring Myanmar that is almost turning into a civil war has prompted the Government of India to decide that the country's border with Myanmar will be covered by barbed fencing, much like the India–Bangladesh border. The states of Arunachal Pradesh, Nagaland, Manipur and Mizoram share a 1,643 km border with Myanmar. There is also a rethink on the free movement agreement with Myanmar that allows people living 16 km on either side unfettered cross–border movement on the production of border passes. The fierce fighting raging in Myanmar has led to deep security concerns in India, besides the large influx of refugees, which will be a natural outcome of this turmoil.

India's Northeast, often regarded as a "distant frontier" is also described in the government's Vision Document 2020 as a "rainbow country". It is surrounded by Bangladesh, Bhutan, China, Nepal and Myanmar. It includes the "seven sisters" — Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. Sikkim too is seen as a part of this region. It has wide disparity in cultures, customs, languages and traditions. A host of geopolitical, historical, political and social conflicts have afflicted this region for years and posed both external and internal security challenges to this country. Geographically distant and economic disparities have further widened the chasm between the Northeast with the rest of India.

The Northeast has seen some turmoil or the other since Independence in 1947, at times due to adverse external influences, internal fratricidal tribal conflicts or differences with New Delhi on many issues, including sovereignty. Yet, over the years, there is an unmistakable improvement with tribals living in various states joining the national mainstream and contributing to the nation's growth. While a majority of tribes are now enthusiastic votaries of the country's democratic system, some serious intra–tribal conflicts persist, often leading to violence and mayhem. Some of these are engineered from across the porous borders between the Northeast states and the countries surrounding them, with China having a hidden hand in supporting some of these insurgencies. The tumultuous and continuing violence in Manipur for around the past nine months or so symbolise the internecine tribal fissures, which need to be addressed by the Centre with alacrity and sensitivity. It cannot be denied that the civil war raging in neighbouring Myanmar for over the last three years has also contributed to instability in Manipur and now threatens to spread to Mizoram and perhaps even other states in the region. That India's Northeast is the gateway for the successful pursuit of New Delhi's "Look East Policy", referred to now as the "Act East Policy", is a cardinal imperative for this nation. Thus, the significance of peace and political stability in Myanmar impacting India's overall East Asian strategies cannot be over–emphasised.

A dispassionate clinical look at the current situation in Myanmar is most essential for Indian policies to be formulated in the foreseeable future. The present conflict in Myanmar was triggered by the February 2021 military coup that toppled the democratically elected government. Apart from causing unjustified casualties to peace–loving civilians and the total disruption of human rights among its citizenry, Myanmar's military junta has shown its incompetence in ruling the nation. In the last three years, tens of thousands of people have fled their homes in Myanmar and sought refuge in India's Northeast, further compounding the security situation there and augmenting tribal fissures in them.

Due to the ethnic bonhomie with the incoming refugees, initially the state governments in Manipur and Mizoram, contrary to the Centre's directives, showered some humanitarian munificence on the refugees.

Ironically, though itself a strong democracy, India has always retained a close relationship with Myanmar's military, which has a reputation of undermining democracy in Myanmar and leading authoritarian regimes.

India feels the military junta's cooperation is essential for New Delhi to deal with the many insurgent outfits roaming around this region and on its periphery. Myanmar's assistance in counter–insurgency operations by striking cross–border against Chinese proxy gangs, based in Myanmar's inhospitable border regions, is required by India's security forces and therefore this country strives to maintain sound relations with the military junta. However, it is also a fact that the Myanmar military junta has miserably failed to contain its own insurgencies.

Currently, Operation 1027, against the military junta, launched by the Three Brotherhood Alliance members comprising the Arakan Army, the Myanmar National Democratic Alliance Army and the Ta'ang National Liberation Army, based in the states of Rakhine and Shan in Myanmar, have achieved substantial success. Many other smaller insurgent groups have joined this alliance. The United States also has been supporting for many years the National Unity Government comprising of insurgent groups against the military junta.

This US policy has forced the Myanmar military government to look towards China and Russia for sustenance and military support. For India, the international pulls and pressures within Myanmar, the inability of the junta to maintain peace and tranquility inside their nation and the proliferation of strong insurgent and separatist groups portends ominous tidings. The influx of illegal immigrants, an increase in the already existing substantial drugs trade and weapons to fuel local insurgent groups within our Northeast region, is fraught with serious security concerns. The current situation in Manipur is an example of this ascending malady.

Apart from an increase in tribals clamouring for economic dominance in parts of the Northeast, there exists among some of them separatist tendencies which need to be closely monitored and nipped in the bud.

Notwithstanding any other pre–occupations, our security establishment must devote adequate time to holistically evolve a comprehensive and firm policy to ensure the maintenance of peace and stability across our strategic Northeast region.

Admiral Arun Prakash says....

Restive Indian Ocean calls for a new vision

The sudden instigation of maritime terrorism by Houthi rebels, as well as the revival of piracy around the Horn of Africa, has cast the Indian Ocean Region (IOR) into a state of ferment. While the Indian Navy (IN)'s bold interventions have invited well deserved applause, the implications of this crisis require New Delhi to undertake not only a review of the strategic environment but also a reappraisal of its neighbourhood policies through the twin prisms of diplomacy and strategy.

In the winter of 1964, I was a cadet on board the training ship, INS Tir when it entered the palm–fringed Malé harbour. In accordance with naval custom, Tir fired a 21–gun salute and broke the Maldivian flag at the masthead — the first foreign warship to render this honour to the newly independent Republic of Maldives. In the 60 years since, the Maldives has occupied a prominent position in the IN's maritime calculus. Our Navy has been the first responder in the Maldives' crises, ranging from the attempted 1988 coup d'etat to the 2004 tsunami and other, lesser emergencies. It is hoped that good neighbourly relations will be resumed once the diplomatic storm dies down.

I mention the Maldives because it happens to be in the news. But the IN has, for over two decades, had in place a low profile but comprehensive plan for discharging its "diplomatic role," the second of four roles mandated by its maritime doctrine. Eschewing the term, "naval diplomacy" to avoid ruffled feathers in the ministry of external affairs (MEA), the Navy has been pursuing a programme titled, "foreign cooperation," under whose ambit, it has extended training as well as hydrographic surveillance and other facilities, besides gifting hardware, including ships, aircraft and helicopters to IOR neighbours such as Mauritius, Seychelles, the Maldives, Sri Lanka and Myanmar to bolster their maritime security.

Our naval diplomacy has attained in full measure the objectives laid down by the maritime doctrine vis–à–vis "... the strengthening of goodwill, political relations and defence cooperation... in consonance with the nation's foreign policy and security objectives". Diplomats may worry about the armed forces seeking a role that goes beyond "security and defence". However, naval diplomacy only aims to support our accredited representatives in the effective conduct of foreign policy. Here, a closer look at our neighbourhood diplomacy is warranted.

The nosedive in India–Maldives relations has neither been sudden nor should it have taken the MEA by surprise. The first ominous signs emerged in 2012 when Maldives cancelled a major airport modernisation contract with an Indian firm in favour of a Chinese company. Over the following decade, local politicians, incited/provoked by Pakistan and China, have transformed the "India First" catchphrase into an "India Out" campaign, culminating in a demand for the withdrawal of "Indian troops". Adroit diplomacy could have swiftly eliminated this putative irritant by having the Navy's aircraft replaced with civil "air ambulances", flown and maintained by a civilian crew.

Even as we see Maldivian politics descending into a phase of instability, there is little reassurance to be drawn from the state of India's relationships with its other immediate neighbours — Nepal, Bangladesh and Sri Lanka. Each of them harbours its own set of grouses that sour relations and expose India to the risk of becoming ensnared in a "South Asia trap", imperilling its great power aspirations.

A question that should exercise the minds of our decision makers and foreign policy practitioners is: Why India, having abjured all thought of an Indian "Monroe Doctrine", is still perceived as a regional "big brother/ bully"? Is it because we grudge the right of our smaller neighbours to exercise the "strategic autonomy" that we so cherish ourselves? Is it because our representatives display a condescending attitude towards hosts, laying excessive emphasis on their "ancient Indian legacy" and India's "superior" culture? And lastly, are we ignoring the impact in neighbouring capitals of India's domestic policies, especially where they are seen as affecting religious minorities?

This brings us to recent diplomatic rows with Sri Lanka, and now, the Maldives, caused by Chinese vessels putting into their ports. Here, it is important to understand that China, being the world's largest manufacturing/ trading nation, is overwhelmingly dependent on the uninterrupted passage of seaborne trade and energy, making the Indian Ocean sea lanes its Achilles heel, which it will protect at all costs.

We must reconcile ourselves to the inevitability of China's PLA Navy (PLAN) establishing, in due course, a permanent presence in the IOR. Chinese "spy ships" — actually, research ships and hydrographic vessels — represent the vanguard of the PLAN, collecting hydrographic and hydrological data and mapping the sea floor, information that will facilitate efficient warship and submarine operations in the IOR. We will see them with increasing frequency in proximate waters.

Such vessels are permitted by the 1982 UN Law of the Sea, the unfettered freedom of navigation on the high seas, and even in the 200–mile exclusive economic zones, provided they are undertaking "innocent passage". Entry for warships into foreign ports requires prior host consent, but given their cordial relationship and economic dependence on China, our IOR neighbours would find it difficult to deny entry to Chinese ships. Therefore, India must show diplomatic forbearance when smaller neighbours, occasionally, kowtow to Beijing.

Even those, so far, oblivious to the criticality of the maritime domain must now realise the profound dependence of national prosperity on the security of sea lanes that carry the world's trade in raw materials, finished goods and energy. The maritime turbulence off the Yemeni and Somali coasts demonstrates that the maintenance of "good order" at sea is an international commitment that requires the widest participation by navies.

This wisdom having dawned on China a couple of decades ago, Beijing methodically put in place all the building blocks, including a grand strategy that makes it a "maritime Great Power" today. Even as India steadily builds its economic heft and upgrades technological competencies, now is the time for strategists and diplomats to craft a maritime vision that will not only provide a boost to India's maritime power, including the Navy, but also foster a favourable "sphere of influence," for its employment.

Lt Gen Kamal Davar says...

....India 2024: Challenges ahead

Current raging conflicts: Ukraine/Russia and Israel/Palestine (Images: BBC and euranetplus-inside.eu)

The dawn of each year, notwithstanding the travails suffered in the outgoing year, generally kindles optimism and the hope of better days to unfold. To all across the world, which inexplicably is at war with itself since the last two years or so, peace and harmony and for those gravely afflicted with unprecedented violence, even the right to merely exist would be asking the least. By all accounts, for India too, 2024 is likely to be a benchmark year with some traditional challenges remaining and some newer ones likely to emerge owing to the myriad geopolitical churnings taking place both regionally and globally.

Three years back when the planet was gradually getting over the near cataclysmic Covid–19 pandemic which took nearly 7 million lives globally and caused financial upheavals, the most severe in a century, the world was surprised with the mighty Russians unwarranted and unjustified invasion of neighbouring Ukraine.

This unequal war is now nearly 2 years old having caused much destruction in Ukrainian towns bordering Russia with hundreds of thousands of innocent Ukranians being displaced, with many fleeing to other nations in Europe. Russian strongman President Vladmir Putin also disregarded Indian PM Narendra Modi's polite call that "this is not an era of war."

Out of the blue on 7 October 2023, Hamas terrorists from the Gaza Strip bordering Israel attacked innocent Israeli civilians, without any provocation, and slaughtered atleast a hundred of them besides taking many civilians hostages. The Israelis, as expected, retaliated with overwhelming strength employing multiple forms of heavy weaponry including the use of air power, tanks, missiles and artillery. The once prosperous and bristling Gaza Strip now lies much in ruins with the poor Palestinians having suffered over 25,000 fatalities with the Israelis unrelenting in halting their operations despite UN strictures and pleas from many friendly nations of Israel including the US. The world watched all these tragedies unfold helplessly.

Apart from the Russian–Ukraine War and the recent Israel–Hamas conflict, many other trouble spots in the world portend violence afflicted happenings. Armenia–Azerbaijan, Syria, Libya, Yemen, Qatar, Afghanistan and in our immediate neighbourhood, violence festers also in Pakistan and Myanmar too is in turmoil.

Last month, another domain in instability has been added with Houthi and Somalian rebels indulging in sea piracy and hijacking merchant ships along the Red Sea igniting the mercantile strategic West Asian waterways ostensibly to deter ships heading for Israel but also indulged in hijacking an India bound ship. The latter, off course, was freed by swift and a professional action by the Indian Navy which now has deployed nearly a dozen ships in these waters to ensure no disruption in our maritime supply chains.

The Russian–Ukraine and Israeli–Hamas conflicts have thrown up many a diverse telling lesson for all nations including India. We will do well to analyse these lessons at an appropriate level, as relevant to the Indian landscape. Militarily and, equally importantly, the economic impact of the recent geopolitical churnings especially impacting our oil supplies from West Asia, Russia and Iran will have to be clinically factored in our policies and overall strategies.

India 2024, by no means, has an easy path to traverse and thus it calls for a "whole of nation approach" to navigate India through the turbulent

waters of the year which has dawned. We have much to celebrate but equally much to care about.

Firstly, in my humble view as a proud Veteran of our beloved country, there is far too much of animosity bordering on hatred among our politicos of differing hues in the nation which is a self–destructive factor in taking the nation forward. We have had good personal relations among members of various political parties in the past, since Independence, and despite ideological or any differences among them mutual cordiality was always existent. Whether from the ruling party or the Opposition, some form of mutual regard for each other is sine qua non.

Overall, India is doing reasonably well in its diplomatic endeavours and managing the vexed Russia–US relations deftly and in keeping with its national interests. However, US President Joe Biden cancelling his trip to India as the chief guest for our Republic Day Parade cannot be taken lightly and some form of our displeasure should be conveyed to Washington. Biden's refusal to come to India owing to India's alleged involvement in the planned assassination of Khalistani terrorist Gunwant Pannun is an outrageous charge and US and Canada should be suitably sounded. As India's strategic ties diversify in many fields with the US, the latter must be made to appreciate India's time honoured adherence to strategic autonomy and non–alignment. Equally, India will have to maintain its traditional friendly relations with Russia both to keep its huge armament dependencies on Russia in order and also continue purchasing Russian oil at cheaper rates.

(Left image: thestatesman.com and Right image: India Today)

As regards diplomacy is concerned, am afraid we are somewhat faltering in the neighbourhood and much revival of the South Asian spirit and cooperation is warranted not only for the benefit of all South Asian nations but to keep China's unbridled ambitions and hegemonistic tendencies at bay in this region. China is likely to continue to remain confrontational towards India in all respects and thus we have to remain well prepared in all respects and assertive on our uneasy borders with them. A conciliatory approach towards them will be a self–defeating exercise as the nation has learnt many times over since decades. China's overtures towards Bhutan will need suitable counter measures to be taken by us and Bhutan's security and well–being kept with us as hithertofore. Equally, China's forays into Bangladesh, Sri Lanka and Nepal will also need to be managed with care by us.

Pakistan, in self created turmoil, can be left to their own volition while we keep a stern eye on their terror mischief creating habits. Hopefully some sense may dawn on them after their general elections with Nawaz Sharif coming back to power—though rather difficult gauging their past.

With India going in for general elections in a matter of few months from now on, the Indian Armed Forces and other security agencies will have to be on full alert to prevent mischief from across or within. 2024 promises to be an eventful year which will set the tone for the coming years for India as it rightfully seeks and strives for its seat on the global high table.

The endeavour to strengthen all constituents of its Comprehensive National Power and ensure intersocietal harmony should be our guiding principles in our march forward.

The writer, a retired lieutenant–general, was the first head of India's Defence Intelligence Agency, is a long–time Pakistan watcher and has been involved in Track–2 diplomacy.

DRDO tests new generation Akash

Defence Research and Development Organisation (DRDO) conducted a successful flight test of the New Generation Akash (Akash NG) missile from the Integrated Test Range (ITR), Chandipur off the coast of Odisha on 12 January 2024. The test was conducted against a high speed unmanned aerial target at very low altitude. During the test, the target was successfully intercepted by the weapon system and destroyed. It has validated the functioning of the complete weapon system consisting of the missile with indigenously developed Radio Frequency Seeker, Launcher, Multi–Function Radar and Command, Control and Communication system.

DRDO tests VSHORADS

DRDO conducted two successful flight tests of Very Short Range Air Defence System (VSHORADS) missile on 28 and 29 February 2024 from a ground based portable launcher off the coast of Odisha from Integrated Test Range, Chandipur. These tests were carried out against high speed unmanned aerial targets under different interception scenarios. During all the test flights, the targets were intercepted and destroyed by the missiles, meeting the mission objectives.

VSHORADS is a Man Portable Air Defence System (MANPAD) designed and developed indigenously by Research Centre Imarat (RCI) in collaboration with other DRDO laboratories and Indian industry partners. The missile is propelled by a dual thrust solid motor and meant for neutralising low altitude aerial threats at short ranges.

Mission Gaganyaan astronauts selected

During the inaugural ceremony held on 27 February 2024 at the Vikram Sarabhai Space Centre, Thiruvananthapuram, Prime Minister Modi unveiled the Indian astronaut logo for the four IAF Astronauts. IAF will be working in 'Mission Mode' along with ISRO to "achieve our Nation's dream of achieving our own Manned Space Flight". Indian Air Force Test Pilots School stated, "We are proud to announce that four IAFTPS alumni have been nominated as crew–elect for ISRO's prestigious Gaganyaan programme, India's first manned mission into space: Gp Capt PB Nair, Gp Capt Ajit Krishnan, Gp Capt Angad Pratap and Wg Cdr S Shukla".

Another Brahmos test

On 24 January 2024, the Indian Navy and BAPL carried out successful engagement of land target at enhanced range with the advanced supersonic cruise missile. "This endeavour revalidates AatmaNirbharta for extended range precision strike capability from combat and mission ready ships".

BEL in orders worth Rs.1034 Crore

Bharat Electronics Limited (BEL) has received an order from Mazagon Dock Shipbuilders Ltd for a value of Rs.695 Crore for supply of spares related to missile systems. The company has also received additional orders worth Rs.339.31 Crore since the last disclosure on 26 December 2023 and these orders pertain to Combat Management System, Composite Communication System, Transmit/ Receive Modules, Mobile Autonomous Stabilisation System and other spares/services.

11 BEL Shakti EWS for Indian Navy

The Ministry of Defence signed a contract with Bharat Electronics Limited (BEL), Hyderabad on 13 February 2024 in New Delhi, for procurement of 11 Shakti Electronic Warfare Systems along with associated equipment and accessories for Indian Navy under Buy (Indian–IDDM) category at a total cost of Rs. 2269 Cr. The Shakti EW System is indigenously designed, developed and manufactured. The Shakti EW System is capable of accurately intercepting electronic emissions and implement counter measures in dense electromagnetic environment. The Shakti EW System will be installed onboard capital warships of Indian Navy.

DRDO hands over SAMAR

DRDO has handed over SAMAR (System for Advance Manufacturing Assessment and Rating) assessment certificates to nine Industry Partners. SAMAR is a benchmark to measure the competency of defence manufacturing enterprises.

DRDO hands over 23 licensing agreements for ToT

DRDO has also handed over 23 licensing agreements for Transfer of Technology (LATOT) to 22 industries. These include manufacturing of carbon/carbon aircraft brakes for LCA Tejas, 100m Infantry Foot Bridge Floating, 40mm High Explosive Anti–Personnel (HEAP) Grenade for UBGL, full trailer of 70T tank transporter for MBT Arjun Mk–1A, expendable mobile shelter solar heated shelter, NMR–Supercapacitor, weaponisation of hand–held thermal imager with LRF (WHHTI) and High Pressure Water Mist Fire Suppression System (HP WMFSS).

"The products based on these DRDO technologies will further boost the defence manufacturing sector and self–reliance in defence" according to DRDO.

IA inducts Modular Bridge System

Indian Army further strengthened its bridging capability with the induction of 46 meter Modular Bridge. The bridging system, designed and developed by DRDO and produced by Larsen & Toubro (L&T), was inducted in a ceremony, attended by General Manoj Pande COAS and officials from Indian Army, DRDO and MoD at the Manekshaw Centre, New Delhi on 27 January 2024.

ISRO's GSLV–F14/INSAT–3DS MISSION

The launch of the GSLV–F14/INSAT–3DS mission was accomplished on 17 February 2024, at 17:30 Hrs. IST from SDSC–SHAR, Sriharikota. In its 16th mission, the GSLV deployed the INSAT–3DS meteorological satellite into the Geosynchronous Transfer Orbit (GTO). Geosynchronous Satellite Launch Vehicle (GSLV) is a three–stage 51.7 m long launch vehicle having a liftoff mass of 420 tonnes. INSAT–3DS Satellite is a follow–on mission of Third Generation Meteorological Satellite from Geostationary Orbit. GSLV–F14/INSAT–3DS mission is fully funded by the Ministry of Earth Sciences (MoES). It is designed for enhanced meteorological observations and monitoring of land and ocean surfaces for weather forecasting and disaster warning.

Adani inaugurates the largest ammo and missile complex

In a landmark achievement for India's defence sector, two mega facilities to manufacture ammunition and missiles by Adani Defence & Aerospace were inaugurated in Kanpur late February 2024. Spread over 500 acres, the facility in Kanpur is set to become one of the largest integrated ammunition manufacturing complexes. It will produce high quality small, medium and large calibre ammunition for the armed forces, paramilitary forces and police. The facility has started rolling out small calibre ammunition, starting with 150 million rounds estimated at 25% of India's annual requirement.

PTC Industries and Nasmyth in MoU

PTC Industries and Nasmyth announced that they have signed a Memorandum of Understanding (MoU) for collaboration to leverage their capabilities for offering global solutions to defence and aerospace customers in India and globally. The MoU will see Nasmyth and PTC work together in support of the 'Make in India' Atamnirbhar Bharat programme leveraging each other's capabilities. PTC has a manufacturing campus in Lucknow and is currently participating in various programmes requiring components, sub–assemblies and assemblies for various defence land, sea and air platforms.

Pratt & Whitney expands India operations

Pratt & Whitney announced the establishment of its new India Digital Capability Centre (IDCC) in Bengaluru. The new centre will accelerate innovation and drive digital and business transformation for Pratt & Whitney worldwide. The facility will be co–located with Pratt & Whitney's engineering and supply chain operations centres of excellence. The location will also facilitate close collaboration with other RTX businesses in India including Collins Aerospace and RTX Enterprise Services. Pratt & Whitney has begun recruiting its first tranche of employees for the IDCC and is expected grow to over 300 employees by 2027. The centre will be focused on delivering multiple digital technology capabilities across various priority areas of Pratt & Whitney's digital transformation.

Collins Aerospace inaugurates IDTC

Collins Aerospace announced the inauguration of the India Digital Technology Centre (IDTC), designed to spearhead advancements in digital technology and innovation. The centre will specialise in enterprise resource planning, artificial intelligence and machine learning, data engineering and analytics and digital enablement of the product lifecycle. These capabilities set the centre apart as a dynamic hub for digital transformation within the company.

Terma's Surface Movement Radars for Indian Airports

Danish manufacturer of advanced radar solutions, Terma, is set to provide Surface Movement Radars (SMR) for four major Indian airports. The order adds to Terma's extensive SMR presence in India, already comprising eight radars in four major airports. The SCANTER 5502 SMRs will be installed in four major Indian airports: Bengaluru, Mumbai, Navi Mumbai, and Hyderabad.

Air India and TASL MoU with Karnataka

Air India and Tata Advanced Systems Limited (TASL) signed a Memorandum of Understanding with the Government of Karnataka for a cumulative investment of INR 2300 crore in the state's aerospace and defence sector. As per the MoU, Air India will establish Maintenance, Repair and Overhaul (MRO) facilities at Kempegowda International Airport Bengaluru (operated by Bangalore International Airport Ltd) starting with airframe maintenance through the development of widebody and narrowbody hangars for all checks, including heavy structural checks.

Boeing inaugurates first India Distribution Centre

Boeing announced the opening of the Boeing India Distribution Centre in Khurja, Uttar Pradesh, The 36,000 square foot parts warehouse will support regional aviation customers in maximising fleet utilisation. The new site "underscores Boeing's continued commitment to expanding its presence in the country and delivering an efficient, cost–effective, and local solution". Boeing announced its investment in the distribution centre less than a year ago during Aero India 2023, and the first parts were shipped to customers in December 2023.

JSW Group makes strategic entry into defence sector

JSW Group, one of India's largest conglomerates announced its strategic entry into the defence sector with the establishment of a new business vertical, JSW Defence and Aerospace (JSW Defence). JSW Defence has acquired a majority stake in an extreme off–road

vehicle company, Gecko Motors Private Limited, now renamed as JSW Gecko Motors Pvt Ltd (JSW Gecko). The company has secured an order worth INR 250 crore from Ministry of Defence (Army), Government of India for the manufacture and supply of 96 Specialist Mobility Vehicles (SMVs), branded as ATOR N1200. This order is currently under manufacturing at JSW Gecko's newly set–up manufacturing unit in Chandigarh, Punjab and will be supplied to the Armed Forces no later than June 2024.

Rolls–Royce agreement with Azad Engineering

Rolls–Royce has announced the signing of a long term agreement with Azad Engineering to manufacture and supply complex components for defence aircraft engines. Through this strategic partnership, Hyderabad based Azad Engineering will join the global supply chain for complex category components for Rolls–Royce's technologically advanced aero engines. Rolls–Royce has a strong ecosystem in India, encompassing strategic local partnerships, joint ventures, robust supply chain, rich talent pool, engineering capability, digital solutions and service delivery capabilities.

Garuda Aerospace order for 500 Kisan drones

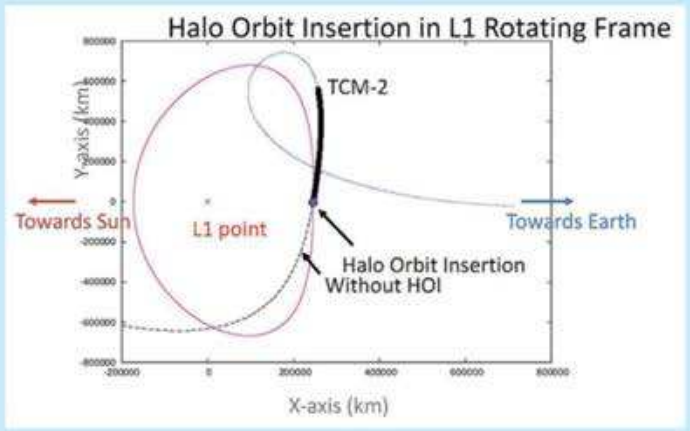
Garuda Aerospace announced that it had secured an order of 500 Garuda Kisan Drones from 10 leading fertiliser companies under the NaMo Drone Didi scheme. The drones can support with spraying of fertilisers and pesticides. Given its precision capabilities, Kisan drones can reduce the quantity of pesticides used in addition to eliminating long exposures to harmful chemicals.

ISRO's Aditya–L1 reaches its destination

The Halo Orbit Insertion (HOI) of its solar observatory spacecraft, Aditya–L1 was accomplished at 16.00 Hrs (approx) on 6 January 2024 (IST). The final phase of the maneuver involved firing of control engines for a short duration. The orbit of Aditya–L1 spacecraft is a periodic Halo orbit which is located roughly 1.5 million km from earth on the continuously moving Sun–Earth line with an orbital period of about 177.86 earth days.

This Halo orbit is a periodic, three dimensional orbit at L1 involving Sun, Earth and a spacecraft. This specific halo orbit is selected to ensure a mission lifetime of 5 years, minimising station–keeping manoeuvres and thus fuel consumption and ensuring a continuous, unobstructed view of sun.

The Aditya–L1 mission is an Indian solar observatory at Lagrangian point L1 for "Observing and understanding the chromospheric and coronal dynamics of the Sun" in a continuous manner.



INS Cheetah, Guldar and Kumbhir decommissioned

Indian Navy Ships Cheetah, Guldar and Kumbhir were decommissioned on 12 January 2024 after rendering four decades of service to the nation. The decommissioning

event was conducted at Port Blair in a traditional ceremony wherein the National Flag, the Naval Ensign and Decommissioning Pennants of the three ships were lowered for the last time, at sunset. Cheetah, Guldar and Kumbhir were built at Gdynia Shipyard, Poland as Polnocny class Landing Ships and were commissioned into the Indian Navy in 1984, 1985 and 1986 respectively.

INS Nirupak decommissioned

The Indian Navy's indigenously designed and built survey ship, INS Nirupak, was decommissioned after 38 years of service to the nation in a ceremony, presided by Vice Admiral Adhir Arora, Chief Hydrographer to the Govt of India at Naval Dockyard, Visakhapatnam on 29 January 2024. The ship, third of its class was launched on 4 June 1981, at GRSE and commissioned into service on 14 August 1985.

Commissioning of Y–3025 (Sandhayak)

The Indian Navy commissioned commission its latest Survey Vessel Sandhayak, at Naval Dockyard, Vizag on 3 February 2024. The event marked the formal induction into the Navy of the first of four Survey Vessel (Large) ships under construction at Garden Reach Shipbuilders & Engineers (GRSE), Kolkata. A significant addition to the naval fleet, Sandhayak is equipped with state of the art hydrographic equipment including Deep and Shallow Water Multi–Beam Echo–Sounders, Autonomous Underwater Vehicle, Remotely Operated Vehicle, Side Scan Sonars, Data Acquisition and Processing System, satellite based positioning systems and terrestrial survey equipment.

MDL contract for 14 FPVs for ICG

The Ministry of Defence signed a contract with Mazagon Dock Shipbuilders Ltd (MDL), Mumbai on 24 January 2024, for acquisition of 14 Fast Patrol Vessels (FPVs) for the Indian Coast Guard (ICG). The value of the contract is Rs 1070 cr. These multi role FPVs will be indigenously designed, developed and manufactured by MDL under Buy (Indian–IDDM) Category and will be delivered in total 63 months.

Collins Aerospace to provide Air India with avionics hardware

Collins Aerospace has been selected by Air India for a full suite of avionics hardware catering to the airline's expanding Boeing 737 MAX fleet. The deal was announced at the recently concluded Singapore Airshow 2024. The comprehensive package includes communication, navigation, surveillance equipment and air data sensors, designed to enhance safety, fuel efficiency and operational performance of Air India's fleet.

Akasa Air orders 150 more Boeing 737 MAX jets

Boeing and Akasa Air announced that the Indian carrier has placed a follow–on 737 MAX order, confirming 150 more jets in its order book. The purchase of 737–10 airplanes and additional 737–8–200 jets by India's all–737 operator was revealed at the Wings India 2024 airshow.

Akasa Air receives two Boeing 737 MAX 8's

Akasa Air, on 3 January 2024, welcomed two Boeing 737 MAX 8 aircraft to its growing fleet. With this, the airline exited the calendar year 2023 with a fleet size of 22 aircraft, including 21 Boeing 737 MAX 8 and one Boeing 737 MAX 8 200, the first of its kind in Asia.

Akasa Air orders 300 LEAP–1B engines

In conjunction with the state visit of the French President Emmanuel Macron to India, Akasa Air and CFM International announced an agreement to purchase CFM LEAP–1B engines to power 150 Boeing 737 MAX airplanes.

The agreement also includes spare engines and a services contract. The Mumbai–based operator launched its operations in August 2022 and had previously ordered a total of 76 LEAP–1B– powered 737–8 aircraft, of which 22 are currently in service.

This new order grows CFM's footprint in India, with more than 400 CFM powered aircraft in service and 2,500 LEAP engines in the backlog.

Air India selects Thales' AVANT Up

Air India has selected Thales' AVANT Up inflight entertainment (IFE) solution. With Thales' AVANT Up, Air India will deliver engaging and memorable guest experiences.

Thales will upgrade and retrofit Air India's current fleet of 40 Boeing 777's and 787's with its AVANT Up system, starting in 2024 and continuing through 2025.

Additionally, Thales will install AVANT Up IFE on Air India's 11 new Airbus and Boeing aircraft with deliveries to commence in 2025.

APPOINTMENTS

Vice Admiral Dinesh K Tripathi is Vice Chief of the Naval Staff

Vice Admiral Dinesh K Tripathi took over as Vice Chief of the Naval Staff on 4 January 2024. Prior to taking over as Vice Chief of the Naval Staff, VAdm Dinesh K Tripathi served as the Flag Officer Commanding–in–Chief, Western Naval Command. An alumnus of Sainik School Rewa and National Defence Academy, Khadakwasla, he was commissioned into the Indian Navy on 1 July 1985. A Communication and Electronic Warfare specialist, he served on frontline warships of the Navy as Signal Communication Officer and Electronic Warfare Officer, and later as the Executive Officer and Principal Warfare Officer of Guided Missile Destroyer INS Mumbai. He commanded Indian Naval Ships Vinash, Kirch and Trishul. He has also held various important operational and staff appointments which include Fleet Operations Officer of the Western Fleet at Mumbai, Director of Naval Operations, Principal Director Network Centric Operations and Principal Director Naval Plans at New Delhi.

Vice Admiral Sanjay J Singh is FOC–in–C, WNC

Vice Admiral Sanjay J Singh took over as the Flag Officer Commanding–in–Chief (FOC–in–C), Western Naval Command (WNC) on 3 January 2024. Prior to taking over as the Flag Officer Commanding–in–Chief of the WNC, Vice Admiral Sanjay J Singh served as the Vice Chief of Naval Staff at Naval Headquarters, New Delhi. Vice Admiral Sanjay J Singh is a graduate of the National Defence Academy, Pune, and was commissioned in 1986 in the Executive Branch of the India Navy. In his career spanning 37 years, he has served on most class of ships of the Indian Navy.

Lt Gen Upendra Dwivedi is Vice Chief of the Army Staff

Lieutenant General Upendra Dwivedi assumed the appointment of the Vice Chief of the Army Staff on 19 February 2024. Prior to taking over as the Vice Chief of the Army Staff, Lieutenant General Upendra Dwivedi was tenanting the appointment of General Officer Commanding–in–Chief, Northern Command from 2022–2024 in extremely challenging operational environment. During his illustrious career spanning across 39 years, he has held command appointments in various operational environments, spanning the length and breadth of the country.

Saab starts construction of new Carl–Gustaf M4 factory in India

Ground breaking ceremony on 4 March 2024 and render of what the facility will look like.

Saab on 4 March 2024 marked the start of the construction of its new Carl–Gustaf M4 manufacturing facility in India with a ground breaking ceremony. The factory will be located in the state of Haryana.

After receiving approval of 100% foreign direct investment, Saab has established a new company, Saab FFVO India Pvt Ltd, which will fully own the new manufacturing facility and produce the Carl–Gustaf M4 weapon.

"I am proud to start constructing our first facility outside Sweden for Carl–Gustaf, a product that has a long history with the Indian Armed Forces. We look forward to starting production of our excellent product, now engineered and made in India", stated Görgen Johansson, Senior Vice President and Head of Saab's business area Dynamics. "Today is an important milestone for Sweden and India. Saab's factory will be the first foreign fully owned defence production facility in India. It is a testament to the strong bilateral relationship between our countries," stated Håkan Jevrell, State Secretary for Foreign Trade, Sweden.

The facility is being built in the state of Haryana at the MET City at Jhajjar. The state has a strong industrial base of good potential partners and skilled employees.

Saab will partner with Indian suppliers and will fully meet the requirements of "Make in India" for the systems manufactured in the facility. At the new factory, Saab will deploy complex technologies including the latest sighting technology and advanced carbon fibre winding to manufacture Carl–Gustaf M4 for the Indian armed forces, and components which may be included in other users' systems.

The Carl–Gustaf system has been in service with the Indian Army since 1976 and is established as the main shoulder launched weapon in the Indian Armed Forces.

Saab India Chairman and Managing Director, Mats Palmberg (Left) and Senior Vice President Saab AB Görgen Johansson (Right) at the press conference at New Delhi post the ground breaking ceremony.

MH–60R Seahawks commissioned into Indian Navy as INAS 334 Squadron

The Indian Navy commissioned the newly inducted MH–60R Seahawk (a maritime variant of the Blackhawk helicopter) multirole helicopter on 6 March 2024 at INS Garuda, Kochi marking a pivotal moment in India's defence modernisation journey. The Seahawks squadron was commissioned in the Indian Navy as INAS 334. The helicopters are a part of the 24 aircraft FMS contract signed with the US government in February 2020.

The Indian Navy is set to witness a significant surge in its maritime prowess with the induction of the Seahawks. The helicopter is designed for anti–submarine warfare (ASW), anti–surface warfare (ASuW), search and rescue (SAR), medical evacuation (MEDEVAC) and vertical replenishment (VERTREP). The helicopter has been rigorously tested in Indian Reference Atmosphere (IRA) conditions and is fully integrated into the fleet. The advanced weapons, sensors and avionics suite make the Seahawks ideal for the Indian Navy's maritime security needs, offering enhanced capabilities for both conventional as well as asymmetric threats.

"The MH–60R helicopter would enhance India's blue–water capabilities, extending the operational reach of the Navy and supporting sustained naval operations across spectrums and over vast maritime domains. The Seahawk's deployment in the IOR would strengthen the Indian Navy's maritime presence, dissuading potential threats and ensuring a secure and safe environment in this strategically crucial region. The commissioning of the Seahawks underscores Indian Navy's steadfast dedication to fortifying maritime security, aligning seamlessly with the Government of India's visionary goal of ensuring Security And Growth for All in the Region", stated Indian MoD.

LCA Tejas news and updates

ADA signs MoU with Indian Air Force

Aeronautical Development Agency (ADA), on 21 February 2024, signed an MoU with the Indian Air Force (IAF) for integration of futuristic Weapons and Sensors for LCA Tejas aircraft. The MoU was signed by Mr. Prabhulla Chandran VK, Technology Director (Avionics and Weapon Systems) of ADA and Air Vice Marshal KN Santosh, Commandant, Software Development Institute (SDI) of IAF. Aeronautical Development Agency (ADA) is a premier organisation under the aegis of the Department of Defence R&D with mandate to Design and Develop Tejas LCA and its Variants.

In present war scenario, there is a continuous need of upgrading the weapons and sensors suite of the aircraft and towards this, ADA has initiated the knowhow transfer for integration of weapons and sensors to SDI. This will facilitate the IAF to independently carry out sensors, weapon integration and flight testing to enhance the operational capabililty of Tejas LCA fighter. ADA has successfully developed and type certified Tejas LCA with a credit of more than 10,000 sorties of incident free flying. IAF has already formed two squadrons of this fighter aircraft and twin seater aircraft are also being inducted.

(Representative images courtesy IAF)

DFCC for Tejas Mk.1A flown successfully

In a significant development towards Tejas Mk.1A programme, the Digital Fly by Wire Flight Control Computer (DFCC) was integrated in prototype LSP7 and successfully flown on 19 February 2024. DFCC has been indigenously developed by the Aeronautical Development Establishment (ADE), Bengaluru for the Tejas Mk.1A. Digital Fly by Wire Flight Control Computer features Quadraplex Power PC based Processor, high speed autonomous state machine based I/O controller, enhanced computational throughput and complex onboard software complied to DO178C level A safety requirements. All critical parameters and performance of the flight controls were found satisfactory. The maiden flight was piloted by Wg Cdr Siddarth Singh KMJ (Retd) of National Flight Test Centre.

Aeronautical Development Agency, under the aegis of Department of Defence R&D and Ministry of Defence has successfully type certified Tejas Light Combat aircraft (LCA). Indian Air Force has already operationalised Tejas LCA Mk.1. The improved version of the aircraft, Tejas Mk.1A features advanced mission computer, high performance Digital Flight Control Computer (DFCC Mk.1A), Smart Multi–Function Displays (SMFD), Advanced Electronically Scanned Array (AESA) Radar, Advanced Self–protection Jammer, Electronic Warfare Suit etc. Secretary DDR&D and Chairman DRDO congratulated the teams involved in the successful flight test which has boosted the confidence towards delivery of Tejas Mk.1A to IAF in a stipulated time frame.

(Representative images courtesy IAF)

Digitronics order from BEL for Tejas

Digitronics, a JSC Group enterprise, has landed a major order from Bharat Electronics to manufacture and supply fully indigenised DC–DC Converters and EMI Filter for use in LCA Tejas Mk.1. This move aligns with Digitronics' commitment to supporting the Government of India's Atmanirbhar Bharat initiative.

Under the contract, Digitronics will design, manufacture, and supply 1500 sets of DC–DC Converters for use in the Pylon Interface Box (PIB) for LCA Tejas Mk.1 combat jet.

Embraer and Mahindra MoU on C–390 Millennium MTA in India

Embraer Defense & Security and Mahindra, on 9 February 2024, announced that they had signed a Memorandum of Understanding (MoU) with the objective of jointly fulfilling the acquisition of the C–390 Millennium multi–mission aircraft by the Indian Air Force in its upcoming Medium Transport Aircraft (MTA) procurement project. The MoU was signed at the Embassy of Brazil in New Delhi.

"We are honoured to announce this MoU with Mahindra. India has a diverse and strong defence and aerospace industry and we have chosen Mahindra as our partner to jointly pursue the MTA programme," stated Mr Bosco da Costa Junior, President & CEO, Embraer Defense & Security. "India is a key market for Embraer and we fully support India's ambitions for 'Atmanirbhar Bharat'. We see this partnership as a symbol of strengthening relations between Brazil and India and a way to foster Global South cooperation."

Embraer and Mahindra will engage with the Indian Air Force to identify the next steps of the MTA programme, as well as contact the local aerospace industry in India to start developing the industrialisation plan for the project.

Mr Vinod Sahay, President Aerospace & Defence Sector and Member of Group Executive Board, Mahindra stated, "We are proud to start this partnership with Embraer, a company that is known for its engineering excellence and a unique portfolio of aircraft and systems. The C–390 Millennium is the most advanced military airlifter in the market, and we believe that this partnership will not only bolster the operational prowess of the Indian Air Force, but also provide an efficient industrialisation solution that aligns seamlessly with the objectives of Make in India."

The MoU was signed by Embraer Defense & Security and Mahindra Defence Systems, a 100% owned subsidiary of Mahindra, that focuses on armoured transport and security related products including electronics.

Embraer has an established presence in India across the fields of defence, commercial aviation and executive aviation. In August 2023, Embraer held a C–390 Millennium Day in New Delhi, India to deepen engagement with the local aerospace industry which was very well attended by the Indian ecosystem.

The C–390 Millennium multi–mission tactical transport aircraft offers unmatched mobility, combining high productivity and operating flexibility with low operating costs, which is an unbeatable combination.

Since entering operation with the Brazilian Air Force in 2019 and most recently with the Portuguese Air Force in 2023, the C–390 has proven its capacity, reliability and performance. The current fleet of aircraft in operation has accumulated more than 11,500 flight hours, with operational availability of around 80% and mission completion rates above 99%, demonstrating exceptional productivity in the category. The C–390 Millennium attained its Full Operational Capability status by the Brazilian Air Force in 2023, which endorses the platform's capability to carry out all missions it was designed to undertake.

To date, the C–390 Millennium has been selected by Brazil, Portugal, Hungary, the Netherlands, Austria, the Czech Republic and most recently, South Korea.

The C–390, the most modern military transport aircraft in the market, can carry more payload (26 tonne) compared to other medium sized military transport aircraft and flies 870 km/h (470 knot). It is capable of performing a wide range of missions such as transporting and dropping cargo and troops, medical evacuation, search and rescue, aerial firefighting and humanitarian missions, operating on temporary or unpaved runways such as packed earth, soil and gravel. The aircraft configured with air to air refueling equipment, with the designation KC–390, has already proven its aerial refueling capacity both as a tanker and as a receiver, in this case by receiving fuel from another KC–390 using pods installed under the wings.

The collaboration around the C–390 Millennium will bring the latest technology in terms of aerospace and military transport aircraft to India. Both Embraer and Mahindra will explore the potential to turn India into a future hub of the C–390 aircraft for the region.

Text: Embraer

All photos: Vayu Aerospace Review

UAVs/RPAS and drone news from India

India for 31 MQ–9B Remotely Piloted Aircraft

The US State Department has made a determination approving a possible Foreign Military Sale to the Government of India of MQ–9B Remotely Piloted Aircraft and related equipment for an estimated cost of $3.99 billion. The Defense Security Cooperation Agency delivered the required certification notifying Congress of this possible sale today.

The Government of India has requested to buy thirty–one (31) MQ–9B Sky Guardian aircraft; one hundred sixty–one (161) Embedded Global Positioning & Inertial Navigation Systems (EGIs); thirty–five (35) L3 Rio Grande Communications Intelligence Sensor Suites; one hundred seventy (170) AGM–114R Hellfire missiles; sixteen (16) M36E9 Hellfire Captive Air Training Missiles (CATM); three hundred ten (310) GBU–39B/B Laser Small Diameter Bombs (LSDB); and eight (8) GBU–39B/B LSDB Guided Test Vehicles (GTVs) with live fuzes. Also included are Certifiable Ground Control Stations; TPE–331–10–GD engines; M299 Hellfire missile launchers; KIV–77 cryptographic appliques and other Identification Friend or Foe (IFF) equipment; KOR–24A Small Tactical Terminals (STT); AN/SSQ–62F, AN/SSQ–53G, and AN/SSQ–36 sonobuoys; ADU–891/E Adapter Group Test Sets; Common Munitions Built–In–Test (BIT) Reprogramming Equipment (CMBRE); GBU–39B/B tactical training rounds, Weapons Load Crew Trainers, and Reliability Assessment Vehicles–Instrumented; Portable Pre–flight/Post–flight Equipment (P3E); CCM–700A encryption devices; KY–100M Narrowband/wideband terminals; KI–133 cryptographic units; AN/PYQ–10 Simple Key Loaders; Automatic Identification System (AIS) transponders; ROVER 6Si and TNR2x transceivers; MR6000 ultra high frequency (UHF) and very high frequency (VHF) radios; Selex SeaSpray Active Electronically Scanned Array (AESA) surveillance radars; HISAR–300 Radars; SNC 4500 Auto Electronic Surveillance Measures (ESM) Systems; SAGE 750 ESM systems; Due Regard Radars (DRR); MX–20 Electro–Optical Infrared (EO–IR) Laser Target Designators (LTDs); Ku–Band SATCOM GAASI Transportable Earth Stations (GATES); C–Band Line–of–Sight (LOS) Ground Data Terminals; AN/DPX–7 IFF transponders; Compact Multi–band Data Links (CMDL); initial spare and repair parts, consumables, accessories, and repair and return support; secure communications, precision navigation, and cryptographic equipment; munitions support and support equipment; testing and integration support and equipment, etc. the estimated total cost is $3.99 billion.

Photo: GA–ASI

Photo: Indian Navy

Drishti 10/Hermes 900 officially unveiled

The Drishti 10/Hermes 900 Starliner MALE UAV at Vibrant Gujrat Summit made a big entry on 10 January 2024. As of now, two each for Indian Army and Indian Navy have been contracted for. These RPAS are being jointly manufactured by Adani Defence and Elbit Systems of Israel. Admiral R. Hari Kumar, Chief of the Naval Staff, Indian Navy recently told Vayu Aerospace Review that Bharatiya Nausena had contracted for supply of two

Hermes 900 Starliner MALE RPAS. These RPAS would be manufactured in India under ToT with Elbit with 60% indigenous content; RPAs to be inducted in the Indian Navy by February 2024.

Drishti 10 in first official flight

According to the Indian Navy, "In a significant step towards Make in India, indigenous Remotely Piloted Aircraft Drishti 10, manufactured by Adani Defence, undertook its maiden flight on 9 February 2024 further augmenting maritime surveillance capability of Indian Navy".

DRDO's flight trials of 'Abhyas'

Four flight trials of High speed Expendable Aerial Target (HEAT) Abhyas were successfully carried out by Defence Research & Development Organisation (DRDO) from the Integrated Test Range, Chandipur in Odisha during 30 January to 2 February 2024. The trials were conducted with four different mission objectives in a revised robust configuration using a single booster designed by Advanced Systems Laboratory, Hyderabad to provide reduced launch acceleration.

DroneAcharya wins Indian Army tender

As the global landscape witnesses an increased reliance on Drone technology in defence operations, "DroneAcharya Aerial Innovations Limited stands at the forefront of India's commitment to building aerially capable defence forces". In a significant development, the company has secured a Defence Tender worth INR 11,80,000 to conduct advanced drone pilot training and GIS (Geographic Information System) training for 20 officers from the Northern Command Pre–Induction Training School at Bhalra, Jammu and Kashmir.

Spirit AS and Garuda Aerospace partnership

Spirit Aeronautical Systems, a leading Greek manufacturer specialising in rotary and fixed wing weaponised drones, and Garuda Aerospace, a prominent Indian manufacturer of drones for civil applications, have entered a strategic partnership through countersigned contracts of cooperation. The core objectives of this partnership include expanding market reach, fostering innovation, and facilitating the exchange of technology, experience and best practices.

MoD procures 5G–enabled Jaga drones

India's IG Drones has secured a procurement order from the Ministry of Defence to provide drones for surveillance purposes. The selected drones have industry first features and enabled with 5G capability and have advanced features and good performance, functioning effectively in extreme temperatures and high altitudes. The drone is capable of vertical take–off and landing and can be effectively used in defence and medical applications. With the advent of 5G services from Telecom Service Providers (TSPs), these drones now boast enhanced precision control capabilities, allowing them to be remotely operated from a command centre, eliminating the need for onsite presence. They can be deployed from any terrain without requiring a traditional runway. These drones carry a 10 kg payload, with an endurance of around five hours.

Boeing in India: new developments

TASL partners with Boeing for advanced composite assemblies

Tata Advanced Systems Ltd. (TASL) has signed a contract with Boeing Commercial Airplanes (BCA) to manufacture and supply advanced composite assemblies for Boeing 737 MAX, 777X, and 787 Dreamliner. TASL will manufacture these components from its state of the art composite manufacturing facilities located in Bengaluru and Nagpur.

"Our association with Tata Advanced Systems Limited continues to evolve as they consistently manufacture critical components for Boeing's platforms with quality and precision. This contract further underscores Boeing's commitment to advancing manufacturing capabilities with local partners, fostering growth in both India and global markets," stated Salil Gupte, President, Boeing India.

Boeing India initiatives to advance Indian aviation ecosystem

Boeing has successfully executed pivotal strategic initiatives in India to advance the country's aviation ecosystem. Engaging with airline customers in the region, regulatory bodies like the Directorate General of Civil Aviation (DGCA) and Ministry of Civil Aviation (MoCA), alongside the Airports Authority of India (AAI) and aviation startups, Boeing conducted strategic programmes including the Air Cargo Symposium, Pilot Roundtable and Executive Development Programmes. These initiatives were steered by Boeing's Global Strategic Initiatives team in India.

India holds a position of strategic significance for Boeing, being one of the three key regions actively supported by the Global Strategic Initiatives team. Noteworthy programmes led by the team in India include:

India Air Cargo Symposium: Focused on the air cargo market, fostering industry dialogues on growth drivers, opportunities, and industry challenges, providing valuable perspectives to shape strategic decisions.

India Pilot Roundtable: A dedicated platform for India's pilot community to engage with Boeing's expert panel, emphasising industry leading best practices in commercial aviation, with a key focus on safety, efficiency and innovation.

Executive Development Programmes: A series of collaborations with elite institutions, tailored for airline

customers, industry stakeholders and government agencies across the region.

Sustainability Workshop: Workshop with our customers and industry stakeholder on India adopting CORSIA and prioritising Sustainable Aviation Fuel (SAF) for decarbonisation.

Boeing is focused on delivering value to Indian customers with advanced technologies and is committed to creating sustainable value in the Indian aerospace sector –developing local suppliers and shaping academic and research collaborations with Indian institutions. Boeing has strengthened its supply chain with more than 300 local companies in India and a joint venture to manufacture fuselages for Apache helicopters and vertical fin structures for the 737 family of airplanes. Annual sourcing from India stands at approximately $1 billion. Boeing currently employs more than 6,000 people in India, and more than 13,000 people work with its supply chain partners. Boeing's employee efforts and country–wide engagement serve communities and citizenship programmes to inspire change and make an impact on more than 1.3 million lives.

India will lead South Asia in the commercial aviation market

Boeing forecasts the South Asia region will become the fastest growing commercial aviation market with more than 8% annual traffic growth over the next 20 years. Supported by a strong economy, India's rapidly expanding middle class will drive growth in regional air travel.

To meet rising passenger and cargo demand, South Asian carriers are projected to quadruple the size of their fleets over the next two decades. Carriers will require more than 2,700 new airplanes to address growth and fleet replacement, according to Boeing's Commercial Market Outlook (CMO), an annual forecast of 20–year demand for commercial airplanes and related services.

The South Asia market is expected to quadruple its fleet over the next two decades to meet passenger demand. Boeing forecasts the region will require 37,000 pilots and 38,000 maintenance technicians over the next 20 years, driven primarily from growing demand in India.

Two landmark Boeing initiatives for India

The Prime Minister of India, Mr. Narendra Modi, dedicated two landmark Boeing initiatives that promise to significantly advance India's aerospace and defence industry. Prime Minister Modi launched the Boeing Sukanya Programme that aims to support the entry of more girl children from across India into the country's growing aviation sector. The programme will provide opportunities for girls and women from across India to learn critical skills in the science, technology, engineering and math (STEM) fields and train for jobs in the aviation sector. For young girls, the programme will create STEM Labs at 150 planned locations to help spark interest in STEM careers. The programme will also provide scholarships to women who are training to be pilots. Investments will support flight training curriculum, obtaining certifications, funding for simulator trainings and career development programmes.

Prime Minister Modi also officially commemorated the opening of the new state of the art Boeing India Engineering & Technology Centre (BIETC) campus in Bengaluru. Built with an investment of Rs. 1,600 crore, the 43 acre campus is Boeing's largest such investment outside the US, and will become a cornerstone for partnering with India on next generation products and services for the global aerospace and defence industry.

"We are honoured and privileged to support Prime Minister Modi's transformative vision for India, and we are grateful to have him dedicate the Boeing campus to foster aerospace innovation in the country," stated David L. Calhoun, Boeing President and CEO.

Stephanie Pope, Chief Operating Officer, The Boeing Company, stated, "We are thrilled for Prime Minister Modi to have personally launched the Boeing Sukanya Programme. Together, we will help expand opportunity for women across India to pursue careers and leadership positions in the aviation sector."

Text: Boeing India

All photos by Durgesh Singh

HAL at Vibrant Gujarat Global Trade Show

HAL participated in the 10th edition of 'Vibrant Gujarat Global Trade Show 2024' from 9–13 January 2024 at Gandhinagar, Gujarat. "With thrust on 'Aatmanirbhar Bharat', HAL seeks to explore the capability of Indian industries through this event", stated Mr CB Ananthakrishnan, CMD (Addl. Charge), HAL.

One of the major attractions at HAL stall was the Su–30MKI aircraft which has been modified indigenously for integration of air to ground BrahMos missile manufactured in India. The missile weighs 2500 kg and has a range of nearly 300 kms. HAL has to date manufactured 220 Su–30MKI aircraft and has overhauled over 100 Su–30 MKI.

HAL's Prachand Light Combat Helicopter (LCH) was on static display. A Make in India product built with private participation, LCH is the only attack helicopter in the world which can land and takeoff at an altitude of 5000 m (16,400 ft) with considerable load of weapons and fuel meeting the specific requirements of Indian Armed Forces.

HAL has identified over 100 critical items for indigenisation and displayed some of them at the show. Besides, the scale models of Su–30, LCA, ALH WSI, HTT–40 and Do–228, HAL stall showcased core competencies and capabilities of Indian industries, opportunities in indigenisation of critical aerospace parts, aggregates, LRUs, materials, and consumables. During the show, HAL focussed on strategies for strengthening aerospace ecosystem by interacting with Indian industry to open the gateway for the future.

Six manufacturing Divisions of HAL: Aircraft Division Nashik, Engine Division Koraput, Accessories Division Hyderabad and Lucknow, Transport Aircraft Division, Kanpur and Engine Division Bengaluru participated at the event.

Photos by: Rachhadiya Raj (Twitter @lca_tejas_) and Jenil Patel (Twitter @JenilP1892)

Rosoboronexport and technology partnership contracts

Sukhoi Su–30MKI

JSC Rosoboronexport (part of Rostec State Corporation) takes into account the pressing challenges facing the Russian defence industry and the system of military–technical cooperation. The company actively offers its partners new formats of cooperation within the global arms market trends in today's environment. "One of the key current tendencies in military–technical cooperation is a rising global interest in technology partnership. According to our estimates, the share of such projects will double by 2030 and occupy 40% of the entire global arms market," Alexander Mikheev stated. "Rosoboronexport has strong competencies in launching licensed production, setting up joint ventures and conducting joint R&Ds with foreign customers. We have an impressive portfolio of completed and current projects for all services of the Armed Forces."

Rosoboronexport has been fulfilling technology partnership contracts with foreign customers since the first year of its establishment. In 2000, the company signed a major contract with India's HAL Corporation to organise licensed production of Su–30MKI aircraft in India. As early as next year, in 2001 another contract was signed with India for the licensed production of Russian MBTs. Production of Russian BMP–2 IFVs, 125mm Mango APFSDS rounds and Invar gun–launched ATGMs was also launched in India through Rosoboronexport.

In addition to organising licensed production on the customer's premises, JSC Rosoboronexport actively operates in the field of establishing and managing joint ventures to manufacture Russian military products in partner countries.

The largest and best–known examples of this type of cooperation are the operating Russian–Indian joint venture for the production of AK–203 assault rifles in India with 100% final local content, as well as a joint venture engaged in modernisation and maintenance of Su–30MKM aircraft. The company also provides technical assistance in establishing special facilities in foreign countries as part of technology cooperation. Russian design bureaus and manufacturers have a broad technology base and extensive experience in developing and making unique military products. As a result, the world market today shows strong interest in joint projects with Russia to develop new advanced models of weapons and military equipment. "Technology partnership projects with foreign countries are mutually beneficial. On one hand, unique competencies of domestic arms manufacturers are in demand abroad. At the same time, our enterprises are able to focus on manufacturing and supplying products for the Russian Army, which is a top priority today. On the other hand, partner countries get opportunities to launch full–scale production on their territory and develop their own industrial base," Alexander Mikheev added.

Courtesy: ROE

Invar gun launched ATGM

News from Airbus India

Airbus partners with TASL for H125 FAL

In a major boost to 'Make in India', Airbus Helicopters has announced that it is partnering with the Tata Group to establish a Final Assembly Line (FAL) for helicopters in the country. The FAL will produce Airbus' H125 helicopter from its civil range for India and export to some of the neighbouring countries.

The FAL will be the first instance of the private sector setting up a helicopter manufacturing facility in India, providing a major boost to the Government of India's 'AatmaNirbhar Bharat' programme. Under this partnership, Tata Advanced Systems Limited (TASL), a subsidiary of Tata Group, will set up the facility along with Airbus Helicopters.

The announcement was made during the two day visit of French President Emmanuel Macron to India as Chief Guest at the Republic Day celebrations on 26 January 2024. The FAL in India will undertake the integration of the major component assemblies, avionics and mission systems, installation of electrical harnesses, hydraulic circuits, flight controls, dynamic components, fuel system and the engine. It will also do testing, qualification, and delivery of the H125 to customers in India and the region. The FAL will take 24 months to set up and deliveries of the first 'Made in India' H125s are expected to commence in 2026. The location of the FAL will be jointly decided by Airbus and the Tata Group.

"Helicopters are crucial for nation building. A 'Made–in–India' civil helicopter will not only be a symbol of the confident New India but will also unlock the true potential of the helicopter market in the country," stated Guillaume Faury, Airbus CEO. "This helicopter final assembly line, which we will build together with our trusted partner Tata, is a reaffirmation of Airbus' commitment to developing the full spectrum of the aerospace ecosystem in India. This will be the second final assembly line Airbus is building in India after the 'Make in India' C295 military aircraft manufacturing facility in Vadodara, Gujarat."

"The H125 is the world's best selling single engine helicopter that outclasses other helicopters in its category. This high performing versatile helicopter is a member of Airbus' Ecureuil family, which has accumulated more than 38 million flight hours worldwide. It can operate in high and hot and extreme environments and can be easily reconfigured for various missions, including aerial work, firefighting, law enforcement, rescue, air ambulance, passenger transport, and many others. The H125 is the only helicopter to have landed on Mount Everest, demonstrating its agility in operating in high altitude, extreme environments", stated Airbus.

The proposed helicopter manufacturing facility will be the second FAL to be established in India by Airbus, leveraging TASL's capabilities in aerospace and defence. The two companies are building the C295 military transport aircraft FAL in Vadodara, Gujarat. The latest announcement is part of Airbus' efforts to develop a holistic aerospace ecosystem in India, where the company is expanding its industrial footprint with aircraft assembly, component manufacturing, engineering and digital design and development, MRO support, pilot and maintenance training as well as academic collaboration to foster human capital.

MASPL expands its relationship with Airbus

Mahindra Aerostructures Pvt Ltd (MASPL) and Airbus Aerostructures GmbH have signed a new contract for the manufacture and delivery of metallic components for all Airbus commercial aircraft models, including the A320 family. Under the contract, MASPL will supply close to 5000 varieties of metallic components to Airbus in Germany from its manufacturing base in India. The contract adds to existing MASPL programmes to deliver parts directly to Airbus at their facilities in Toulouse, France. MASPL has been a direct supplier to Airbus Group since 2015, and partners with Airbus on numerous initiatives.

Airbus contracts with TASL and MASPL

Airbus has signed contracts with Tata Advanced Systems Limited (TASL) and Mahindra Aerospace Structures Private Limited (MASPL) to procure commercial aircraft components. Under the contract, TASL and Mahindra

Rémi Maillard, President and Managing Director of Airbus India and South Asia (Photo: Durgesh Singh)

Aerostructures will manufacture metallic detail parts, components and assemblies for Airbus' A320neo, A330neo and A350 programmes. "Airbus has made 'Make in India' front and centre of its strategy in the country. Our ambition is not only to support the growth of the Indian commercial fleet but also to grow the complete aerospace ecosystem here – and that includes developing and strengthening manufacturing and engineering capabilities from our Indian partners," stated Rémi Maillard, President and Managing Director of Airbus India and South Asia.

Airbus and Skill India, JV with AI and partners with GMR

Delivering on its commitment to 'Skill India', Airbus has entered into a 50:50 joint venture with Air India to launch a world class pilot training centre in Gurugram, Haryana. The Tata Airbus Training Centre will offer A320 and A350 flight training to some 5,000 new pilots over 10 years. The training centre is due to be operational starting early 2025 with the initial installation of four A320 FFS. The Tata Airbus Training Centre will offer courses approved by Directorate General of Civil Aviation (DGCA) and European Union Aviation Safety Agency (EASA). Airbus has also partnered with GMR Aero Technic to offer Aircraft Maintenance Engineering training courses at the latter's facility in Hyderabad.

Airbus Helicopters and PHL celebrate 35 years

Airbus Helicopters is celebrating 35 years of partnership with Pawan Hans Limited (PHL). The national helicopter operator inducted the first AS365N/N3 Dauphin in its fleet in 1987. It is the largest civil customer in the world for Airbus Dauphin helicopters deployed for offshore oil and gas operations, public transportation under Government of India's Regional Connectivity Scheme (RCS). They are also deploying the Dauphin for relief operations and emergency response during crises.

Sanjeev Razdan, Chairman & Managing Director, Pawan Hans Limited (PHL), and Sunny Guglani, Head of Helicopters, Airbus India and South Asia, along with the PHL and Airbus team members celebrating the milestone at Wings India 2024 air show in Hyderabad.

Airbus orders and deliveries in 2023

(Photos: Vayu Aerospace Review)

Airbus delivered 735 commercial aircraft to 87 customers around the world in 2023, demonstrating strong performance despite a complex operating environment. The commercial aircraft business registered 2,319 gross new orders (2,094 net). As a result, its 2023 year end backlog stood at 8,598 aircraft.

"2023 was a landmark year for Airbus' Commercial Aircraft business with exceptional sales and deliveries on the upper end of our target," stated Guillaume Faury, Airbus CEO. "A number of factors came together to help us

achieve our goals, including the increased flexibility and capability of our global industrial system, as well as the strong demand from airlines to refresh their fleets with our most modern and fuel–efficient aircraft." Guillaume added, "This is a remarkable achievement. My thanks goes to our customers, supplier partners and all the Airbus teams who made it happen."

"We originally anticipated aviation to recover sometime in the 2023–2025 timeframe, but what we saw in 2023 was, alongside the single–aisle market, widebody return much sooner than expected, and with vigour", stated Christian Scherer, Airbus' newly appointed CEO, Commercial Aircraft. "A big thumbs up to our commercial and regional teams, and importantly, a big thank you to our customers for their trust and partnership. We have never sold as many A320s or A350s in any given year, not to mention welcoming seven new customers for the A350–1000. Travel is back and there is serious momentum!" Christian added, "I'm proud to say there are now 735 more fuel–efficient Airbus jets flying today, paving the way to our lower carbon future. It's the orders we win today that will support us in investing in innovative and even more sustainable solutions tomorrow."

Text: Airbus

Full aircraft fleet deliveries for 2023

	2023	2022
A220 Family	68	53
A320 Family	571	516
A330 Family	32	32
A350 Family	64	60
Total	**735**	**661**

Airbus and Heligo services contract for H145

Airbus has signed an HCare Initial contract, a comprehensive by–the–hour services contract with Heligo Charter Private Limited for six Airbus H145 helicopters deployed for offshore and onshore operations in India. Under this five year contract, Heligo will benefit from Airbus' HCare Initial programme, which will give the operator the freedom to replace scheduled and unscheduled components within 24 hours and pay a fixed rate per hour of helicopter flown.

Heritage Aviation orders two Airbus helicopters

India based aircraft charter company Heritage Aviation has placed an order for H125 and H130 Airbus Helicopters to operate under the Government of India's regional connectivity scheme 'Ude Desh ka Aam Nagrik' (UDAN). "We are honoured that Heritage Aviation has put their trust in Airbus Helicopters for their growing network of charter services in India. The Government of India's UDAN scheme has made huge strides in enhancing regional air connectivity and empowering the Indian tourism sector. We are proud that Airbus Helicopters is contributing to this growth by making remote locations and regions accessible to people. Both the H125 and H130 are great choices that will help further promote this sector in the country," stated Sunny Guglani, Head of Airbus Helicopters, Airbus India and South Asia.

A220 doors contract for Dynamatic Technologies

Giving a significant push to the Government of India's 'Make in India' vision, Airbus has awarded a contract for the manufacturing and assembly of its A220 Family aircraft doors to Bengaluru based Dynamatic Technologies. This is one of the largest aerospace export contracts to India.

The contract will support the ramp–up of the A220 programme by creating additional capacity to the currently existing source. Under the agreement, Dynamatic will manufacture and assemble the cargo, passenger and service doors along with the over–wing emergency exit doors for the A220 family aircraft (eight doors per aircraft). The doors contract includes the manufacturing of detailed parts components, which will create downstream opportunities for the other Indian suppliers.

Rémi Maillard, President & Managing Director, Airbus India & South Asia, presenting an A220 aircraft model to Mr. Jyotiraditya M Scindia, Union Minister of Civil Aviation and Steel, in the presence of Gen. VK Singh (retd), Minister of State for Civil Aviation and Road Transport & Highways, and Udayant Malhoutra, CEO & Managing Director, Dynamatic Technologies, in New Delhi on 8 February 2024.

This is the second doors contract awarded by Airbus to an Indian supplier in less than one year. In 2023, Airbus gave the contract for the manufacturing of bulk and cargo doors of the A320 Family to Tata Advanced Systems Ltd.

A long–standing partner to Airbus, Dynamatic already manufactures the Flap Track Beam of the Airbus A330 and A320 Family aircraft as well as the cockpit escape hatch door of the A220.

For Airbus, India is a strategic resource hub where the company is expanding its industrial footprint with aircraft assembly, component manufacturing, engineering design and development, MRO support, pilot and maintenance training as well as academic collaboration to foster human capital.

Today, every Airbus commercial aircraft has components and technologies made in India. Currently, Airbus' procurement of components and services from India stands at about US$750 million every year, which will rise to US$1.5 billion in the next few years. Airbus' efforts to mature the wider Indian aerospace ecosystem also includes the building of two Final Assembly Lines: One for the C295 military aircraft in Vadodara and the second one for the H125 helicopter.

India C295 programme approved by DGAQA

Marking a milestone in the 'Make in India' C295 programme, 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, to produce detailed parts and sub–assemblies in India.

As per the approval, the certificate for which was formally handed over on 12 February 2024, Airbus Defence and Space is working with Tata Advanced Systems Limited (TASL) to produce detailed parts and sub–assemblies at various locations in India.

"This certification demonstrates the continuing trust and confidence of DGAQA in Airbus quality standards. All detailed parts for the C295 will be manufactured in India under exacting Airbus quality standards. We continue to work in strong partnership with Tata Advanced Systems Limited to apply a robust and comprehensive quality framework for successful aircraft manufacturing in India for the C295 'Make in India' programme under the policy of Aatmanirbhar Bharat," stated Jorge Tamarit Degenhardt, VP, Head of C295 India Programme, Airbus Defence and Space.

India formalised the acquisition of 56 Airbus C295 aircraft to replace the Indian Air Force (IAF) legacy AVRO fleet, in September 2021. Under the contractual agreement, Airbus will deliver the first 16 aircraft in 'fly–away' condition from its final assembly line in Seville, Spain. The remaining 40 aircraft will be manufactured and assembled by Tata Advanced Systems Limited (TASL) in India as part of an industrial partnership between the two companies.

Sanjay Chawla, Director General of Aeronautical Quality Assurance (centre), presenting the certificate of approval to Michael Schoellhorn, CEO of Airbus Defence and Space (right) and Masood Hussainy, Head, Aerostructures and Aeroengines, Tata Advanced Systems Limited (left), at the C295 Main Components Assembly facility in Hyderabad.

MoD's Interim Union Budget 2024–25

In the current geopolitical scenario and with the twin objective of promoting self reliance and exports, the Defence Budget has touched Rs 6,21,540.85 crore in the Financial Year 2024–25. This comes out to be 13.04% of total Union Budget, which was presented by Finance Minister Smt Nirmala Sitharaman in Parliament on 1 February 2024.

The Ministry of Defence (MoD) continues to receive the highest allocation among the Ministries. The budgetary allocation to Defence for FY 24–25 is higher by approx. one lakh crore (18.35%) over the allocation for the FY 2022–23 and 4.72% more than allocation of FY 23–24. Of this, a major share of 27.67% goes to capital, 14.82% for revenue expenditure on sustenance and operational preparedness, 30.68% for Pay and allowances, 22.72% for defence pensions and 4.11% for civil organisations under MoD.

Budgetary allocation for capital expenditure in Defence for FY 24–25 is Rs 1.72 lakh crore which is 20.33% higher than the actual expenditure of FY 22–23 and 9.40 % more than the Revised Allocation of FY 23–24. The allocation is in line with the Long Term Integrated Perspective Plan (LTIPP) of the three Services aimed to fill the critical capability gaps through modernisation of the Armed Forces by materialising some big ticket acquisitions in FY 2024–25. The enhanced budgetary allocation will facilitate in equipping the Armed Forces with state of the art, niche technology lethal weapons, fighter aircraft, ships, platforms, unmanned aerial vehicles, drones, specialist vehicles etc.

Planned modernisation of existing Su–30MKI fleet along with additional procurement of aircraft, acquisition of advanced engines for existing MiG–29, acquisition of transport aircraft C–295 and missile systems will be funded out of the budget being allocated. Apart from this, to take the initiative of 'Make in India' further the LCA MK–I IOC/FOC configuration will be additionally funded to ensure state of the art technology in domestic production. The Indian Navy projects such as acquisition of deck based fighter aircraft, submarines, next generation survey vessels etc will all materialise through this allocation. The sizeable allocation under capital is centered around promoting 'Aatmanirbharta' in Defence. Large portion of the allocation will be utilised for procurement through domestic sources to provide domestically manufacutured next generation weapon system to the country which will have a multiplier effect on the GDP, create employment, ensure capital formation and provide a stimulus to the domestic economy.

As per the Economic Survey of India report 2023, in the ship building sector, the investment multiplier is around 1.82, which means that an infusion of approx. Rs 1.5 lakh crore in naval ship–building projects would accrue a circulation of Rs 2.73 lakh crore in the ship building sector due to the multiplier effect.

This year onwards, the Government of India has taken a conscious call to foster jointness among the services by consolidating the demand of the three Services into similar items of expenditure such as Land, Aircraft and Aeroengines, Heavy and Medium Vehicles etc.

Allocation to the Armed Forces for revenue expenditure (other than Salary) meant for sustenance and operational commitment for FY 24–25 continues to be high at Rs 92,088 crore, which is 48% higher than the budgetary allocation of FY 2022–23. During the mid–year review, the allocation on this head was increased by 82% over the budgetary allocation of FY 22–23 crossing the figure of Rs one lakh crore for the first time. This is aimed at providing best maintenance facilities and support system to all platforms, including aircraft and ships.

Total Budgetary allocation on account of Defence pensions is Rs. 1,41,205 crore which is 2.17% higher than the allocation made during 2023–24. It will be incurred on monthly pension to approx 32 lakh pensioners through SPARSH and through other pension disbursing authorities.

In the light of the continued threat perception faced at the Indo–China border, there continues a jump in the Capital Budget allocation to the Border Roads Organisation. The allocation for BE 2024–25 is Rs 6,500 crore, which is 30% higher than the allocation for FY 23–24 and 160% higher over the allocation of FY 2021–22.

Allocation to the Indian Coast Guard (ICG) for this FY 2024–25 is Rs 7,651.80 crore which is 6.31% higher over the allocation of FY 2023–24. Of this, Rs 3,500 crore is to be incurred only on capital expenditure, adding teeth to the arsenal of the ICG to address the emerging challenges posed in water and provide humanitarian assistance to other nations.

The budgetary allocation to Defence Research and Development Organisation (DRDO) has been increased to Rs 23,855 crore in FY 2024–25 from Rs 23,263.89 crore in FY 2023–24. Of this allocation, a major share of Rs 13,208 crore is allocated for capital expenditure.

DAC clears capital acquisition proposals worth Rs 84,560 crore

The Defence Acquisition Council (DAC), under the chairmanship of Raksha Mantri Mr. Rajnath Singh, accorded approval for Acceptance of Necessity (AoNs) for various capital acquisition proposals amounting to Rs 84,560 crore on 16 February 2024.

The DAC has accorded AoN under Buy Indian–Indigenously Designed Developed and Manufactured (IDDM) category for procurement of a new generation of anti–tank mines having seismic sensor and provision of remote deactivation with additional safety features. In order to enhance the operational efficiency and domination in the Tactical Battle Area for engaging targets that are Beyond Visual Line of Sight by the Mechanised Forces, the AoN under Buy (Indian–IDDM) category has been accorded for procurement of Canister Launched Anti–Armour Loiter Munition System.

Further, to strengthen the Air Defence Systems, especially the capabilities to detect slow, small and low flying targets as well as surveillance, detection and tracking of different targets, the AoN has been accorded for procurement of Air Defence Tactical Control Radar under Buy (Indian–IDDM) category.

The AoN for procurement of Medium Range Maritime Reconnaissance and Multi Mission Maritime Aircraft, through Buy and Make category, has been granted by the DAC for strengthening the surveillance and interdiction capabilities of the Indian Navy and the Indian Coast Guard (ICG) over the country's vast maritime area.

Further, to keep the Indian Naval Ships one step ahead of the threats posed by the adversaries, the AoN under Buy (Indian) category has been accorded for procurement of Active Towed Array Sonar having capabilities to operate at low frequencies and various depths for long range detections of adversary submarines. The AoN has also been accorded for procurement of Heavy Weight Torpedoes for enhancing the attacking capabilities of Kalvari Class submarines. The AoN for sustainment support through Follow On Support (FOS) and Repair Replenishment support through Follow On Supply Support (FOSS) for 24 MH60R aircraft under Foreign Military Sale route with the US Government has also been accorded.

Contracts for military equipment

On 4 January 2024, MoD signed two contracts for procurement of 697 Bogie Open Military (BOM) Wagons at a cost of 473 Cr with Jupiter Wagons Limited and procurement of 56 Mechanical Minefield Marking Equipment (MMME) Mark II at a cost of 329 Cr with BEML Ltd, under Buy (Indian–IDDM) category. Bogie Open Military (BOM) wagons, designed by Research Design and Standard Organisation (RDSO) are specialist wagons used by the Indian Army for mobilisation of the Army units. BOM wagons are used to transport light vehicles, Artillery Guns, BMPs, Engineering Equipment etc. from their peacetime locations to operational areas.

Contract with AWEIL for 463 SRCG's

The Ministry of Defence signed a contract on 14 February 2024 with Advanced Weapon Equipment India Ltd (AWEIL), Kanpur for manufacturing and supply of a total of 463 indigenously manufactured 12.7 mm Stabilised Remote Control Guns (SRCG) for the Indian Navy and Indian Coast Guard at a total cost of Rs. 1752.13 crores, with Indigenous Content (IC) of more than 85%. The SRCG will enhance the capability of Indian Navy and Indian Coast Guard to accurately engage small targets that post a threat to ships in an asymmetric environment, both by day and night.

MoD signs five major capital acquisition contracts

As part of 'Aatmanirbharta in Defence' and to further boost Make–in–India initiative, the Ministry of Defence (MoD) signed five major capital acquisition contracts worth Rs 39,125.39 crore on 1 March 2024 in New Delhi.

Out of the five contracts, one was with Hindustan Aeronautics Limited for procurement of aero engines for MiG–29 aircraft, two with Larsen & Toubro Limited for procurement of Close–in Weapon System (CIWS) and procurement of High–Power Radar (HPR) and two with BrahMos Aerospace Private Limited (BAPL) for procurement of BrahMos missiles and procurement of shipborne BrahMos system for the Indian Defence Forces. "These deals will further strengthen indigenous capabilities, save foreign exchange and reduce dependency on Foreign Origin Equipment Manufactures in future", stated MoD.

The contract for RD–33 aero engines for MiG–29 aircraft has been signed with Hindustan Aeronautics Limited (HAL) at a cost of Rs 5,249.72 crore. These aero engines will be produced by the Koraput Division of HAL. These aero engines are expected to fulfill the need of Indian Air Force (IAF) to sustain the operational capability of the MiG–29 fleet for the residual service life. The aero engines will be manufactured under Transfer of Technology (TOT) license from the Russian OEM. The programme will focus on indigenisation of several high value critical components, which would help increase the indigenous content of future Repair and Overhaul (ROH) tasks of RD–33 aero engines.

The contract for procurement of CIWS has been signed with Larsen & Toubro Limited at a cost of Rs 7,668.82 crore. CIWS will provide terminal air defence to select locations of the country. The project will boost and encourage active participation of Indian aerospace, defence and associated industries including MSMEs. The direct and indirect employment generated by this project would be approximately average of 2,400 persons/year over the period of five years. The contract for procurement of HPR has also been signed with Larsen & Toubro Limited at a cost of Rs 5,700.13 crore. It will replace existing long–range radars of IAF with modern Active Aperture Phased Array based HPR with advanced surveillance features. It will significantly enhance the terrestrial air defence capabilities of IAF with integration of sophisticated sensors capable of detection of small radar cross section targets. It will boost to indigenous radar manufacturing technology as it would be first of its kind radar built by the private sector in India. The direct and indirect employment generated by this project would be approximately average of 1,000 people/year over the period of five years.

The contract for procurement of BrahMos missiles was signed with BrahMos Aerospace Private Limited (BAPL) at a cost of Rs 19,518.65 crore. These missiles would be utilised to meet combat outfit and training requirements of Indian Navy. This project is likely to generate employment of nine lakh man–days in Joint Venture entity and around 135 lakh man–days in ancillary industries (including MSMEs) of the country.

The contract for procurement of shipborne BrahMos system has also been signed with BrahMos Aerospace Private Limited (BAPL) at a cost of Rs 988.07 crore. This system is the Indian Navy's primary weapon for maritime strike operations fitted onboard various frontline warships. The system is capable of hitting land or sea targets from extended ranges with pinpoint accuracy at supersonic speeds. The project is likely to generate employment of around 60,000 man–days over a period of 7–8 years.

Indian Coast Guard celebrates its 48th Raising Day

The Indian Coast Guard (ICG) celebrated its 48th Raising Day on 1 February 2024. From a modest beginning with just 7 surface platforms in 1978, ICG has grown into a formidable force with 152 ships and 78 aircraft in its inventory and is likely to achieve targeted force levels of 200 surface platforms and 100 aircraft by 2030.

ICG is now considered to be one of renowned Coast Guards in the world due to its achievements and for the efficiency with which it operates its assets in a challenging environment, thereby ensuring round the clock safety and security. True to its motto "Vayam Rakshamah" meaning "We Protect", the service has to its credit, saving over 11,554 lives since its inception in 1977 and 200 lives in the year 2023, which translates into saving one precious life every second day.

To ensure security in the Maritime Zones of India, the Indian Coast Guard has maintained 24 x 7 vigil by deploying about 50 to 60 ships and 10 to 12 aircraft daily. This is to fulfill the nation's expectation to keep our seas free and secure in order to facilitate sustainable progress on blue economy efforts by various stakeholders, besides ensuring a safe environment for maritime transportation through our sea lanes. It is envisioned that the future ICG shall be omnipresent by showing strong presence in Maritime zones of India.

The vast seas with overlapping jurisdiction provide avenues for anti–nationals to exploit the sea routes by posing themselves as mariners at work at sea. Maritime Law Enforcement has been strengthened multifold and the hawk eye vigil by the ICG in our near coast and blue waters has resulted in seizure of weapons, contraband and narcotics worth Rs. 15,343 Crores since inception with Rs. 478 crore worth being seized in the year 2023 alone. Our

collaborative actions have created an effective deterrence and created a shield at sea where the penetration by the smugglers has been made nearly impossible.

ICG has been pioneering in inducting indigenous assets in line with 'Make in India' and 'Aatmanirbhar Bharat Abhiyan' missions and has inducted several indigenous ships, aircraft and equipment during recent years. Further, 21 ships are under construction at 3 shipyards including 2 Pollution Control Vessels which will be our frontline ships for combating marine pollution in our AoR. 16 ALH MK–III aircraft have been inducted into ICG. Further, contract towards procurement of 2 additional Dornier aircraft has been concluded and contract for 9 Advanced Light helicopters is likely to be finalised soon.

Additionally, procurement of 8 Dornier aircraft and 6 Multi–Mission Maritime Surveillance aircraft is also in the pipeline to strengthen the operational capability of the Indian Coast Guard. Six Dornier aircraft have also been upgraded with state of the art systems and sensors as part of 17 ICG Dornier Mid–Life Upgrade contract with HAL, Kanpur for modernisation of ICG aircraft. Majority of our assets are indigenously manufactured and about 90% of our capital budget is spent on indigenous assets.

In compliance with GoI's strategic vision for a 'Digital Armed Force', the Ministry of Defence (MoD) and TCIL have made a transformative agreement for accomplishment of Digital Coast Guard (DCG) mission. This is one of the major initiative towards paperless office.

On the marine environment protection front, the ICG being the Central Coordinating Authority for Oil Spill response in Indian EEZ, has ensured that there were no major oil spill incidents in Indian waters throughout last year. Further, 25th National Oil Spill Disaster Contingency Plan meeting and 9th National Pollution Response Exercise (NATPOLREX) were conducted Off Vadinar in Gulf of Kutch from 23–25 November 2023 to assess the preparedness and coordination among all agencies to respond to oil spill incidents. Taking forward, the vision of the Prime Minister's on cleanliness across the nation, 'Swachh Sagar, Surakshit Sagar' and 'Punit Sagar Abhiyan' were conducted nationwide, which attracted mass participation of volunteers.

In the last one year, sanction for creation of 195 posts have been accorded by GoI, which will assist Indian Coast Guard in effectively discharging its duties as a credible, reliable and omnipresent maritime force.

The President of India, Vice President, Prime Minister and Defence Minister have extended greetings and congratulated the Indian Coast Guard on completion of 47 glorious years of yeoman service to the nation and appreciated the remarkable role played by the service in pursuit of the nation's interests in the Maritime Zones.

Text courtesy: ICG
All photos: Vayu Aerospace Review

Naval Commanders' Conference 24/1

The first edition of the Naval Commanders' Conference of 2024 commenced on 5 March 2024. The Conference, this time around, was held in a hybrid format where in the first phase was held at sea. The inaugural session of the Conference had the Raksha Mantri embarking at sea to witness both aircraft carriers demonstrating Indian Navy's ability to conduct 'twin carrier operations'. The Conference, an annual event of paramount importance, serves as a platform for Naval Commanders to deliberate on strategic, operational, and administrative matters concerning maritime security. Held against the backdrop of evolving geo–political dynamics, regional challenges and the current volatile maritime security situation in the region, the conference plays a pivotal role in shaping the future course of the Indian Navy.

During the three–day event, the Raksha Mantri, Mr. Rajnath Singh, addressed the Naval Commanders. The Chief of Defence Staff, along with the Chiefs of the Indian Army and Indian Air Force, engaged with the Naval Commanders during the conference to discuss the convergence of the three Services in light of the common national security environment. They explored avenues to enhance tri–service synergy and readiness in defence of the nation and India's national interests.

The last six months have witnessed significant changes in geo–political landscape in IOR due to the ongoing Israel–Hamas conflict. The strategic alignment of the nations has resulted in a spill over of the kinetic actions on land into the Maritime Domain. Along with the drone and missile attacks on mercantile shipping, a resurgence of piracy has also been witnessed. The Indian Navy has responded to the emerging threats with strength and resolve demonstrating its capability as a First Responder and its commitment as a 'Preferred Security Partner in the region'.

The Indian Navy's corner stone event, Commanders Conference serves as a crucible for charting the course of the Navy's future amidst a rapidly evolving maritime environment. By fostering strategic clarity, operational excellence, technological innovation, and international cooperation, the Conference reaffirms the Navy's commitment to safeguarding India's maritime interests and upholding its status as a responsible maritime power in the region.

Text and photos: Indian Navy

The DFFSS seminar, New Delhi

Col Jasbir Singh Dahiya on....

...."Recollections from the Delhi Forum for Strategic Studies Seminar (DFFSS) on Global and Regional Geopolitical Disruptions Impacting India"

The Delhi Forum for Strategic Studies (DFFSS), a collective of some of the most eminent minds from the strategic community in India, came together at the India International Centre on 15 January 2024 to discuss the important challenges posed by the sudden global and regional geopolitical disruptions such as the conflicts in Ukraine and Gaza and deduce important lessons for India. The seminar was very well attended by former diplomats, senior Veterans from the Armed Forces, members of the media and noted strategic analysts.

The discussion centered around four carefully curated topics covering combining deft military and diplomatic opinions to include Asymmetric Warfare Challenges confronting India; Shaping the South Asia Landscape; Indo–Pacific and the Littoral Nations Dynamics; and the Lessons from the Russia–Ukraine and Israel–Hamas Conflicts, essentially covering all areas of prevailing and rising strategic concerns of the Nation from security, geo–politics to trade and development as well as relations with the neighbouring countries.

Spearheading the discussion, DFFSS President, Lt Gen Kamal Davar, welcomed the guest speakers and the participants and prayed that in the coming year, our beloved nation India, that is Bharat, makes unhindered all–round progress, successfully overcomes myriad challenges and secures its rightful place on the global high table.

Speaking about the recent conflicts, especially in Ukraine and Gaza, he highlighted the range of disruptions that have gravely impacted the difficult post–Covid–19 economic and industrial recovery across the world, created a plethora of security challenges for India and other nations as well as caused the shortage of food and other essentials affecting millions of people across the world. He emphasised that the Russian–Ukraine and Israeli–Hamas conflicts carry a large number of military and non–military lessons for India which must be studied and analysed appropriately for the nation's benefit.

Bringing out the unpredictability and evolving destructive nature of the conflicts, Lt Gen Davar reminded the audience that India, as a foremost emerging world power, cannot afford to neglect the countless consequences of these dangerous interruptions on its development and security and should therefore be fully prepared to negotiate them efficaciously. He emphasised that we must earnestly strive to further strengthening the all constituents of our Comprehensive National Power while ensuring that our 140 crores people march in unison towards the nation's goals.

Discussing the Challenges of Asymmetric Warfare in the current environment, currently Chancellor of Kashmir National University and former Srinagar

Corps Commander, Lt Gen Ata Hasnain brought out the intricacies of the combination of insurgency and terrorism in J&K and how despite phenomenal successes in combating it, keeps rearing its head through the interregnum in different formats. He also touched upon the Naxal problem and insurgency in the North East and brought out that Asymmetric Warfare is not just an internal challenge but an integral part of the broader warfare practiced by nations and India should be specifically cautious about the use of the various elements of asymmetric warfare both by China and Pakistan during the war as also during periods of normalcy.

He also called upon the military and polity to study the impact of disruptions resulting from the conflicts in Myanmar, Ukraine, Gaza, and elsewhere to harness the key lessons. He emphasised that asymmetric warfare is increasing in its scope, span and engulfing many domains. In particular, China is well ahead including from all the military powers in the world. He stated that asymmetric warfare or third generation warfare though conceptually speaking is between nations unequal in military capabilities but China is a unique example as to how it indulges in proxy war, encouraging insurgencies and disaffection, indulging in cyber warfare and border skirmishes etc.

Speaking on the need to shape the South Asian landscape, former Foreign Secretary and eminent diplomat, Ambassador Shyam Saran enunciated how India's route to progress and greater strategic relevance lies in its close and uninterrupted bonding with its South–Asian neighbours who are linked to each other by history, civilizational contacts, culture, geography and trade apart from many other ancient connections. He talked about strengthening regional connectivity through railways and highways and unhindered trade as well as greater people–to–people contacts.

He emphasised that to achieve the promised potential and equitable development across the South–Asian sphere in the way to significantly enhance India's regional clout, as well as reduce chances of some powers to disrupt India's relations with its South Asian neighbours, India will have to further reach out in myriad ways to get the South Asian community much more together for the overall benefit of the region.

Former C–in–C Southern Naval Command Vice Adm Anil Chawla, speaking on Indo–Pacific and the Littoral Nations Dynamics, underlined the unique security aspects of the maritime domain over the phenomenal zone of India's interest from the western Pacific Ocean to the Red Sea and the role played by the littoral states specifically given Chinese inroads and interests in the Indian Ocean and its increasing collaboration to find friendly ports and military bases. He called upon India to keenly watch the maritime space and continually enhance its military and diplomatic reach to overcome maritime disruptions that could have a bearing on the trade of essentials and industrial production. He also hailed India's maritime deployment for the safe passage of vessels through the Gulf of Aden which is impacted by the conflict in Gaza and nuanced the importance of such preventive deployment in larger national interest.

He detailed various steps the Indian Navy had taken to defeat sea piracy being indulged in recently by Houthi and Somalian sea pirates. These steps by the Indian Navy have earned worldwide appreciation. Though the Indian Navy is gradually building up its overall strength, he hoped that adequate budget for the Indian Navy will be ensured in the future by successive governments.

Former Lt Governor Lt Gen Bhopinder Singh focusing on the lessons from the Russia–Ukraine and Israel–Hamas conflicts spoke about the latest technologies as well as the tactics used in these conflicts and opined that future wars in all likelihood will be far more complicated to win. He also suggested about the balancing of military and economic asymmetry, where existing, and the challenges faced by even far superior militaries in decisively winning conflicts. Speaking about the likelihood of similar situations, he said that today's conflicts have an impact far beyond the borders in a globalised world. Not only the nations but their adversaries too are learning from the real–time monitoring of these conflicts and hence we should be prepared for newer and more disruptive use of technologies and forms of warfare. He stated that notwithstanding military and economic assistance from friendly foreign nations ultimately the onus to fight one's wars lies with the nation itself.

Summing up the deliberations, the Chief Guest, former Union Minister Mr. Manish Tewari, MP lauded

the speakers for their crisp and evocative presentations and the thought provoking discussions which took place subsequently. He shared his imprints of the prevailing regional and global situation and how India's critical focus on human resource development could help it reap the demographic dividend before it becomes a challenge. He conveyed his appreciation for the nation's Armed Forces in successfully combating various security challenges faced by the nation.

He also stressed the importance of seamless connectivity across South Asia and helping bordering countries in trade and development to reduce internal and external challenges. Propounding that new age challenges require new age thinking, he emphasised the need for constant evolution in evolutionary practices in our institutions at all levels of governance.

He emphasised that internal party politics has got nothing to do with a nation's security and economic challenges and we all must steer clear of any such divisive factors for the nation's growth, integrity and prosperity was paramount. Politics must be shunned where it conflicts with a nation's well being.

VAYU on–the–spot report

CAPF Mini Expo, New Delhi

ZEBU AMV

Protective gear by SMPP

The Central Armed Police Forces or CAPF Mini Expo has now been established as one of the most awaited local Expo's that gives Indian Defence Manufacturers (IDMs) an opportunity to showcase their products directly to their potential users in near future i.e. the Armed Forces/Paramilitary forces!

The most recent edition of the CAPF Mini Expo, took place at the PHD House in Hauz Khas, New Delhi on 4 March 2024. The expo saw participation by some of the well known IDMs and new start–ups. The 'Key Focus Areas' of the expo were:

Ordnance Products: In this category, Rippel Effect India showcased it's variety of grenade launchers, which were the six round Multi–Grenade Launcher (MGL), 40mm under–barrel grenade launcher (UBGL) for the AK platform and derivatives. They also showcased their APC–

MKU protective gear

New TASL LAMV

9 SMG variant, chambered in .45 ACP cartridge which is a licensed produced variant of the B&T UMP–45.

Special Equipment: Zen Technologies showcased their 'Cornershot' Weapon system in this category. Cornershot is useful for clearing corners during Room Intervention OPs and to bring effective fire on the enemy without exposing the operator while in a CQB situation. The weapon system can be fitted with the Glock–17,19 & 26 variants of the Glock series handguns and OFB Made 9mm Hi–Power pistols. It is currently in use with the NSG and SWATs of many state police.

ZEBU AV interior

Armoured vehicle by ZEBU

Protective Gear: SMPP and MKU Ltd gave healthy opposition to each other during the Expo! And were the big attraction for all especially the members of the CAPFs there. MKU showcased its KAVRO series of protective gear which includes Armoured Vests to Ballistic Helmets, while SMPP focused on the modular TAC–Vests and High Cut Ballistic helmets along ACHs with PATKA modifications.

Protective Mobility: TASL and a start–up called Zebu LTD showcased their Light Mobility Vehicles (LMVs) and Light Armoured Vehicles (LAMVs). But TASLs new LAMV and LMV stole the limelight both at the venue and on social media just after being posted by us on X, while

Entry poster

Grenade launchers by Rippel Effect

UMP–45 by Rippel Effect

Rishav Gupta with the Cornershot

Abhinav Negi with Zen Technologies Cornershot

not being physically present there like the ZEBU LMVs. It attracted a lot of attention from just being in a poster with a spec–sheet at the TASL's stall!

At lastly, just to summarise the article, I would say that the CAPF Mini Expo while being a 'Mini Expo', gave descent exposure to the all products showcased by the IDMs.

Article by Abhinav Negi of Team VAYU

Photos: Abhinav Negi & Rishav Gupta (Twitter: @_devildog_rv_)

VAYU on–the–spot report

IAF conducts 'Exercise Vayu Shakti-24' in Rajasthan

Pokhran range near Jaisalmer reverberated with thunderous explosions and applause, on 17 February 2024, as the Indian Air Force showcased its offensive capabilities through an enthralling and formidable display of its firepower. Chief of Defence Staff, General Anil Chauhan graced the occasion as the Chief Guest.

The event began with three Chetak helicopters trooping the National Flag and the Air Force ensign, flying past the grand stand with the National Anthem playing in the background. This was followed by a perfectly timed 'Sonic Boom' created by a Rafale aircraft. Two Jaguar aircraft flying at low levels followed the Rafale, taking high fidelity reconnaissance images of the area.

In keeping with this year's theme of the Exercise, 'Lightning Strike from the Sky', over 120 aircraft displayed the IAF's offensive capabilities by day as well as by night.

Fighter aircraft of the Indian Air Force including the Rafale, Su–30MKI, MiG–29, Mirage–2000, Tejas and Hawk attacked and destroyed simulated enemy targets on ground and in the air with deadly precision. These attacks were delivered in multiple modes and directions, employing a variety of precision guided munitions as well as conventional bombs and rockets. Upholding IAF's firm commitment to 'AtmaNirbhar Bharat', the indigenously built Tejas aircraft showcased its swing role capability and destroyed an aerial target with a missile, followed by the engagement of a ground target with bombs. Keeping up with the technological advancements in combat domain and the lessons learnt from recent conflicts, the IAF also displayed a long range unmanned drone, which destroyed a simulated enemy radar site, with pinpoint accuracy. An IAF Rafale also successfully engaged an aerial target with a beyond visual range air to air missile.

Combat support operations by transport aircraft included a Containerised Delivery System drop by a C–17 heavy lift aircraft and an assault landing by a C–130J carrying IAF Special Forces, Garuds.

The Apache attack helicopter demonstrated its firepower in this event for the first time, by engaging

targets with air to ground guided missiles, while Mi–17 helicopters engaged ground targets with rockets. Joint operations included the IAF and Indian Army's weaponised version of the Advanced Light Helicopters Mk–IV devastating simulated enemy targets using their rockets and swivel guns. As another first, IAF Chinook helicopters demonstrated rapid deployment of combat assets by airlifting the Indian Army's M–777 Ultra–Light Howitzers in an underslung mode enabling prompt destruction of simulated enemy targets on ground.

As the sun set on the horizon, Garuds inserted by Mi–17 helicopters carried out an 'Urban Intervention' demonstrating their prowess in anti–terror/insurgency operations aimed at clearing hideouts of inimical elements. The indigenous air defence systems, Akash and SAMAR missile systems were also showcased, destroying multiple aerial targets.

Night events displayed for the first time the capabilities of indigenous Light Combat Helicopter 'Prachand' wherein it neutralised designated target with rockets. This was followed by a Jaguar and Su–30MKI dropping heavy calibre and area weapons at night showcasing the strategic bombing capability of the IAF. Remotely Piloted Aircraft carried out the bomb damage assessment of all targets that was live streamed to the operations centre and to the audience.

The event also included a free fall drop by the Akashganga team and flare dispensing by C–130J by night. In the spirit of jointness, a Tri–service band enthralled the audience with their tunes. During the display, approximately 50 tonnes of ordnance was dropped in a short span of two hours over an area of two square km. The event truly showcased IAFs offensive lethality and precision targeting capability.

All photos by Mayyank Kaul (Twitter @ThrustVectorNeo and Instagram ThrustVectorNeo)

Text: IAF

Exercises and visits

INS Kabra at Colombo, Sri Lanka

Indian Navy's Fast Attack Craft INS Kabra arrived at Colombo, Sri Lanka on 8 January 2024. The ship was accorded a warm welcome by the Sri Lanka Navy. During the port call, Commanding Officer, INS Kabra called on Commander, Western Naval Area, Rear Admiral TSK Perera. In a presentation ceremony, essential spares and stores meant for the Sri Lanka Navy and Air Force were handed over by the ship. The visit "further strengthens the bilateral cooperation and camaraderie between the two Navies in keeping with the Prime Minister's vision of SAGAR".

India–Japan CG ships off Chennai

A joint exercise between Indian Coast Guard and Japan Coast Guard was held off the coast of Chennai on 12 January 2024. The exercise was conducted in line with Memorandum of Cooperation (MoC) between the India and Japan signed in 2006, wherein both countries had agreed to promote interaction between the two Coast Guard organizations including High Level Visits, Annual Joint Exercises, training exchanges, workshops and seminars.

In continuance of this ongoing cooperation, Japan Coast Guard Ship "Yashima" had arrived Chennai on a four day goodwill visit. The ship participated in Annual Joint Exercise on 12 January 2024 in which nine ships and six aircraft of Indian Coast Guard also participated.

Indian/Thai Navy exercise and CORPAT

The maiden Bilateral Maritime Exercise between the Indian Navy (IN) and Royal Thai Navy (RTN) was

conducted from 20 to 23 December 2023. Indigenously built Indian Naval ships Kulish and IN LCU 56 participated in the inaugural edition of the exercise. The RTN side was represented by His Thai Majesty's Ship (HTMS) Prachuap Khiri Khan. The 36th edition of India–Thailand Coordinated Patrol (Indo–Thai CORPAT) was also conducted along with the maiden bilateral exercise. Maritime Patrol Aircraft from both navies participated in the Sea Phase of the exercise.

Royal Navy ship HMS Spey at Kochi

HMS Spey, an offshore patrol vessel of the Royal Navy was on a goodwill visit to Kochi from 17–27 January 2024. The ship was accorded a warm reception amidst fanfare by the Indian Naval band on arrival. During the port call at Kochi, professional and social interactions and sports fixtures were held between the Indian Navy and Royal Navy. The Royal Navy personnel visited onboard INS Sunayna and shared best practices towards enhancing interoperability between the two Navies. Cdr Paul Caddy, Commanding Officer, HMS Spey called on Cmde Sarvpreet Singh, Chief Staff Officer (Operations), Southern Naval Command and discussed issues of mutual interest.

During the visit, a team from Headquarters Sea training (HQST) conducted training module on Force Protection Measures, Damage Control and Firefighting onboard HMS Spey. These exercises aided teams from HQST and the ship to understand the procedures and SOPs followed by both the Navies. The professional exchange "exemplified the commitment of both Navies to foster strong Naval partnerships, emphasising the significance of mutual co–operation in maritime security and training".

Indian Army SF in Egypt for Exercise Cyclone

The Indian Army contingent comprising 25 personnel reached Egypt to take part in the 2nd edition of India–Egypt Joint Special Forces Exercise Cyclone. The Exercise was conducted at Anshas, Egypt from 22d January to 1 February 2024. The first edition of the exercise was conducted last year in India. The Indian contingent was represented by troops from The Parachute Regiment (Special Forces) and Egyptian contingent comprising 25 personnel is being represented by Egyptian Commando Squadron and Egyptian Airborne Platoon.

Aim of the Exercise is to acquaint both the sides with each other's operating procedures in the backdrop of Special Operations in desert/semi desert terrain under Chapter VII of United Nations Charter. Exercise Cyclone is designed to develop bilateral military cooperation and strengthen bond between two armies through conduct of discussions and rehearsal of tactical military drills.

Indian–Kyrgyzstan SF Exercise Khanjar

The 11th edition of India–Kyrgyzstan Joint Special Forces Exercise KHANJAR was conducted at the Special Forces Training School in Bakloh, Himachal Pradesh from 22 January to 3 February 2024. It is an annual event conducted alternatively in both the countries. The Indian Army contingent comprising 20 personnel was represented by troops from The Parachute Regiment (Special Forces) and the Kyrgyzstan contingent comprising 20 personnel was represented by Scorpion Brigade.

Exercise Desert Knight

On 23 January 2024, the Indian Air Force (IAF) conducted Exercise Desert Knight along with French Air

and Space Force (FASF) and United Arab Emirates (UAE) Air Force. While the French participation included the Rafale fighter aircraft and a Multi Role Tanker Transport, the UAE Air Force fielded the F–16. These aircraft operated from the Al Dhafra air base in the UAE. The IAF contingent comprised of Su–30MKI, MiG–29, Jaguar, AWACS, C–130–J and Air to Air Refueller aircraft. The exercise in Indian FIR was conducted over the Arabian Sea, with IAF aircraft operating from bases within India.

The main focus of Exercise Desert Knight was on enhancing synergy and interoperability between the three Air Forces. The interactions during the exercise facilitated the exchange of operational knowledge, experiences and best practices amongst the participants. Such exercises are indicative of the growing diplomatic and military interactions in the region, apart from showcasing the prowess of the IAF.

India–Saudi Arabia Exercise 'Sada Tanseeq'

The inaugural edition of India–Saudi Arabia Joint Military Exercise 'Sada Tanseeq' commenced at Mahajan, Rajasthan and was conducted from 29 January to 10 February 2024. The Saudi Arabian contingent comprising 45 personnel was represented by Royal Saudi Land Forces. The Indian Army contingent also comprising 45 personnel was represented by a Battalion from the Brigade of the Guards (Mechanised Infantry).

The aim of the Exercise was to train troops of both sides for Joint Operations in Semi Desert terrain under Chapter VII of the United Nations Charter.

Exercise Sea Dragon, Guam

On 28 January 2024, an Indian Navy P–8I returned on completion of the two week long Exercise Sea Dragon at Guam. The Indian naval crew "enhanced interoperability in the multilateral exercise with the US Navy, Royal Australian Air Force, JMSDF and ROK Navy through joint ASW drills and tactics".

IAF at Singapore Air Show

A team of 71 personnel of Indian Air Force's (IAF)

Sarang Helicopter Display Team landed at the Paya Lebar Air Base of Singapore to participate in the Singapore Air Show 2024 on 12 February 2024. The Sarang Helicopter Display Team showcased its aerobatics manoeuvres at this event with five Advanced Light Helicopters (ALH) also known as 'Dhruv'. The induction was carried out with the IAF's C–17 Globemaster III heavy lift transport aircraft.

ICGS Varaha at Maputo Port, Mozambique

Indian Coast Guard Offshore Patrol Vessel (OPV) ICGS Varaha made a significant port call at Maputo Port,

Mozambique on 14 February, 2024 as a part of ongoing strategic overseas deployment to East Africa, marking a pivotal milestone in the ongoing diplomatic maritime engagements. During its three day visit, the crew of ICGS Varaha participated in a series of professional interactions in the field of Marine Pollution Response (MPR), Maritime Search and Rescue (M–SAR) and Maritime Law Enforcement including cross–deck training, call on to various Mozambique Naval and maritime agencies officials, sports fixtures, joint yoga sessions, tabletop exercises and Passage Exercise (PASSEX) with the Mozambique Naval Forces.

Exercise MILAN 2024

Mr. Jagdeep Dhankhar, the Vice President of India inaugurated the International Maritime Seminar, conducted on 22 February 2024 as part of MILAN 2024. The International Maritime Seminar, which was a pivotal component of MILAN 2024, proved to be a convergence of global maritime excellence. The Chief of Naval Staff of Indian Navy, Naval Chiefs of Friendly Foreign Countries (FFC), senior dignitaries, delegates including Ambassadors, High Commissioners and senior naval officers from India and friendly foreign countries participated in the seminar.

The 12th edition of the Multilateral Naval Exercise MILAN 24 commenced on 19 February 2024 in Visakhapatnam with the arrival of warships and one maritime patrol aircraft from FFC. Assets from about 50 more international navies took part. From Indian Navy, nearly 20 ships including aircraft carriers INS Vikrant and INS Vikramaditya and nearly 50 aircraft including MiG–29K, LCA, Tejas and P8I participated in the exercise. Highlights of the harbour phase from 19 to 23 February

2024 included the Milan Opening Ceremony, International City Parade, International Maritime Seminar, MILAN Tech Expo, MILAN Village, Subject Matter Expert Exchange and Table Top Exercise. During the sea phase from 24 to 27 February 2024, participating Navies conducted advanced air defence, anti–submarine and anti–surface warfare drills.

Gunnery shoots on aerial and surface targets, manoeuvres and underway replenishment were also conducted.

MILAN 2024 aimed to strengthen regional cooperation and maritime security, foster interoperability and understanding between participating navies and provide a platform for sharing best practices and expertise.

The IAF's Suryakiran Aerobatic Team

The Suryakiran Aerobatic Team (SKAT), a distinguished demonstration ensemble of the Indian Air Force (IAF), epitomises precision, skill and the spirit of aviation excellence. Established in 1996, SKAT swiftly ascended to become an emblematic representation of India's aerial prowess. Comprising the adept aviators of the 52nd Squadron of the IAF, the team has consistently dazzled audiences across the globe with their breathtaking aerobatic displays. Renowned for their flawless coordination and daring maneuvers, the Suryakiran team executes their performances with finesse and flair, captivating spectators with each meticulously choreographed sequence. As ambassadors of Indian aviation, they continue to inspire admiration and awe, showcasing the prowess and professionalism of the Indian Air Force on both national and international stages. We asked them a few questions and they answered.

Interview with the CO of SKAT

***VAYU**: Can you describe the exhilaration and challenges of flying in aerobatic formations, and what drew you to become an IAF aerobatic pilot?*

Ans. Aerobatic maneuvers at their very core, are combat maneuvers used to describe a geometry by trading height for speed or vice versa in order to gain an edge in combat. Thus, every fighter pilot must gain proficiency in aerobatics in order to exploit the manoeuvrability of the airplane in combat and thus gain an edge. Close formation too has its combat applicability be it air to air refuelling or flying a tight formation hoping to deceive enemy radars into underestimating the number of aircraft.

Suryakiran team is different as they are expected to execute aerobatics in formation. Add to this, the fact that there are 9 aircraft in formation (the only team in Asia to do so) and often with members maintaining references with respect to another member maintaining formation to the leader. Thus, in any maneuvers, the outer members traverse a larger path that requires much larger power and control inputs that the others, while the inners have to balance the need to be steady for the sake of the outers, vis a vis the need to give corrections to stay in formation with the leader. Doing this for 30 minutes, in turbulence at just 100 meters of the ground, is both exhilarating and nerve wracking at the same time. It boils down to being professional and being focussed, which all IAF fighter pilots are trained to be since day 1.

The everlasting impact that an aerial display or even

a flypast has on the citizens of our country whether, within India or abroad, especially the youth, and the pride beaming in the eyes, is what draws pilots to join the Suryakiran team.

***VAYU**: How does the training process differ for aerobatic pilots compared to regular fighter pilots, and what specific skills and techniques are necessary for executing precision maneuvers?*

Ans. The primary difference in training is twofold. Firstly, while all IAF pilots are proficient at aerobatic maneuvers, it is the proximity to ground that would be immediately apparent to any new comer to the team. Secondly, aerobatic maneuvers in formation using another aircraft, rather than the horizon as a reference, is again uncharted territory for most pilots. Thus, the training pattern is structured too gradually to expose and build up the requisite skills and confidence in both these aspects. During the training, pilots initially fly formation aerobatics in formation at higher heights, and single aircraft aerobatics at extreme low heights, and therefore by amalgamating the two aspects and introducing the pilot to formation aerobatics at low level. The number of aircraft in formation directly

determines the complexity of the manoeuvre and hence the number of aircraft in formation is gradually increased as the proficiency of the trainee increases.

The skill set required is often a highly refined and specialised sub–set of the skills all IAF fighter pilots possess. The primary skill sets would be hand eye coordination, fast reactions, anticipation and an ability to position and maintain the aircraft with respect to extremely specific reference points and hold it there for 30 mins.

***VAYU**: What safety measures and precautions are taken during aerobatic displays to ensure the wellbeing of pilots and spectators?*

Ans. Pilot and spectator safety is the number one consideration be it when planning and executing any specific manoeuvre or when planning and executing a display. Every manoeuvre the team performs has built in safety margins and very clear abort criteria in case those safety margins are infringed upon. The pilots of the team represent some of the very best the IAF has to offer and go through a rigorous selection process before being selected to the team. Once selected, they undergo a comprehensive syllabus that sees them training for almost six months before they are qualified to carry out a display.

Spectator safety is a natural product of the extensive training and preparation inherent to the display teams. Firstly, there are strict guidelines on how the display is to be conducted and positioning of maneuvers with respect to the crowd so as to keep the audience safe in any eventuality. Secondly, an extensive network of Bird Hazard Control Team (BHCT) is deployed during any display to ensure a relatively secure environment to operate in, as well as to inform the team well in advance in case of any eventuality that requires the pilot's attention. Clear and safe areas free of population, close to the display site are thoroughly researched, studied and briefed for every display site. Lastly, the civil administration too has a large role to play by ensuring crowd management and proper waste management, to reduce bird hazard.

***VAYU**: How do you maintain composure and focus while performing intricate aerobatic maneuvers especially in high stress situations or during an air show?*

Ans. Performing at maximum cognitive and physical capacity under high stress is something all IAF pilots are trained for. In essence, this does not change be it in air–to–air combat, air to ground work, air to air refuelling or any other mission. It is honing and refining the capability to maintain composure and focus, that the team's extensive pre display season syllabus focuses on. The approach taken is an extremely professional one and the results achieved are a result of years of training and practice that make the pilot in the cockpit focus on the job at hand.

***VAYU**: Can you share any memorable moments or experiences you've had while participating in air shows or competitions as an IAF pilot?*

Ans. Perhaps two memorable instances that come to mind would be the newly resurrected team's first ever nine aircraft display on the Hawk MK 132 at Air Force Station Hindan on Air Force Day 2017. This was testimony to the steep learning curve, professionalism and commitment of the team, leading to rapid upgradation from a four aircraft team in 2015 to six in 2016 and finally nine in 2017.

The second most memorable instance would be the AF day display this year conducted over the iconic Sangam at Prayagraj. The public response was overwhelming and on the final day, it was hard to even pick up the ground features that we use as reference for maneuvers, due to a sea of people occupying every vacant space on ground.

***VAYU**: What are some of the key factors that contribute to a successful aerobatic team performance and how do you establish trust and synchronisation with your fellow aerobatic pilots?*

Ans. A successful aerobatic team performance is a coming together of myriad factors. This starts from the ground preparation such as the study of the display site, planning of the profile, liaising with the organising authority for various administrative requirements, airspace requirements, maintenance requirements and the logistics of planning operations from the nearest airfield. Our team commentator has a key role in weaving together a narrative that combines the socio–cultural and historic significance of the occasion, with descriptions of the maneuvers in a way that appeals to the audience and is easily assimilated.

The trust amongst pilots is forged right from a new entrant's, first foray into the world of fighter flying. This forms a significant trait that is evaluated when an aspirant applies to the team. The trust and synchronisation are thereafter built upon all through the training season and syllabus. It culminates into the 9 aircraft formations where trust and synchronisation are key factors. This is because you fly looking at one aircraft for reference but you have 8 other aircraft within 5 metres of you. They are often not looking at you nor are you looking at them, yet the safety lies in the innate trust that they would maintain position no matter what. Without trust and synchronisation, the formations would not be so tight nor so complex.

***VAYU**: How do you adapt your flying techniques and strategies when transitioning from regular fighter operations to aerobatic displays?*

Ans. The Hawk being a training aircraft does not have the same thrust reserve as a fighter aircraft and thus a pilot has to be much more aware of energy management during every manoeuvre especially when in close proximity to ground. Similarly, the lack of fly by wire or autopilot makes the flying far more hands–on as compared to modern fighters that the team pilots are used to flying.

Furthermore, formation aerobatic flying is more reliant on reflexes and hand–eye coordination. As compared to a fighter aircraft, there is relatively less system management involved, however the flying is entirely manual with no automation whatsoever in terms of autopilot etc.

***VAYU**: What role does precision and timing play in executing aerobatic maneuvers and how do you practice and perfect these skills during training?*

Ans. A large contributor to the impact of any manoeuvre is precision and timing of execution. Thus, executing a manoeuvre perfectly in isolation would not have a desired impact. Similarly, a perfectly timed manoeuvre executed inaccurately (for example well left of the crowd) would not yield the required results. As would be appreciated in a 30 mins display, inaccuracy in timing or geographical positioning or imprecision in execution of a manoeuvre would have snowball effects onto the rest of the display. Hence, the training for this is as important as training for the manoeuvre in itself, and this is what the team trains to for 6 months of the year. The training season is often more gruelling than the display season and every manoeuvre of every practice is videographed and thoroughly debriefed until the required standards are achieved. The practise of video graphing and debriefing is an ongoing process after every display.

***VAYU**: Can you discuss the level of coordination and communication required between the pilot and ground control during performances, and how it affects the overall display?*

Ans. The communication with ground control can broadly be classified into two categories vis a vis communication with agencies such as ATC and the team's safety observer on ground. Both these form essential parts of any successful display.

Most of the times, the Suryakiran display is on strict timelines and part of a larger airshow with many participating aircraft that are often airborne from other parts of the country. For example, the AF Day display at Sangam had over 100 aircraft participating in the show. The team is given a very specific entry time (down to the seconds) and a specific duration of profile that must be adhered to. Towards this, air traffic control has a crucial role to play in keeping 100 aircraft within a very limited geographical space adequately separated whilst facilitating climb/descend etc in the most convenient way, keeping in mind the capabilities and limitations of each individual aerial platform. They also have the key task in assessing the flow of events on ground and giving time corrections to the team so that the team can make a perfectly timed entrance each and every time.

Once the team commences its display, the only person on ground the team is in contact with is the safety observer, who is a member of the team and a display qualified pilot. The safety observer assimilates and filters all information from various ground control agencies including bird watchers and safety services and is responsible for the timely yet brief transmission of the information to the team if relevant at that stage. He is also responsible to communicate to the team regarding visual appeal and could tell the team to shift closer or away from the crowd depending on how the formations and maneuvers appear from ground.

***VAYU**: Looking ahead, what advancements or changes do you anticipate in the field of aerobatics, and how do you think they will shape the future of Indian Air Force aerobatic displays?*

Ans. I think, the advent of highly manoeuvrable aircraft platform bodes well in terms of aerobatic capabilities of aircraft in the future. Even today, 4th and 5th gen aircraft that perform at air shows appear to defy the laws of physics and aerodynamics. This manoeuvrability and ability to have "carefree" handling would only increase in the coming days and certainly exciting times are in store for both pilots as well as spectators. I also think the advent of swarm drone technology and manned/unmanned teaming has exciting possibilities in the field of formation aerobatics. Machines would necessarily not be limited by aeromedical limitations (such as high G) that human pilots are subject to, and thus allow to push the boundaries even further. It would be an ideal stage to showcase the seamless synergy and interoperability between man and the machine to achieve common objectives with flawless precision.

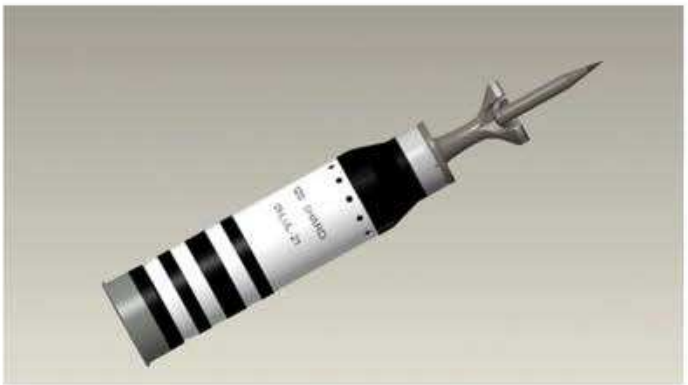
Article, interview and all photos by Mayyank Kaul (Twitter @ThrustVectorNeo and Instagram ThrustVectorNeo)

Modern anti–tank threats and solutions

One can argue that the era of tanks is over! The Nagorno–Karabakh, Russia–Ukraine, and Israel–Gaza wars have flooded social media with photos of destroyed tanks. While one can argue tanks have become more vulnerable than ever, it also should be understood that the tanks are going nowhere immediately. However, rather than discussing the credibility of a tank in a modern context, we will first try to find out the major threats a tank might face on the battlefield and possible solutions to combat them.

Threat 1: KE rounds

One of the biggest and most effective anti–tank threats is the armour–piercing fin–stabilized discarding sabot (APFSDS), or kinetic energy rounds. It's a metal dart that is fired through the main gun of a tank and uses only kinetic energy to penetrate the target. In simple words, it's a bullet for the tanks! Modern KE rounds use high–density materials like tungsten carbide (ex: 3BM42 Mango, 3BM60 Svinet–2, DM73) or depleted uranium (ex: M829A4) to achieve maximum penetration. Modern tank guns fire at a high supersonic or near hypersonic speed! Hence, these rounds could defeat the enemy armor as a hot knife goes through butter! While it's a highly lethal



In latest news, Nexter qualifies the new SHARD 120mm APFSDS tank ammunition. SHARD is "the solution" for all NATO 120mm tanks to defeat modern MBTs (by 15%) and has been designed by KNDS to bring 120mm APFSDS tungsten alloy ammunition "to the next level of performance against all modern MBTs".

solution, the effect gradually decreases with distance and increased angle. Hence, the sloping angle of the turret is a feature of many tanks, which increases the line–of–sight (LOS) armor thickness. While the use of high–hardness steel (HHS) along with rolled homogeneous armour (RHA) can decrease the effect, the latest western and Russian KE rounds are powerful enough to nullify efforts.

Threat 2: HEAT warhead

The high explosive anti–tank, also known as the HEAT warhead, is the most common kind of threat to a tank. Such a warhead has a thin metal liner inside in the shape of an explosion charge. When the charge is detonated, the liner collapses rapidly, resulting in a high speed jet of liquid known as an explosively formed penetrator (EFP), allowing it to pierce through the enemy armour. It must be remembered that such EFP doesn't melt the armour but rather pierces through it at hypersonic speed like a KE round. The main advantage of a HEAT round to KE is that the effect of HEAT doesn't get affected by the distance, unlike KE. Hence, such a warhead is widely used on various different platforms. One can find them in tank ammunition (ex: 3BK29, M830A1), tank launched missiles (ex: 9M119 Invar, LAHAT), vehicle mounted ATGM (ex: Nag, Brimstone), heli–launched ATGM (ex: SANT, Hellfire, Vikhr), man–portable ATGM (ex: Javelin, Spike, Amogha III), lighter shoulder–launched ammunition (ex: RPG 7, Carl Gustaf), or even off route mines (ex: PARM 2). The long list of ammunition is given not to bore the reader but to help understand the wide range of uses.

Javelin

While the RHA could be a solution to an old generation KE round, it gets defeated by the plasma jet quite easily. Hence, composite armour was developed to address the issue. The composite armour uses layers of alumina, ceramic, rubber, fiberglass etc, which are then sandwiched between the RHA layers. Thus, the combined armour works well against both the KE and heat. However, a bigger HEAT warhead can still defeat the armour. Hence, there is a necessity for add on armour.

The most widely used passive counter to it is explosive reactive armour (ERA). Multiple sheets of explosives are sandwiched between two metal plates. When struck by an anti–tank projectile, the explosives get detonated, propelling the metal plates in opposite directions. While the movement opposite the direction of the jet disrupts the formation, it also increases the distance covered by the shaped charge. Thus, the effect gets nullified or at least decreased. The concept was pioneered by the Soviets, but it was Israel that used it successfully during combat ("Blazer" during the 1982 Lebanon War).

Namica

ERA is now used widely and has seen evolution through the ages. To address threats of different degrees, Russia has developed several different types of ERA. The latest "Relikt" or "Monolith" uses thicker metal shells to withstand KE rounds as well. Besides, Russia has fielded soft–bag ERA, which is stripped of any metal coverage to reduce weight and work as a reinforced measure against HEAT warheads. To enhance protection further, a new type of large ERA box is also being fielded. Such a box carries 4S22/4S24 elements. But all of these measures are mainly to work against heat rounds and a desperate attempt against tandem strikes. However, mounting ERA itself is not a safe bait. The explosive nature poses a threat to the nearby friendly crew. Hence, an alternative 'Non–energetic Reactive Armour' (NERA) has been developed where non–metallic materials (like specialised rubber, polymers etc) are sandwiched and laminated between metal plates. It works on the principle of the bulging effect and sheering stress against an incoming projectile.

However, defence against lighter HEAT warheads like those used in RPG type ammunition could be a little easier. For that, slat armour (also known as bar, mesh, and cage armor) can be used. The RPG type ammunition has a typical shape with a sharp nose at the front. The front point carries piezoelectric crystals followed by a fuse. Upon impact, the crystal gets crushed, triggering the activation of the fuse, which triggers the destination. So, in simple words, the slat armour aims to disrupt the triggering. The typical netting of the armour doesn't allow the warhead to pass, but the nose! The strike either doesn't crush the crystal or triggers a short circuit, disabling the fuse. This is comparatively easy to make and can be found in a range of forms, from crude to the latest sophisticated one with reinforced nodes.

Modern ATGM with bigger and tandem warheads

can do much bigger damage, defeating both ERA and reinforced slat armour. Hence, to combat the threat, an Active Protection System (APS) has been developed. There are two types of APS systems. The first one is dubbed a soft kill system, which doesn't destroy the incoming warhead but rather disrupts the command guidance (ex: Shtora 1, MUSS). Such systems emit infrared lights, mimicking the enemy missile exhaust. Thus, the SACLOS feeds the wrong guidance, veering the missile off course. The second kind of APS, known as the hard kill system, prefers to defeat the threat itself (ex: Trophy, Iron Fist, Arena M, etc.). Such systems have millimeter wave radars (MMW) to detect an incoming projectile. The system then releases explosively forged projectiles (ex: Trophy) or explosive projectile interceptors (ex: Iron Fist) to defeat incoming projectiles.

Trophy APS

Another interesting defensive aid is the laser warning system. This is used against enemy laser guided threats. Such devices not only detect laser sources of illuminators, designators or rangefinders. Modern systems are integrated to detect radar guided and radio guided threats as well. It can respond adequately by launching a smoke screen, disrupting both IR and laser guidance. Such a smoke screen also offers discretion against protection from visual detection, allowing the platform to quickly move amidst a thick screen of smoke. Thus, there is a kind of soft kill method as well. Hence, many new APS, like Afghanit, use a hybrid of both soft kill and hard kill methods.

Interestingly, tanks with even hard kill APS have been found destroyed in combat. A Russian T–80UM2 with Drozd 2 was destroyed during the ongoing Russia–Ukraine conflict, and multiple Merkava 4 tanks with Trophy were destroyed during an Israeli military operation after the 7 October 2023 terrorist attack. Still, it will be absolutely wrong to assume the APS didn't work, as the Russian tank was destroyed by artillery firing. And the exact condition of the Israeli tanks is not known.

While the APS is the best possible solution against enemy projectiles, it has some limitations as well. But we will focus on only one. Many modern ATGMs are designed to strike enemy tanks not from the side but from the top or roof of the tank! Obviously, the roof is the thinnest area of a tank. Hence, defeating that part is quite easy. However, various methods are taken to increase protection in that area. Russians mount ERA, Israel adds additional armor plates, and Germany uses 'Igelpanzerung' (also known as hedgehog armor due to the spiked appearance). Though their efficiency is limited to only bomblets, DPICM or smaller EFP, is nevertheless irrefutably an important measure.

Threat 3: Drones

Unmanned aerial systems have evolved enough to be deployed for various roles. While medium– to large tactical drones (ex: MQ–9, Bayraktar TB2, Orion) are highly capable of delivering munitions, they are highly susceptible to enemy air defence in a contested airspace. Though these are highly efficient platforms, they are costly enough to

IAI Harop loitering munition

be deployed in mass to successfully neutralise threats on the ground. And exactly why smaller drones and loitering munitions came into the picture. These are cheap enough to be built in huge numbers, which can easily overwhelm conventional methods of air defence.

Kamikaze drones (ex: Harop, Lancet, Switchblade, Shahed–136) are guided flying warheads that can loiter until the best potential target is selected. A high–speed, steep dive can strike at the top of the armoured platforms. But most notorious has been the first–person view (FPV) enabled quad, hexa, or octocopters (ex: Aerorozvidka, DJI), which carry light ammunition (it could grenade, RPG warhead, and even a modified anti–tank mine) only to drop on unsuspecting troop positions, light vehicles or armored platforms with an opened hatch susceptible to a deadly strike to the stored ammunition. Bigger platforms are comparatively easier to identify. But such smaller systems are not less than a nuisance, as traditional defences are not available against them. They could be mass deployed, tag multiple targets, and switch positions quickly before the enemy can react! When deployed together in a swarm, they can quickly overpower enemy strongholds without modified air defence. India has quickly realised the threat and invested heavily both in achieving similar goals as well as in a defence against enemy swarm attacks. Some small UAS (ex: Eleron–3SV, Orlan–10) are specially designed for reconnaissance, surveillance and identification; they have even been used to guide artillery strikes on enemy positions. Thus, the artillery strikes are gradually becoming more accurate and more target specific. Hence, threats against unsuspecting armoured platforms have increased multiplefold.

Such platforms gained notoriety during the Nagorno–Karabakh War of 2020. To combat the emerging threats, Russia quickly fielded a slat–armour–type structure to the roof–top of their tanks, definitively known as the 'Cope Cage'! Widely used in the war in Ukraine, it has resulted in a mixed performance. Indeed, these systems have saved crucial lives. But like any other measure, it has limitations. Two prime concerns are the inability to withstand a bigger warhead and the coverage of the vehicle. But remember, it was never developed to defeat top–attack ATGM or artillery shells and is working just fine against smaller FPV kamikaze drones. Israel has also been found to have mass deployed similar weapons during the ongoing war against Hamas. Russian recently started fielding an improved variant enforced with ERA bricks.

While this has been one method to defend, another one that has gained momentum is drone jammers! Along with hand–held measures, several vehicle mounted jammers (ex: Volnorez, Saniya, Triton, Cupol) have been a regular sight in the Russia–Ukraine war. However, a credible result has yet to be assessed. Reports of failures are frequent. But this is mostly attributed to the poor quality of the built–in frequency range. Nevertheless, mass deployment is a new impetus for integrated defence. While vehicle–mounted remote–weapon systems (RWS) are also being improved for hard kill action along with specialised ammunition, various APS are being improved by corresponding developers to act against such threats.

Threat 4: Drawbacks in the Tank Design

Amidst the war, Western and Russian media purportedly have flooded social media and news outlets with images of burned and destroyed tanks on the other side. But images of destroyed Russian tanks with uprooted turrets are much more frequent to find. Whatever weapons have hit the Russian tanks, they have fallen prey to the "jack–in–the–box" effect. The 'T' series uses an autoloader, and ammunition is arranged in a carousel. The crew sits directly on the auto–loader itself! A successful penetration by any anti–tank round is likely to hit the storage, causing cooking off one or multiple ammo. Even being hit by fragmentation or sapling can trigger one. This leads to massive and instantaneous pressure inside the turret, along with continuous detonation of other stored ammunition in a chain reaction and conflagration, resulting in a violent blow to the turret. Western countries tried to solve the problem by storing the ammunition inside a 'containerised ammunition bin individual system' (CABIS) and blow–off panel (BOP), which reduced the risk of ammo trigger and chain reaction. Still, the Leopard 2A6 has been found to have fallen as hull ammunition storage was breached! The only difference to the Russian situation is that crew

Front of the Arjun Mk.1A MBT

survivability is much higher. The US has taken safety to another level by placing CABIS itself inside a blast door! As an alternative, new designs prefer bustle storage or placing crew inside an insulated compartment.

Threat 5: Artillery and Mines

The biggest threat to the tank is still the artillery. Artillery still holds the number one position as the most notorious 'tank–killer'! It can be often observed that the precise artillery strike has obliterated an advancing armoured column while a few surviving platforms are destroyed afterwards with the help of kamikaze drones! In fact, with the emergence of guiding drones, artillery has become much more accurate and, hence, deadlier. If not a 'total kill', the fragmentation could lead to the 'mission 'kill' destroying the mounted optics, thus stripping the tank of crucial situational awareness. Along with this, anti–tank mines (ex: TM–62), IED, and off–route mines (ex: PARM 2) are a big headache. It has been noticed that IED can have a devastating effect on a tank, including the deaths of crew members. The minimum, a 'mobility 'kill' is also possible. And on a battlefield, a stranded tank is as good as a dead one!

KF51 Panther

The only way to stop the enemy from firing their artillery is to destroy them! It will be possible with only a successful mass airstrike on the enemy position. Now, how to conduct a successful air operation in a potential contested airspace is a different subject! But there's no other way to address the issue without neutralising enemy artillery. While dedicated anti–mine operations will be needed to prepare a safe route for armour advancement, it could be done by reinforcing platforms with anti–mine equipment (ex: mine rollers, flail, track–width mine plough, rotating chain, surface clearance device) or using special methods like mine–clearing line charging (ex: M58, UR–77) and mine–field breaching systems (ex: Python). To combat threats from IED, a dedicated vehicle–mounted jammer (ex: RP–377VM) has been developed. But more than the jammer, a better way is to detect, identify, and neutralise the threat with a dedicated platform, preferably with the help of an unmanned system.

While the traditional threats to a tank are getting deadlier day by day, the emerging new threats are gaining momentum through rapid evolution. It will take some time to find dedicated solutions to the threats. The immediate solution might not be the best one. For example, Russian tanks are designed as medium platforms, in sharp contrast to the existing Western designs. But, amidst conflict, they have been bulked up with reinforcement. One can identify all around slat armour, multi–layer ERA reinforcement, ERA coverage to the gun mantlet, the turret ring, the lower front plate, and even the engine compartment, the integration of a drone and an IED jammer, and yet fall prey to the threats. Every battle leads to the evolution of tank design and the emergence of new technologies. So, in the near future, we should be prepared to witness tanks embracing new shapes!

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Fifth generation rise of Korea and Turkey

Turkey and South Korea are the two countries that have stunned the world with the rapid rise of multi–domain advanced indigenous technologies, enriching as well as steering themselves towards self–reliance in the true sense. Today we will dive into the journey of their fifth–generation fighter jet development programmes to understand their objectives, planning, progress, obstacles and process of achievement.

KF–X KF–21 Boramae

The Korean fighter jet programme dates back to 2001, when then President of South Korea Kim Dae Jung envisioned a programme for a multi–role fighter jet to replace the F–4D/E Phantom II and F–5E/F Tiger. The "Joint Chiefs of Staff" soon formulated the requirements, but practically no movement could be observed till 2009 amidst the risk of a highly ambitious programme. The limited indigenous capability steered Korea to concentrate on the then under development FA–50 programme and F–X Phase 3 acquisition. However, the 2010 North Korean attack on Yeonpyeong Island changed the course forever, and Seoul zeroed down to develop a fighter jet under a programme named "KF–X.".

To reduce the risk, it was decided to have a fourth generation platform first rather than jump to an ambitious fifth generation one. The same year, in July, Indonesia officially joined the programme under a partnership to provide 20% of the funding for the project. However, until January 2024, not much progress regarding investment has been made, so keeping the Indonesian side of the story out of the picture. Surprisingly, in the same year, Turkey was also reported to join the programme and contribute 20% of the total investment.

Thus, at one point, it could become a trilateral partnership between South Korea, Indonesia, and Turkey. But Turkey departed within months, announcing their MMU TF–X, which would later give birth to "Kaan." Defence Acquisition Programme Administration (DAPA) got involved in configuration studies and outlining technical requirements. Based on the requirements, the design teams started drafting the basic shape. The Agency for Defence Development (ADD) presented two basic designs: C103 and a canard C203, keeping the potential results of F–X Phase 3 in mind.

Meanwhile, Korea Aerospace Industries (KAI) proposed a single–engine alternative design, the C501, as a cost effective solution. In 2013, General Electric F404 and F414 and Eurojet Turbo GmbH EJ200 were selected as the potential engines of the KF–X. KAI and Korean Air Aerospace Division (KAL–ASD) were selected as the two competing companies to develop KF–X. KAL signed a MoU with Airbus, while Lockheed Martin became a partner of KAI. In May 2015, DAPA awarded KAI as the official establishment to continue the KF–X programme. The next year, in May, a contract worth an estimated $3.5 billion was awarded to General Electric for the supply of 240 (and spare) F414 engines. The local variant would be

known as F414–GE–400K and manufactured by Hanwha Aerospace. However, everything wasn't smooth afterwards as the US government sanctioned the transfer of four key technologies to Korea by Lockheed Martin. However, Lockheed agreed to supply 21 technologies from the F–35 under an agreement. DAPA went ahead to develop those critical technologies in–house.

The next few years saw many Korean companies partner with established foreign firms with strongholds in corresponding fields and come up with indigenous solutions. The PDR was completed by June 2018, and the C109 model was officially locked as the official design. The first prototype was put on the assembly line in February 2019, and it was ready by November. The completed prototype was first rolled out to the public on 9 April 2021. The very same day, KF–X was officially christened KF–21 Boramae. It conducted the first taxi trial on March 17, 2022. Finally, on July 19, that year, it conducted the first flight. As of January 2024, all six prototypes have conducted their flight, and DAPA has certified the KF–21 as a combat–ready platform. KF–21 is now scheduled to enter serial production in the same year. KF–21 is maturing block by block. Block 1 is an advanced 4.5–generation platform with semi–recessed missile bays to carry long–range air to air missiles. Thus, Block 1 will be just an air–superiority platform. Block 2 will be further modified to be a multi–role platform. Finally, Block 3 will incorporate an internal weapon bay to be a fully fifth–generation platform. There is also a proposal for a naval variant for the potential Korean aircraft carrier project. Currently, there is a requirement of 40 KF–21 Block I and 80 Block II platforms. South Korea aims to continue to have a sixth–generation platform.

TF–X Kaan

It was in 2010 when then Prime Minister of Turkey, Tayyip Erdoğan, under the presidency of Abdullah Gül, met then Chief of General Staff Gen. Işık Koşaner to develop an advanced national fighter jet project to be completed by 2023. The next year, the Savunma Sanayii Mustesarligi (SSM, Undersecretariat for the Defence Industry) and Turkish Aerospace Industries (TAI) signed an agreement to design and develop the platform. Tusaş Engine Industries (TEI) was roped in for the development of the indigenous turbofan engine in due course. The Milli Muharip Uçak (MMU, National Combat Aircraft) programme aimed to complement and eventually replace the F–16 in service. The preliminary design phase was started in mid 2011, and a sum equivalent to $20 million was allocated. Swedish aerospace giant SAAB joined in 2012 for the formulation of conceptual designs. The next year, TAI submitted three different concept designs: FX–1, FX5, and FX6. Both the FX–5 and FX–6 were single–engine concepts, while the FX–1 was a two–engine one. In 2015, Turkey zeroed in on the twin–engine concept. The next year, SSM granted $1.8 billion to TAI

for the preliminary design phase. The aim was to acquire the necessary technologies for the development, set–up of testing infrastructures, and certification of the platform.

Around the same time, a RFP was released for the procurement of an adequate engine and domestic production with the transfer of technology as much as possible. General Electric, Eurojet Turbo GmbH (a consortium of Rolls–Royce Holdings PLC and MTU Aero Engines AG), and Snecma responded with their products: the GE F414 and GE F110, the EJ–200 and the M88, respectively. In 2017, a contract worth more than £100 million was signed with BAE of the UK for engineering support. This enabled further partnership between Kale Group and Rolls–Royce for the development of an advanced turbofan engine for the TF–X, with IPR rights secured for Turkey. The JV, known as Turkish Air Engine Company (TAEC), was to make a suitable engine based on the EJ200. However, the £100 million partnership soon hit a hiatus due to uncertainties over technology transfer, to be solved only by 2022. Meanwhile, BMC and TAI established TRMotor Power Systems and signed a MoU with Savunma Sanayii Başkanlığı (SSB, Defence Industry Agency, erstwhile SSM) in 2018 for the development of the engine. TEI was already involved in the project. All three establishments responded to the RFP released by the SSB in 2022 for the development of an adequate engine.

Interestingly, TRMotor now has a partnership with TEI and Ukrainian–origin Ivchenko Progress. For the interim, a General Electric F110–GE–129 engine was selected. The preliminary design work for TFX started in 2021. The first prototype was put on the assembly line in March 2022, and it was ready by November. The completed prototype went public for the first time on 10 February 2023. It conducted the first taxi trial on 17 March 2023. On 1 May, President Erdoğan officially named TF–X "Kaan"! Finally, on 21 February 2024, the first prototype of "Kaan" conducted its maiden flight, creating history as the fourth nation in the world and second nation in Asia to make a fifth–generation fighter jet to the sky! The first flight spanned 13 minutes, reaching an altitude of 8,000 feet and achieving a speed of 230 knots.

Turkey plans to fly seven prototypes, followed by formal joining in 2028. A naval variant is also planned for future aircraft carriers in Turkey. As of February 2024, there is a plan for 270 platforms (of which 250 are planned between 2029 and 2040) for the air force. Block 10 will use the US origin GE F–110 engine, while Block 20 will be integrated with the indigenous engines. Turkey aims to evolve "Kaan" into a sixth–generation fighter platform in the next decade.

A comparative data between KF–X (KF–21 Boramae) and TF–X (Kaan)

	KF–X	TF–X
Length	16.9 m	21 m
Wingspan	11.2 m	14 m
Height	4.7 m	6 m
MTOW	25.6 T	27.2 T
Powerplant (initially)	2 × General Electric F414–GE–400K (98 kN with afterburner)	2 × General Electric F110–GE–129 (131 kN with afterburner)

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VAYU on–the–spot report

Wings India 2024, Hyderabad
Indian civil aviation aims higher

Roughly a year after the massive air fest of Aero India, the country hosted another carnival for aviation enthusiasts with Wings India 2024. The 4 day airshow, backed by the Ministry of Civil Aviation, saw the big leagues of aviation sector touching down at Begumpet International Airport in Hyderabad. Approximately 200 companies had arrived to promote their products, proudly displayed their inventory, launched landmark programmes and aircraft and signed milestone deals and agreements.

Dynamic aircraft showcase

This year's Wings India event was special as this one happened just after India's two biggest record breaking civil aviation deals. As we know Air India purchased 470 aircraft for their fleet which has a combination of both Airbus and Boeing aircraft, as well as Indigo also purchased 500 narrowbody aircraft from Airbus, which was the most aircraft ever bought by a single airline.

B777X and A350: The showstoppers

Boeing 777X is Boeing's latest long–range, wide body twin engine jetliner which has new composite wings (longer than previous versions), General Electric's GE9X engines (more fuel efficient version of GE90), bigger cabin width, more seating capacity than previous Boeing 777s, and a folding wingtip (automatic, as well as it can be controlled from the cockpit also) which ensures that this aircraft can be parked in most of the commercial runways around the globe. The aircraft was launched in November 2013 and can carry a maximum of 426 passengers for a range of 13,500 Km. The aircraft borrows technologies from the Boeing 787 Dreamliner, and the cockpit layout is almost the same as that of a Dreamliner. The Boeing 777X–9 first flew in 2020, and the deliveries are expected from 2025.

The other star of the show was Air India's newly inducted Airbus A350–900. It was Air India's first Airbus A350–900 with a new livery as well as a new crew uniform. The aircraft is in direct competition with Boeing's 777, and they are already flying since 2010, with almost 585 aircraft delivered in various configurations.

Both aircraft were purchased by Air India, but only the A350–900 belonged to Air India and it was India's first A350 aircraft, whereas Boeing bought their experimental Boeing 777X–9, on which they performed different tests before the aircraft was ready to be inducted into service. For reference, Air India ordered 34 A350–1000, 6 A350–900 and 10 Boeing 777X.

Akasa Air showcased its Boeing 737 Max–8 aircraft. This showcase was interesting as, Akasa Air signed an aircraft order of 150 Boeing 737 Max aircraft at this very Wings India event, taking their total order book to 226 aircraft. Air India Express also showcased their Boeing 737 Max–8 aircraft, but the special thing about this 737, was

its livery, this was Air India's new livery on the express, and the aircraft was looking beautiful.

HAL showcased their ALH Dhruv Mk III Civil variant where in features it was shown that this helicopter can carry 9/14 passengers where 9 is the seating for VIP configuration and 14 is for the utility roles. The cabin volume here is 7.33 m3 and the total internal payload capacity is 1000 kg with an endurance of 4 hours.

The cockpit is completely glass cockpit, and the helicopter can fly for a max range of 630km with 20 min reserve fuel. The helicopter can be used in different roles, such as tourism, disaster management, mining exploration, search and rescue, casualty evacuation etc. HAL also showcased their civil variant of Dornier's Do–228 aircraft, this one is called the Hindustan 228 Aircraft and it has a maximum takeoff weight of 5,695 kg with 19 passengers. This aircraft was approved by DGCA for civil use in 2023 only. This aircraft has immense potential as an affordable regional aircraft, especially under the Indian government's UDAN Scheme.

Bombardier showcased their Global 6500 private jet, with an outstanding range of 12,223 km and maximum speed of 956 Km/h. The Global 6500 has the widest cabin in its class, supporting a maximum of 17 passengers, the interior is comfortable and sophisticated.

The Sky Spectacles: Global Stars and Sarang

The Mark Jefferies Global Stars Aerobatic team provided spectacular formation air display and solo display on their Extra 330SC aircraft. The EXTRA 330 SC is a single seat, low wing aerobatic monoplane with a conventional (taildragger) landing gear design. The team painted the skies with tricolour–themed smoke and flares in their respective time slots. The Indian Air Force premier helicopter display team, Saranag also flaunted the agility of the indigenous ALH Dhruv helicopters in front of the home crowd.

Deal signings and industry partnerships

Speaking of partnerships, Wings India 2024 allowed various firms to sign MoUs and contracts. Akasa Air finally announced its three digit order for Boeing 737 MAX narrowbody aircraft, valued around $20 billion, with deliveries to begin in 2027. Airbus formed a JV with Air India to launch a pilot training centre and partnered with GMR to train maintenance crew. The Haryana government signed MoUs for three aviation projects. The agreements involve the Airports Authority of India managing equipment at Hisar airport, Pawan Hans establishing a

heli–hub Dwarka Expressway in Gurugram, and Alliance Air operating flights from Hisar under the VGF (Viability Gap Funding) scheme.

We then head to MEHAIR, India's first seaplane company, to sign an MoU with British–based ZeroAvia for ZA600 hydrogen electric engines. Noida International Airport (NIA) signed an MoU with Akasa, second after IndiGo, for international and domestic operations. JetSetGo, a private plane experience provider based in Mumbai, signed agreements worth $780 million which also includes 150 aircraft acquisitions. Further agreements, deals and MoUs were signed involving firms and the government, which aims to bolster the civil aviation sector.

Industry outlook and press conferences

Press conferences always offer an interactive platform for media and firms. Boeing and Airbus in their respective industry outlook programmes described the current status of their performance in the Indian market, and what kind of growth was expected in the coming times. Both were optimistic to see significant nourishment of civil aviation in India due to rising demand. Hence, both aerospace giants are looking to secure more orders and support for their products from their Indian customers. Contributing to the "Make in India" initiative, Airbus signed contracts with Tata Advanced Systems Limited (TASL) and Mahindra Aerostructures to manufacture metallic detail parts, components and assemblies for Airbus' A320neo, A330neo and A350 platforms.

Innovative Technologies

Wings India had a great range of interesting elements to dazzle the visitors and among them were key indigenous product showcases and concept demonstrations. HAL not only displayed their civil version of Dornier Do–228 as Hindustan 228 but also showcased further potential of this platform as an amphibian aircraft, which can not only be useful for the military but also can find its use case as a civil carrier. The Govt of India is working on creating more sea aerodromes, opening the door for seaplanes to be a new means of transport in this country using rivers and dams as the water airdromes and has huge potential in the coming future. In that regard, this indigenous aircraft has huge potential.

Then there was 2.5m X 2.5m Continuous Wind Tunnel as a joint project by CSIR, DRDO and ISRO and it is India's First and Largest Trisonic continuous tunnel. This tunnel can support tests up to Mach 0.1 to 1.8, and for an Angle of Attack of range –45 Degrees to +45 Degrees, ensuring non–stop testing for complex parameters.

Along with the updated Regional Transport Aircraft (RTA) cockpit replica, National Aerospace Laboratories (NAL) showcased their all electric Hybrid UAV which is capable of autonomous vertical take–off and landing while having fixed wings. This drone can fly for a duration of 120

minutes, in which it can hover for 10 minutes and can fly for a duration of 110 minutes in a fixed wing configuration. The structure is all composite and this platform has a ceiling limit of 5 km, while the range sits out at 30 km, this UAV can carry a 5 kg of max payload.

Austrian company Schiebel showcased their unmanned rotorcraft Camcopter S–100. This aircraft was recently inducted by the Indian Navy. The S–100 has a maximum take–off weight of 200 kg with 6 hours endurance which can be extended up to 10 hours with optional external AVCAT fuel tanks. The maximum speed here is of 220 km/hr and the ceiling limit is at 5,500 m. It can carry a host of multiple payloads which are surveillance as well as tactical in nature.

In conclusion

In summary, Wings India 2024 emerged as a pivotal event for the Indian aviation industry, showcasing innovations, fostering partnerships, spectacular static displays and overall highlighting the country's civil aviation potential. Aerial displays by the Global Stars Aerobatic team and Sarang helicopters added excitement along with the evening drone show.

We would like to thank the authorities for the great arrangements, as we found little to no discomfort in facilities like restrooms and foodcourts.

Overall, Wings India 2024 served as a platform for networking, knowledge exchange, and celebration of India's aviation advancements.

Article by Rishav Gupta and Durgesh Singh
Photos by Durgesh Singh and Rishav Gupta

HAL at Wings India 2024



HAL displayed its upgraded civil Dhruv helicopter which could be seen at the static display area.

HAL showcased its indigenous civil platforms, Hindustan–228 aircraft and ALH Dhruv upgraded civil helicopter during Wings India 2024 which was held from 18–21 January 2024 at Begumpet Airport, Hyderabad. Mr. C. B. Ananthakrishnan, CMD (Additional Charge), HAL stated, "HAL is propelling the initiative of 'Made in India' fixed wing civil aircraft to boost regional connectivity in India. The Company is leveraging its strengths in manufacturing aircraft like Do–228 and HS–748 and extending its capabilities to civil aircraft programmes like the Regional Transport Aircraft. HAL is also actively pursuing collaborations for undertaking civil MRO activities."

HAL was present at Hall A, Stall No 25 during the show and the stall had scale models of LUH (civil variant), Hindustan–228, ALH (civil variant), Line Replaceable Units (LRUs) and accessories pertaining to civil aircraft. HAL also held business meetings with OEMs and customers besides signing agreements with its business partners for various projects.

Upgraded civil Dhruv helicopter: The upgraded civil Dhruv helicopter, a variant of Advanced Light Helicopter, is a 5.5 ton, twin engine helicopter, designed and developed by HAL. The helicopter can perform various roles like disaster management, Search and Rescue (SAR), underslung roles, Heli–tourism, VIP ferry etc. The helicopter has Advanced Glass Cockpit and avionics. This helicopter would meet the Regional Connectivity programme (RCS) of Govt of India.

Hindustan–228: The Hindustan 228 aircraft is a multipurpose, light weight twin turboprop aircraft indigenously developed by HAL to cater to the remote regional connectivity on short haul air routes under the Regional Connectivity Scheme, UDAN (Ude Desh Ka Aam Nagrik). Hindustan–228 can be configured for variety of roles–Regional Airliner/Air Taxi, VIP/Executive Transport, Search and Rescue, Casualty evacuation/Ambulance, Cargo and Logistics Support, Calibration of Airport Nav–aids, Geographical surveys, Aerial photography, etc. The aircraft cockpit is upgraded with fully digital Glass Cockpit, upgraded avionics and systems. The aircraft is Type Certified by DGCA.

Civil LUH: HAL has also taken the initiative to develop a civil variant of the Light Utility Helicopter. The Company is pursuing the build of the LUH civil prototype with DGCA certification, expected to be achieved by December 2025.

Photos by Durgesh Singh and Rishav Gupta

MEHAIR and ZeroAvia paving way for India's Next Green Revolution

The global call for adopting green energy is at its peak, with big leagues having already replaced a good number of conventional services with eco–friendly energy alternatives, and also heading for standardising the latter under its future plan. The aviation industry is no exception, for the reason that currently 3% of global CO2 emissions annually are attributed to this field. This is equivalent to approximately one billion metric tonnes of CO2. Therefore, a small but pivotal step was taken during Wings India 2024 in Hyderabad.

ZeroAvia, a British–based aircraft powerplant manufacturer signed an agreement with Maritime Energy Heli Air Services Pvt. Ltd. (MEHAIR), an Indian air–service provider to supply hydroelectric engines for its upcoming Cessna 208 Caravan aircraft. This is a conditional order involving 20 ZA600 engines, the first ever commercial product by ZeroAvia which already secured more than 2000 units ordered by customers worldwide.

The first lot of the Caravan aircraft will be delivered to MEHAIR by mid–2024. However, these will be equipped with standard Pratt & Whitney PT6 engine. The transition to hydrogen electric engines will be carried out only after ZA600 completes the series of full certification processes in both India and abroad, which will likely take 2 years overall.

A Dornier 228 aircraft testbed is undergoing flight tests in the UK, featuring the standard combustion engine on one side and the 5–blade config ZA600 on the other. Completion of these tests will pave the way for engine integration into new aircraft models, including the Caravan, initiating another phase of certifications.

ZeroAvia has been working on hydrogen electric engines for a very long time now. It has been recognised globally as an important player in promoting green travel experience with its powerplant development, ranging from small turboprop aircraft to regional jets like Bombardier CRJ. The engines aim to offer performance nearly equivalent to that of the factory counterpart but provide an eco–friendly solution as well as lower operating costs in the long term.

MEHAIR establishing an ecosystem

When looked at with a wider perspective, MEHAIR aims to establish a new ecosystem in the country. When founded in 2011, the company had managed to bring seaplane experience for the very first time in India. Catering primarily to the Andaman & Nicobar Islands, the company offered seaplane flights for tourists and regular travellers across the islands. Being the sole provider of such service, it was not only an airline but also a pioneer in establishing an ecosystem of seaplane operations in the country. It was actively involved in training individuals for operating and maintaining a seaplane, which has its own set of technicalities as compared to standard wheeled aircraft. The advent of Covid–19 had shut down the business for more than 3 years but now the company is looking to revive itself under the UDAN scheme which will connect various small cities. MEHAIR comes with an advantage. As Director Siddharth Verma explained, "We start where airlines end". With its seaplane fleet, MEHAIR can connect the locations that don't accommodate a proper airport but a water body that can house waterdrome. The

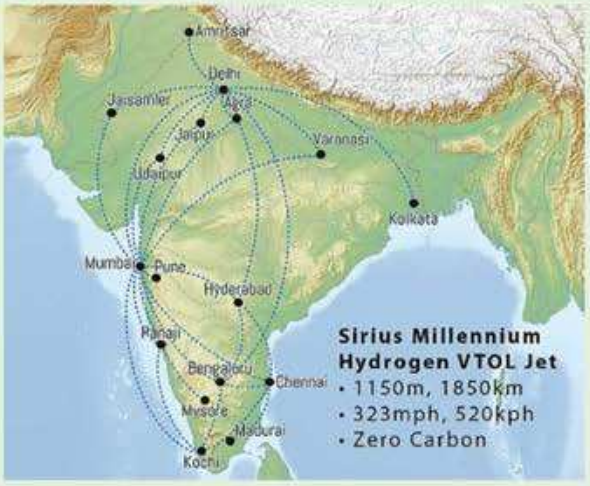
newly launched UDAN 5.3 will introduce routes to cater to the public in Gujarat region, allowing MEHAIR to operate regular flights to boost both daily and tourism connectivity as well as seaplane business in India.

The company's endeavors are poised to usher in a new phase for the Indian aviation industry, capitalising on the country's vast untapped coastal region and contributing to a greener future.

Article by Rishav Gupta (Twitter @_devildog_rv_)

On the right is Siddharth Verma, Director, MEHAIR.

Sirius Aviation AG partners with India's MEHAIR



Swiss aerospace company, Sirius Aviation AG, has announced an historic partnership with MEHAIR to secure 50 orders of the Sirius Millennium Jet. This landmark agreement includes 50 firm orders, with an option to add 50 more, totalling approximately $400 million in value. The Sirius Jet, the world's first hydrogen–powered, zero emissions, vertical takeoff and landing (VTOL) aircraft, features a high speed capability, quieter ducted fan jets and an innovative hydrogen powertrain. This jet has a range of 1150 miles.

Under this deal, MEHAIR will oversee the assembly of 50 Sirius Millennium Jets and 1,400 Millennium Hydrogen Fan Jets, along with integrating 50 Hydrogen Fuel Cell Powertrains and 10 Hydrogen Generation Units in India, marking a new era of zero–carbon aviation. "Joining forces with Sirius Jet marks a significant step for India's aviation, promising passengers luxurious yet economical travel with zero emissions," stated Siddharth Verma, the Director of MEHAIR.

MoCA's RCS–UDAN Scheme

Ministry of Civil Aviation (MoCA) launched the Regional Connectivity Scheme (RCS) – UDAN (Ude Desh ka Aam Nagrik) on 21 October 2016 to enhance regional air connectivity from unserved and underserved airports in the country and make air travel affordable to the masses. UDAN is a market driven scheme. Interested airlines, based on their assessment of demand on particular routes, submit their proposals at the time of bidding under UDAN.

UDAN is a demand driven scheme, wherein airline operators assess the feasibility of operation on a particular route and submit bids under the scheme from time to time. An airport which is included in the awarded routes of UDAN and requires upgradation/ development for commencement of UDAN operations, is developed under the 'Revival of unserved and underserved airports' scheme. On the basis of five rounds of biddings,

76 airports, including 2 water aerodromes and 9 Helipads in different regions of the country, have been developed and operationalised by RCS flights. The RCS scheme also mandates Regional Connectivity Fund allocation to regions in a manner that promotes balanced growth/ regional connectivity in different parts of the country.

519 routes have been operationalised since inception of the RCS–UDAN Scheme. The routes include 53 tourism routes and 48 helicopter routes connecting hilly regions of the nation.

More than 133.86 lakh passengers have benefited from the UDAN flights. 2.56 lakh flights have operated under the UDAN scheme so far.

The UDAN scheme has encouraged procurement of different type of aircraft in the country. Presently, 3 seater Tecnam, 9 seater Cessna 208B, 19 seater Twin Otter, 50 seater Embraer 145, 42/72/78 seater ATR and Q–400 as well as bigger aircraft like 189 seater Airbus 320/321 and B737 are in operation for UDAN flights.

13 airlines have commenced operations under UDAN, including start–ups. The scheme has been the cradle for birth of new airlines like Air Taxi, IndiaOne, Star Air, FlyBig and Fly91.

UDAN has become a game changer for many airports by triggering air connectivity and regional growth.

LM delivers F–16 Block 70 to Slovakia

Lockheed Martin has announced the successful delivery of the first two Slovakian F–16 Block 70 jets. Furthermore, Bulgaria has signed a Letter of Offer and Acceptance (LOA) for an additional eight jets for its fleet. Once the agreement is finalised, the backlog will increase by eight. Deliveries for Slovakia will continue through 2025, and the first group of jets, known as a ferry cell, is expected to arrive in Slovakia mid–2024.

Skunk Works rolls out X–59

Lockheed Martin Skunk Works rolled out the X–59, a unique experimental aircraft designed to quiet the sonic boom, at a ceremony in Palmdale, California. The ceremony marked a significant milestone in Lockheed Martin's and NASA's decades long journey to solve one of the most persistent challenges of supersonic flight, ie, the sonic boom.

Kosovo for 246 Javelins

Kosovo has requested to buy two hundred forty six (246) Javelin FGM–148F missiles (includes six (6) fly–to–buy missiles); and twenty–four (24) Javelin Lightweight Command Launch Units (LWCLU).

DragonFire laser achieves another UK first

The DragonFire laser directed energy weapon (LDEW) system has achieved the UK's first high power firing of a laser weapon against aerial targets during a trial at the MoD Hebrides Range. The latest trial, delivered by Dstl and the DragonFire partners MBDA, Leonardo and QinetiQ builds on a series of highly successful trials, including the first static high–power laser firing of a sovereign UK capability and demonstration of the DragonFire system's ability to track moving air and sea targets with very high accuracy at long range.

French order for 42 H145s

The French Armament General Directorate (DGA) ordered 42 new H145 helicopters at the end of 2023, on behalf of the Ministry of Interior, with deliveries set to start in 2024. Of these 42 helicopters, 36 are destined for the French rescue and emergency response agency, Securite Civile, while the French law enforcement agency, Gendarmerie Nationale, will use six. The contract includes an option for a further 22 H145s for the Gendarmerie Nationale.

Croatia for 8 UH–60Ms

Croatia has requested to buy eight (8) UH–60M Black Hawk helicopters; nineteen (19) T700–GE 701D engines (16 installed, 3 spares); twenty (20) AN/ARC–231A RT–1987 very high frequency (VHF)/ultra high frequency (UHF) / Line of Sight (LOS) satellite communications (SATCOM) radios, etc.

Greece for 40 F–35 JSF CTOL

Greece has requested to buy up to forty (40) F–35 Joint Strike Fighter Conventional Take Off and Landing (CTOL) aircraft and forty–two (42) Pratt & Whitney F135–PW–100 engines (40 installed, 2 spares).

Turkey for 40 new F–16s and modernisation of 79

Turkey has requested to buy 40 new F–16 aircraft and to modernise 79 existing F–16 aircraft to V–Configuration. The request includes thirty–two (32) F–16 C Block 70 aircraft; eight (8) F–16 D Block 70 aircraft; forty–eight (48) F110–GE–129D engines (40 installed, 8 spares), etc.

Saab order for AT4 from NSPA

Saab has received an order for the anti–armour weapon AT4 from the NATO Support and Procurement Agency (NSPA). The order value is approximately EUR 63 million (approximately SEK 700 million) and deliveries will take place 2026–2027.

Hungary's C–390 in maiden flight

The first C–390 Millennium of the Hungarian Air Force has successfully completed its maiden flight in Gavião Peixoto. Embraer Defense & Security team flew the aircraft for approximately 4 hours, carrying out a complete assessment of the aircraft, which will now undergo a test campaign ahead of the entry into service with the Hungarian Air Force.

Italy for 24 AIM–120C–8 AMRAAMs

Italy has requested to buy twelve (12) AIM–120C–8 Advanced Medium Range Air–to–Air Missiles (AMRAAM) that will be added to a previously implemented case whose value was under the congressional notification threshold. The original Foreign Military Sales (FMS) case,

valued at $32.5 million ($23.0 million in Major Defense Equipment (MDE)), included twelve (12) AIM–120C–8 AMRAAM missiles. This notification is for a combined total of twenty–four (24) AIM–120C–8 AMRAAM missiles.

Italy for 125 additional SDB II

Italy has requested to buy one hundred twenty–five (125) Guided Bomb Unit (GBU)–53/B Small Diameter Bombs–Increment II (SDB–II) All–Up–Rounds (AURs); and eight (8) GBU–53/B SDB–II Captive Carry Reliability Tests (CCRTs) that will be added to a previously implemented case whose value was under the congressional notification threshold.

Meghna Aviation and Ginger Aviation take Bell 407GXi

Bell Textron Inc has announced that Meghna Aviation and Ginger Aviation have each taken delivery of a Bell 407GXi, making them the first commercial operators of the Bell 407GXi in Bangladesh and Taiwan respectively. Meghna Aviation's Bell 407GXi is the third one in–country after the two that are operated by the Bangladesh Army. It will be used to support their corporate, leisure and utility helicopter charter business.

AirX signs LOI for AirFish WIG planes

ST Engineering announced that its joint venture (JV) company, ST Engineering AirX, has signed an LoI with Eurasia Mobility Solutions for an order of up to 10 AirFish Wing–in–Ground (WIG) craft with options for 10 more.

Under the agreement, ST Engineering AirX, original equipment manufacturer of the AirFish family of WIG craft, will customise and deliver the 10 seater AirFish 8 to Eurasia Mobility Solutions progressively from 2025 to serve Turkey's tourism and private transportation sectors.

Saab receives Gripen order for Hungary

Saab has signed a contract with the Swedish Defence Materiel Administration (FMV) and received an order for four additional Gripen C fighter aircraft for Hungary. This order follows an amendment to the contract between FMV and the Hungarian Government signed in December 2001 regarding 14 Gripen C/D fighters for the Hungarian Air Force.

The contract amendment for the four additional aircraft was signed by the Hungarian Ministry of Defence and FMV on 23 February 2024. With this new contract amendment, Hungary will operate a total of 18 Gripen C/D aircraft.

Raytheon tests new AMRAAM–ER variant

Raytheon and Kongsberg Defence & Aerospace, with support from the Norwegian Ministry of Defence (MoD) and Armed Forces, successfully completed a flight test of an updated AMRAAM Extended Range missile variant from a National Advanced Surface to Air Missile System (NASAMS).

Saab RBS 70 NG for Canada

Saab has received an order from Canada for the short range air defence system RBS 70 NG. The order value is approximately CAD 227 million (SEK 1.8 billion) with deliveries starting during 2024. The order includes all necessary equipment to operate the RBS 70 NG, including firing units, missiles, transport vehicles, training and support.

Boeing contract for 17 P–8A Poseidon's

The US Navy has awarded Boeing a $3.4 billion contract to begin manufacturing 14 P–8A Poseidon aircraft for the Royal Canadian Air Force and three additional P–8s for the German Navy. There are 200 P–8s currently in service or on contract across nine countries including the United States, Australia, India, United Kingdom, Norway, New Zealand, Korea, Germany and Canada.

Equinor for 10 Bell 525s

Bell, a Textron Inc company, announced a purchase agreement with Equinor for the sale of 10 Bell 525 aircraft for North Sea offshore operations with deliveries expected to begin in 2026.

FORM IV

Statement about ownership and other particulars about newspaper/magazine (Vayu Aerospace & Defence Review) to be published in the first issue every year after the last day of February.

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5. Editor's Name Nationality Address	Vikramjit Singh Chopra Indian E–2 Defence Colony New Delhi 110024

6. Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital.

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Vikramjit Singh Chopra	E–2, Defence Colony, New Delhi 110024

I, Vikramjit Singh Chopra, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Vikramjit S. Chopra

Date: 15 March 2024 — Signature of Publisher

Israel Defence Industry updates

IAI's interception of long–range BM by "Arrow"

Israel Aerospace Industries (IAI) congratulated the IDF on the successful interception of a long range ballistic missile by the "Arrow" missile defence system. The Arrow is an advanced air defence system created and designed to intercept ballistic missiles outside of the Earth's atmosphere. The system is developed in collaboration between Israel's "Homa" Directorate within the Ministry of Defence, the US Missile Defence Agency (MDA), and IAI with the involvement of security industries in both Israel and the United States.

Rafael tests advanced Spyder

Rafael announced the successful completion of a test for its advanced Spyder air defence system in its newest configuration – All in One which was conducted by Rafael with the Israeli Ministry of Defence Directorate of Defence Research & Development. The test involved intercepting a unmanned aerial vehicle (UAV) in a challenging operational scenario, achieving a direct and effective hit.

The Spyder system, produced by Rafael, is operationally used by several military forces worldwide, providing air defence solutions against various airborne threats, including missiles, UAVs, aircraft, helicopters, and tactical ballistic missiles (TBMs). The system intercepts threats using two families of Rafael manufactured interceptor missiles, Python and Derby. Recently, Rafael introduced a new configuration for the Spyder – the All in One, featuring an integrated radar, electro–optical launcher, advanced control and command system, and Python and Derby interceptors, all mounted on a single platform.

Rafael Trophy APS for Leopard 2 A8 MBT

EuroTrophy GmbH has been awarded a contract from KNDS (KMW+NEXTER Defence Systems) for the Leopard 2A8 programmes for Germany and Norway. KNDS is the result of the association of Krauss–Maffei Wegmann and Nexter, based in Germany and France and forming the European leader in Land Defence systems. Trophy has become the most successful active protection system integrated on Western Main Battle Tanks including Leopard 2, Abrams M1 and Merkava IV, as well as lighter platforms such as the Namer APC and other wheeled and tracked IFVs.

IAI to deliver long range LMs

Israel Aerospace Industries (IAI) signed two separate agreements with two countries to deliver long

range loitering munitions. These two significant orders follow a previous contract signed earlier, that has also declared the purchase of IAI's long range loitering munitions. This series of orders represent the growing global demand for IAI's long range loitering munition family and "demonstrates IAI's unique capability in this market segment".

Elbit Advanced Skylark for IDF

Elbit Systems Ltd will produce and provide the Artillery Corps of the Israeli Defence Forces (IDF) with the Skylark 1 Transitional Vertical Take–Off and Landing Small Tactical Unmanned Aerial Systems (Skylark 1 eVTOL), combined with through–life maintenance services for all the IDF Ground Force's STUAS systems (Skylark 1 & Skylark 3). Weighing up to 20kg, the new Skylark 1 eVTOL is a man–packed or vehicle–based platform offering the endurance and range of a fixed–wing STUAS with the capability to hover, take–off and land vertically.

Elbit SkyStriker LMs for export

Elbit Systems Ltd announced that it had been awarded a $95 million contract to supply SkyStriker loitering munitions (LM) to a European country. The contract will be carried out over a period of two years. As part of the contract Elbit Systems will provide several hundred SkyStriker units. Elbit Systems' SkyStriker LM is a fully autonomous loitering munition that can locate, acquire and engage operator designated targets with a warhead of up to 10 kg, enabling high precision performance.

Elbit Systems Crossbow Turreted Mortar System

Elbit Systems' Crossbow Next Generation Turreted Mortar System made its first appearance at the Company's booth during the previous DSEI exhibition in London, England. The automatic mortar system was developed by Elbit Systems' Land under an Israel Defence Force contract and is MIL–STD–810G compliant. The Crossbow system has a capability of shooting the first round in less than 30 seconds, has a maximum rate of ten rounds per minute with a sustained rate of fire of six rounds per minute, with a short sensor–to–shooter circle. It can fire a variety of munitions including the Iron Sting guided mortar munition providing effective range of up to 10 kilometers.

Elbit Systems UK and British Army

Elbit Systems UK has been awarded a contract by the UK Ministry of Defence to develop and provide artillery and mortar training simulators. The Interim Indirect Fire Simulation (IIDFS) will be provided to the Royal School of Artillery (RSA) at Larkhill, the Combined Arms Manoeuvre School (CAMS) at Warminster and the Collective Training Group (CTG) at training locations in the UK and abroad.

Elbit Systems UK will develop, produce and integrate simulators for the British Army's 81mm mortars and 105mm Light Gun, providing simulated ammunition and a unique, high technology interface for live communication between instructors and military personnel.

Spike NLOS airworthiness

Lockheed Martin successfully fired eight Rafael Spike NLOS all up rounds (AURs) over the course of five days from the US Apache Echo Model V6 at Yuma Proving Ground in Arizona.

The successful live fire event clears the Spike NLOS Long Range Precision Munitions Directed Requirement (LRPM DR) system for Airworthiness Release (AWR) for the USApache platform, which paves the way for starting to equip the system onto the US Army's current Apache V6 platforms.

Israel for M830A1 120mm tank cartridges

Israel has requested to buy thirteen thousand nine hundred eighty–one (13,981) 120mm M830A1 High Explosive Anti–Tank Multi–Purpose with Tracer (MPAT) tank cartridges. Also included are publications and technical documentation; US Government and contractor engineering, technical, and logistics support services; studies and surveys; and other related elements of logistics and programme support. The estimated total cost is $106.5 million.

Hermes 650 Spark unveiled

Elbit Systems has unveiled its latest addition to its market leading Hermes family. This Next Generation Unmanned Aerial System (UAS) boasts "outstanding endurance, versatility, and cost–effective performance across land, air and sea operations". With a useful load of 260kg, the UAS boasts eight modular storage stations, accommodating large payload bays in the fuselage and six hard points on the wings.

This allows it to carry payloads up to 120kg on full fuel capacity without compromising flight endurance. The system's multi–payload capability integrates high–quality electro–optics (EO), radar, SIGINT, and other advanced functionalities simultaneously. It has the ability to execute long missions within SATCOM range and has an extended endurance lasting up to 24 hours.

UK to deploy Carrier Strike Group to IOR in 2025

The UK and India on 10 January 2024 vowed to continue strengthening ties during the first visit of an Indian Defence Minister to the UK in more than 20 years. In a move that signals the growing importance of the strategic relationship between the UK and India, Defence Secretary Grant Shapps welcomed the Raksha Mantri Mr. Rajnath Singh to the UK to agree unprecedented levels of UK–India defence cooperation.

The Defence Secretary announced the UK's plans to send its Littoral Response Group to Indian Ocean Region later this year, with plans for the Carrier Strike Group to visit in 2025 both will operate and train with Indian forces. The two nations also discussed future cooperation in defence from joint exercises to knowledge sharing and instructor exchanges. These steps build on the comprehensive strategic partnership envisaged in the 2030 India–UK roadmap, announced in 2021.

In the coming years, the UK and India will also embark on more complex exercises between their respective militaries, building up to a landmark joint exercise to be conducted before the end of 2030, supporting shared goals of protecting critical trade routes and upholding the international rules based system.

Defence Secretary, Grant Shapps, stated, "There is absolutely no question that the world is becoming increasingly contested, so it's vital that we continue to build on our strategic relationships with key partners like India. Together we share the same security challenges and are steadfast on our commitment to maintaining a free and prosperous Indo–Pacific. It is clear that this relationship is going from strength to strength, but we must continue to work hand in hand to uphold global security in light of threats and challenges that seek to destabilise and damage us."

Collaboration with industry is also key in the strategic defence partnership between the UK and India, with the two nations working together on electric propulsion systems that will power our future fleets, and cooperating on the development of complex weapons. Building on the existing strategic partnership, during the visit the UK and India also confirmed several new joint initiatives. These include:

- Launching Defence Partnership–India – a bespoke office designed to further defence collaboration between the two countries.
- A commitment to several instructor exchanges between our world leading Officer Training Colleges and specialist schools, alongside signing of a Youth Exchange MoU to solidify the already strong relationship between our cadet organisations.
- Signing a Letter of Arrangement that will enable further emphasis to be placed on research and development between our two nations, focused on next generation capabilities.
- Solidifying an agreement on logistics exchange, allowing for the provision of logistic support, supplies and services between the United Kingdom and Indian Armed Forces, for joint training, joint exercises, authorised port visits and Humanitarian Assistance and Disaster Relief (HADR) operations.

Text and photos: UK MoD

Updates from Saab

Sweden for Mobile Short–range Air Defence

Saab has received an order for its Mobile Short Range Air Defence (MSHORAD) solution from the Swedish Defence Materiel Administration (FMV). The contract period is 2024–2026 and the order value is approximately SEK 300 million. Saab booked the order in the fourth quarter 2023. FMV and the Swedish Armed Forces will use the acquired solution for two configurations, both integrated on the BvS10 armoured vehicle, to further define Sweden's future mobile air defence requirements.

GlobalEye support contract with UAE

Saab and the United Arab Emirates (UAE) Ministry of Defence have signed a contract and Saab has received an order regarding in–service support for the GlobalEye Airborne Early Warning and Control (AEW&C) solution. The order value is approximately USD 190 million with a three year contract period that runs until 2026. The contract includes maintenance and logistics support, as well as training services.

Order to produce T–7A fuselage systems

Saab has received an award from Boeing to produce T–7A aft fuselage systems. The order value for Saab is USD 101.7 million (approximately SEK 1 billion) and the order was booked in the fourth quarter 2023. The T–7A aft fuselage systems will be produced at Saab's manufacturing facility in West Lafayette, Indiana.

Saab to complete Lima Airport's Digital Apron Management

In a significant stride towards addressing traffic congestion and bolstering integrated situational awareness, Lima Airport Partners (LAP) has selected Saab to enhance its Digital Apron Management Centre with a comprehensive suite of surveillance solutions. Saab's surveillance system includes a fully integrated platform featuring ADS–B surveillance sensors, the Aerobahn surface management system, TactiCall voice communications integration, and Digital Towers equipped with high definition cameras, ensuring a thorough digital visualisation of the airport's surface.

Saab and MBDA to strengthen co–operation

In this context, a major new step has been taken in the relationship between the two countries. On 31 January, Micael Johansson and Eric Béranger, the CEOs of Saab and MBDA, expressed their willingness to support this process in the fields of anti–tank and air defence, two capabilities identified as particularly critical for the armed forces of both countries, especially in the context of high intensity conflicts.

Rosoboronexport at World Defence Show 2024, Saudi Arabia

Rosoboronexport (part of Rostec State Corporation) was the organiser of Russia's single exhibit at the World Defence Show 2024, which was held 4–8 February at Riyadh, Saudi Arabia.

"The World Defence Show is being held for the second time and it has already become a key event for the global defence industry. Compared to 2022, the scale of the Russian exhibit has doubled and Rosoboronexport is represented at all possible venues of the exhibition. In the outdoor display area, the company will show the ZA-SpN Titan and Spartak armoured motor vehicles, UAVs of the Orlan family. The Il-76MD-90A(E) military transport aircraft will be on display at the airfield, while the latest products for the Air Force, Ground Forces, Navy and air defence systems will be exhibited in a pavilion," stated Alexander Mikheev, Director General of Rosoboronexport. More than 20 domestic defence manufacturers, including the Almaz-Antey Corporation, Special Technology Center, Remdiesel, Rostec State Corporation and its subsidiaries High Precision Systems, UAC and Technodinamika, presented their products within a single Russian exhibit.

For the Ground Forces, the company showcased the T-90MS tank, which has substantiated its capabilities in real combat operations and is in great demand in the Middle East, ERA-protected BMP-3 infantry fighting vehicle, ZSA protected field ambulance, Spartak and Typhoon-K MRAP vehicles. As part of its exhibit, Rosoboronexport presented an integrated combat gear for special operations forces personnel, which included the Chukavin sniper rifle and Bespokegun Raptor and Elegance precision rifles, Kalashnikov AK-200 series, AK-12, AK-15, AK-19 and AK-308 assault rifles, 9mm Lebedev compact pistol, 9mm Kalashnikov PPK-20 submachine gun and the Kub-E loitering munition.

Rosoboronexport also exhibited the Orlan-10E and Orlan-30 UAV systems in the outdoor display area. In the UAV countermeasures segment, the company showcased the Product RB-504P-E, Radiomonitoring station for communication channels monitoring and the Serp-VS6 electronic countermeasures system for countering small UAVs.

Air defence assets were represented by a wide range of surface to air missile (SAM) systems of various ranges. Among them were Almaz-Antey's S-400 Triumf long-range system, S-350E Vityaz, Viking and Buk-M2E medium-range systems, and various versions of the Tor short-range SAM system. High-Precision Systems Holding Company, part of Rostec State Corporation, demonstrated the Pantsir-S1, Pantsir-S1M self-propelled and the Pantsir-ME naval air defence missile/gun systems, as well as the Verba and Igla-S man-portable air defence systems.

For the Navy, Rosoboronexport exhibited the newest autonomous unmanned underwater vehicle Klavesin 1RE, hydrofoil boat Sagaris and the Project 20382 corvette in a new export configuration fitted with the Zaslon integrated radar system and built using stealth technologies to reduce its signature.

2nd Lada class submarine commissioned by Russian Navy

Pr. 677 Lada class submarine built under a deeply improved design has fulfilled all the planned trials and was commissioned end January 2024 by the Russian Navy. The ceremony of raising the Russian naval ensign on Kronstadt submarine took place at the Admiralty shipyards. Rubin Design Bureau is the designer of the submarine.

The keel laying ceremony of Kronstadt took place in 2005, but Admiralty shipyards started the submarine building process only in 2013, after the deep upgrade of Rubin's design had been approved, and the Ministry of Defence restarted building of Lada class submarines. The design solutions grant the new level of combat capacities for a conventional submarine in Russian shipbuilding practice.

The decision of Russian Ministry of Defence to proceed building the batch of Lada class submarines ensured the evolution of the Russian underwater shipbuilding. The third vessel in the series, Velikiye Luki, was launched December 2022. The fourth and the fifth Lada class submarines are under construction at the Admiralty shipyards with their keels laid June 2022. Thereby, the Russian Navy will be expanded by submarines, which have the upper hand in a duel situation.

Lada class is featured by ultra low acoustic signature, significantly lower than that of previous diesel electric submarines. That is facilitated by ship mechanisms with low vibration activity, made specifically for these submarines by Russian companies. The vessel is armed with powerful missile and torpedo weaponry with an option to strike sea and land targets.

The tradition of naming a ship in honour of the northern outpost of Russia comes from the 18th century. The first Kronstadt, a sailing battleship, participated in the Russian – Swedish war of 1741–1743, when Russia won and kept its new territories in the Baltic Sea region. The second Kronstadt, a large ASW ship, was built in Leningrad at the Northern shipyard and served in 1969–1992, performing reconnaissance and surveillance missions. In 2005 the name Kronstadt was given to the fourth generation submarine, the representative of the class, which is to be the backbone of the Russia's conventional submarine forces.

CEO Rubin Design Bureau Igor Vilnit

Commander–in–Chief gives the naval ensign to the submarine commander

Commander–in–Chief of the Russian Navy Admiral Nikolay Yevmenov

All Photos: Rubin Design Bureau

News from Dassault

EiF of final tranche of 18 Rafale for Indonesia

The final tranche of 18 Rafale for Indonesia came into force on 8 January 2024. It follows the entry into force, in September 2022 and August 2023, of the first and second tranches of 6 and 18 Rafale, thus completing the number of aircraft on order for Indonesia under the contract signed in February 2022 for the acquisition of 42 Rafale. "In choosing the Rafale, Indonesia has opted for a unique tool for sovereignty and operational independence that will help consolidate its role as a major regional power. This choice also consolidates ambitious industrial and academic cooperations. We are fully committed to making this partnership a success, with a resolutely long term vision," stated Eric Trappier, Chairman and CEO of Dassault Aviation.

Order of 42 Rafales for FASF

At the end of December 2023, the French Defence Procurement Agency (DGA) awarded Dassault Aviation an order for 42 Rafale combat aircraft, known as "tranche 5", for the French Air Force (AAE). "On behalf of Dassault Aviation and the 400 companies involved in the Rafale programme, I would like to thank the Ministry for the Armed Forces, the DGA and the AAE for their renewed confidence. We are ready and determined to use our skills as prime contractor and complex systems integrator to serve the sovereignty of our nation. This military industrial sovereignty is an exception in Europe. It guarantees the superiority of our combat aviation. It is also an asset for diplomatic influence and an economic strength in export trade", stated Éric Trappier, Chairman and CEO of Dassault Aviation.

The Rafale has been designed to evolve by successive standards, in order to adapt the latest technologies to user needs. Standard 4, focusing particularly on connectivity, is under development. Standard 5, which is currently preparing for launch, will bring new capabilities in collaborative combat. The Rafale is a success in the export market, with seven customer countries to date. The order book, plus the new "tranche 5" contract, secure production activity for the next ten years.

Dassault Aviation Group in 2023

Aircraft ordered in 2023: 60 Rafale were ordered (42 France, 18 Indonesia), compared with 92 Export Rafale in 2022. The order for an additional 18 Rafale for Indonesia entered into force on 8 January 2024 and is therefore not part of the 60 Rafale order intake for 2023. 23 Falcon's were ordered, compared with 64 in 2022.

Aircraft delivered in 2023: 13 Rafale (11 France, 2 Export) were delivered, while 15 had been guided; 14 Rafale (13 Export, 1 France) were delivered in 2022. 26 Falcon's were delivered, while 35 had been guided; 32 Falcon's were delivered in 2022.

Aircraft in backlog: As of 31 December 2023, the backlog included 211 Rafale, (141 Export, 70 France) compared with 164 Rafale as of December 31, 2022, 84 Falcon's compared with 87 Falcon's as of 31 December 2022. The order for an additional 18 Rafale for Indonesia entered into force on 8 January 2024 and is therefore not part of the 211 Rafale backlog of 31 December 2023.

Groupe ADP and Dassault join forces

Dassault Aviation, its subsidiary Dassault Falcon

Service (DFS) and Groupe ADP are joining forces to make Paris Le Bourget airport a pioneer in sustainable aviation. The five year agreement signed by Groupe ADP, Dassault Aviation and DFS strengthens their action in decarbonisation at Paris Le Bourget airport, in a number of areas including distribution and use of Sustainable Aviation Fuel (SAF), use of electric equipment for all ground operations (fueling, taxiing, towing, etc) and use of geothermal power for airport buildings and hangars. The agreement also contains a section aimed at boosting the airport's attractiveness in its employment pool.

"At Dassault Aviation, we firmly believe that business aviation must lead the way in decarbonising the aviation industry. Our aircraft are particularly well suited to integrating emission reducing innovations. And our customers, who are mostly businesses, are backing us in this initiative. We are exploring several technologies, including SAFs which look very promising: our Falcon jets can already fly with fuel containing 50% SAF. However, only mixes with 30% are currently available in the market. We must therefore accelerate the process. Our agreement with Groupe ADP will contribute, by furthering our ambition to work together toward the most effective solutions, both in this area and in many others," stated Éric Trappier, Chairman and CEO of Dassault Aviation.

InSight FDS certified on Falcon 2000/EX

Universal Avionics (UA) and Trimec Aviation have achieved FAA Supplemental Type Certificate (STC) for the Falcon 2000/EX equipped with the InSight Flight Display System. The upgrade replaces legacy Pro Line 4 avionics with the latest–generation displays and synthetic vision to resolve obsolescence issues, maintenance challenges, improve operational efficiency and performance, and enhance safety. The Falcon 2000/EX InSight installation includes four high resolution displays and two touchscreen enabled control displays, replacing aging CRT technology with significantly brighter displays, while increasing functionality and improving situational awareness. The system integrates with existing aircraft systems and includes Universal Flight Management Systems (FMS) and UniLink Data Communications Solution.

Visit to Duxford Aviation Society and Imperial War Museum Duxford, UK

Duxford Aviation Society (DAS) is a voluntary organisation which came into being in 1975 and is a partner organisation of the Imperial War Museum. With the passage of time, DAS aims have been widened to include other preservation projects such as military vehicles. The Society owns and maintains The British Airliner Collection and opens some of these aircraft to the public on a daily basis. The DAS Military Vehicle Wing (MVW) regularly presents demonstrations of tanks and other vehicles based at Duxford. The Society is a registered charity and its funds come from the public, from donations, from fund raising activities and as a result of services provided to the Museum. New members are always welcome.

In the Civil Aircraft Section, the Society is responsible for the restoration and preservation of the British Airliner Collection. The Airliners are restored and maintained by volunteers under the guidance of a Project Manager who is a full time employee of the Society. Volunteers are drawn from all walks of life and levels of skill but all have an abiding interest in the preservation of the aircraft collection. Many of the volunteers do not have directly aviation–related skills but learn from those that do and the level of restoration achieved is testament to their industry and commitment.

In the Military Vehicle Section, members of the MVW are involved in the restoration and preservation of military vehicles. In their workshop, they restore vehicles belonging to the Society and to the IWM, and other vehicles that are privately owned but are on loan to the museum or the Society. The collection of vehicles is extensive and varied and a great deal of work is involved in keeping them all in good condition. Some of the vehicles are being restored as running examples whilst the remainder are destined for static display. The MVW is responsible for much of the restoration work on vehicles used in the various tableaux in the Land Warfare Hall. The MVW is located in a workshop at the western end of the Land Warfare Hall. Vehicle demonstrations can often be seen taking place in the adjoining running area, and it is possible to arrange rides on some of these exciting vehicles.

Imperial War Museum Duxford is a branch of the Imperial War Museum near Duxford in Cambridgeshire, England. Britain's largest aviation museum, Duxford houses the museum's large exhibits, including nearly 200 aircraft, military vehicles, artillery and minor naval vessels in seven main exhibition buildings. The site also provides storage space for the museum's other collections of material such as film, photographs, documents, books and artefacts. The site accommodates several British Army regimental museums, including those of the Parachute Regiment (named Airborne Assault) and the Royal Anglian Regiment.

Based on the historic Duxford Aerodrome, the site was originally operated by the Royal Flying Corps (RFC) during the First World War. During the Second World War Duxford played a prominent role during the Battle of Britain and was later used by United States Army Air Forces fighter units in support of the daylight bombing of Germany. Duxford remained an active RAF airfield until 1961. After the Ministry of Defence declared the site surplus to requirements in 1969 the Imperial War Museum received permission to use part of the site for storage. The entirety of the site was transferred to the museum in February 1976.

In keeping with the site's history many of Duxford's original buildings, such as hangars used during the Battle of Britain, are still in use. Many of these buildings are of particular architectural or historic significance and over thirty have listed building status, Duxford "retaining the



best preserved technical fabric remaining from a historic airfield up to November 1918 and being "remarkably well–preserved". The site also features several purpose built exhibition buildings, such as the Stirling Prize winning American Air Museum, designed by Sir Norman Foster. The site remains an active airfield and is used by civilian flying companies, and hosts regular air shows. The site is operated in partnership with Cambridgeshire County Council and the Duxford Aviation Society, a charity formed in 1975 to preserve civil aircraft and promote appreciation of British civil aviation history.

Duxford remains an active airfield (IATA: QFO, ICAO: EGSU) and maintains two parallel runways; an unpaved 880 m (2,890 ft) grass strip, and a concrete runway with a length of 1,503 m (4,931 ft), both oriented at 060/240–degrees. The runway was originally purchased from the Ministry of Defence by the Cambridgeshire County Council in 1977. In October 2008, an agreement was reached between the council and the Imperial War Museum, under which the runways and 146 acres of surrounding grassland would be sold to the museum for approximately £1.6 million.

Since 1973, Duxford has held regular air shows. Duxford is the home of several private aviation companies, such as Classic Wings, The Fighter Collection, the Old Flying Machine Company and The Aircraft Restoration Company. Between them these companies provide pleasure flights, historic aircraft for film or television work, and aircraft restoration services. Perhaps the most notable privately owned and operated aircraft based at Duxford is B–17 Preservation Ltd's Sally B, the only airworthy B–17 Flying Fortress in Europe.

Major air shows held regularly include the Duxford Air Show, and American Air Day, which is held in conjunction

with units of the Third Air Force (part of the United States Air Forces in Europe), based at nearby RAF Lakenheath and RAF Mildenhall. The Flying Legends show (organised by The Fighter Collection), was held annually at Duxford until 2019.

The Duxford Air Show usually exhibits a wide range of aircraft, from vintage warbirds to contemporary jet aircraft, along with aerobatic flying by groups such as the Red Arrows. While the Flying Legends show focuses on historic aircraft, especially those of the Second World War.

In 2008 it was reported that these displays generate up to £1.8 million, while the loss of up to £100,000 due to adverse weather is also budgeted for.

The policing bill, necessary to manage the resulting road traffic, was reported as some £8,000. Major events have included the Battle of Britain 70th Anniversary airshow, held on 4–5 September 2010, attended by more than 40,000 people, featuring formation displays by four Hawker Hurricanes and 16 Spitfires.

Visit & photography: Tahira Kaur Chopra

Text courtesy: Duxford Aviation Society and Wikipedia

Four years for MIMOUSS

Captain Jean–Brice Millet (callsign "MIMOUSS")

On 20 February 2024, the new French Air and Space Force (Armée de l'Air and Espace) Rafale Solo Display (RSD) for 2024–2025 season was presented: Captain Jean–Brice Millet, with callsign "MIMOUSS".

The presentation took place at Base Aérienne 113 Saint–Dizier–Robinson (ICAO: LFSI) in the north–east of France. After a presentation and a short interview in the morning, Captain Millet flew his low–level demo in the afternoon. The low level show was caused by the low clouds that day.

Captain Millet joined the French Air and Space Force (Armée de l'Air and Espace) in 2006, where he earned his wings in 2009. From 2010 onwards, he flew the Mirage 2000N from BA Istres for four years. After two years at the headquarters of the French nuclear headquarters at Taverny AB, he went in 2016 as a Rafale pilot to St–Dizier AB. Captain Millet will be the Rafale Solo Display pilot for the 2024–2025 season.

He is a member of Escadron de Transformation Rafale 3/4 Aquitaine (Rafale Transition Squadron 3/4 Aquitaine) that trains French and foreign Rafale pilots. For four years, he will be part of the Rafale Solo Display team.

In all countries around the world, fighter pilots have a callsign. This is for reasons of confidentiality on the one hand and to be easily recognised on the radio on the other hand. During the initiation of a new pilot in a squadron, the new pilot receives a callsign from the other pilots. And captain Millet received the callsign "MIMOUSS" from his colleagues.

For recruitment, a survey is sent to all Rafale pilots of the French Air and Space Force (AAE), so it is a voluntary job. The AAE human resources department makes an initial selection based on the careers of the pilots who apply. They must have more than 500 hours of flight time on Rafale, they must be a patrol leader and of course they need to have an appetite for relationships and communication. And they must commit to four years, two years as pilot followed by two years as coach. Finally, the candidates must pass an interview with the coach, the current demonstrator pilot, the commander of Escadron de Transformation Rafale 3/4 and other air force personnel. It is the current demonstrator who has the final say on the choice of the new RSD pilot, as the current demonstrator will be the coach for the next two years. They must have a match as they see each other more often than their spouses during the demo season.

Being a Rafale Solo Display demonstrator pilot is a very demanding job. Both physically and mentally. "Performing a 10–minute demonstration in the air is the equivalent of doing a marathon while sprinting". The body must be well prepared to handle all this while pulling many "G"–forces. The team has a sport–coach to train physical strength during the autumn and winter months before the training starts. "I do sporting activities on a daily basis and a healthy lifestyle is also super important" says Captain Millet. The Rafale demonstration is strictly personal and will only be performed by the demopilot himself; in case of illness or absence there will be no show, the coach will and cannot take over this demo.

The airshow period normally starts in May, lasting until October or November, with on average 30 airshows and events. So every weekend there is an airshow, resulting in about one hundred demonstrations per year. In January, the flight training began for season 2024 with 30 training flights that increased each flight in complexity. Before takeoff, Captain Millet prepared for the flight by 'walking' the demonstration on the ground, using his hands to mark the actual flight in the air. In order to prepare for demo flying, Captain Millet flew with the Patrouille de France and the Équipe de Voltige to get acquainted with the concept of demo flying for a large crowd. This way he learned what the audience on the ground would see while watching his Rafale demonstration.

Annual shows

The Rafale Solo Display is one of the ambassadors of the French Air and Space Force, next to the Patrouille de France with the AlphaJets and the Équipe de Voltige with the Extra EA–300 aircraft. The Rafale Solo Display can be seen on many airshows and exhibitions in France and abroad; to show the full capacity of the Rafale while representing France. There are three types of Rafale shows depending on the weather conditions. On a sunny day the "high show" is performed, with a ceiling of 3500 feet. On an overcast day, the "low show" is performed, with a ceiling of 1500 feet. And when it is a very cloudy day, the "flat show" is performed, with a ceiling of only 800 feet.

Not only the spectators on the ground will experience these differences. Also the Rafale pilot experiences these different sensations. During their training sessions, a sunny training under the sun at Solenzara AB in April gives a 'slower' experience than a gray winter training at Saint–Dizier AB in freezing conditions according to captain Millet.

Team

The previous RSD pilot Captain Butin with callsign "Bubu" was the RSD in the seasons 2022–2023. For the season 2024–2025 he will be the coach and manager of the team. His task is to help Captain Millet to concentrate fully on his primary mission: to fly the RSD Rafale during the shows.

He takes care of everything in the team and he takes care that everything goes well for "Mimouss" so he can concentrate on flying only. He takes care of the external communication with the organisers of shows and with the French the general staff where requests for demonstrations arrive.

Captain Butin also manages the technical issues in the team. Next to the previous and current pilots, there is a team of 45 Rafale technicians from St–Dizier AB ready to support the displays and for every event 8 or 9 technicians are selected to participate. As they travel mostly by truck to the various airbases, they spend hours on the road.

RSD pilot Captain Butin with callsign "Bubu"

Article: Joris van Boven and Alex van Noye
Photos by: Joris van Boven

Força Aérea Portuguesa or Portuguese Air Force – Part 1

The history of the Portuguese military aviation is deeply connected with the foundation of the Air Club of Portugal (AeCP) on 11 December 1909 by 30 aviation enthusiasts, the majority of them being Army officers. The AeCP became one of the major boosters of the development of aviation in Portugal, including its military use. The first flying unit was created in 1911 and named Companhia de Aerosteiros (Aerostation Company), which was part of the Army Telegraphic Service and were operating Air Balloons. In 1912, the first aircraft were received by the Portuguese Government, a Deperdussen B was offered by the Portuguese born Colonel Albino Costa of the Brazilian Army, a Maurice Farman MF4 was offered by the O Cormércio do Porto newspaper and an Avro 500 was offered by the Portuguese Republican Party. On 14 May 1914 the Escola Militar de Aeronáutica, EMA (Military Aeronautics School) was created. On 17 July 1916, Lieutenant Santos Leite performed the first Portuguese military airplane flight in the Deperdussin B that had been offered in 1912. During World War I, Portuguese airmen volunteered to fly in French aviation units and Captain Óscar Monteiro Torres became the first Portuguese pilot that was killed in an air combat when his SPAD S.VII was shot down, after himself having shot down two German planes!

On 29 June 1918, the Serviço Aeronáutico Militar (Military Aeronautical Service) was organised which included the Composite Aviation Depot Flight (EMAD), the Aeornautical Material Park (PMA) and the Military School of Aviation. The EMAD was responsible to train pilots and observers and to prepare the creation of future air units and was initially installed at Alverca and transferred to Tancos, where an airfield was built to serve as its base. The PMA was installed at Alverca air base and was the

precursor of the still existing OGMA aviation industry. On 7 February 1919 the Group of Aviation Flights República (GEAR), the first operational aviation unit was created. In 1920 the Military School of Aviation transferred from Vila Nova da Rainha to Granja do Marques, the site of what would become the still existing Sintra Air Base. In 1937 the Military Aeronautics underwent a major reorganisation and the air bases Sintra, Ota and Tancos were created followed by Lisbon in 1942.

Portugal was not directly involved in World War II but had to defend its neutrality and one of the major military priorities became the deterrence of a possible invasion of the strategic Azores Islands. Lajes airfield at the Azores Island became strategically crucial for the United States Military in future conflicts. In 1949 Portugal joined the North Atlantic Treaty Organisation (NATO) as own of its founders. On 1 July 1952 the Military Aeronautical Service was established as an independent branch and was called Força Aérea Portuguesa (Portuguese Air Force). The General Command of the Air Forces and the Directorate General of the Under–Secretariat of State were disbanded and being replaced by the Estado–Major da Força Aérea, EMFA (Air Force Staff).

In 1958 the FAP received its first North American F–86F Sabre jet fighters and on 24 September 1958 Captain Moura Pinto does the first Portuguese supersonic flight, by doing a dive with one of the Sabre's. In the late 1950s the FAP was partially foreseeing the conflicts in the Portuguese overseas territories and increased its effort to implement itself in those territories like Angola, Mozambique, Portuguese Guinee and Cape Verde in the early 1960s. On 4 October 1959 the important air base Monte Real is inaugurated and is from then till now the main operating base of the FAP's fighter aviation squadrons. The first stationing of jet training units were from the German Air Force. In 1964, also Beja air base was in use and in the beginning it was serving as a NATO forward naval air base.

From 1961 to 1975, the FAP was deeply engaged in theatres of war in Angola, Mozambique and Portuguese Guinee and mainly due to the international arms embargo to Portugal, the Air Force had to struggle with limitation of means, being obliged to extend the use of old aircraft or to employ aircraft that were not suited for the kind of warfare that was being fought. In September 1974 Portuguese Guinee was independent, followed by Angola in November 1975 and this led to the FAP to gradually withdraw from the several overseas territories. In 1974 the FAP had around 850 aircraft in its inventory and this was reduced to a third in 1976 with most of the old assets being phased out. A major reorganisation started in 1977, this included the creation of the national air command and also the Air Force Academy was created. The reorganisation of the FAP was accompanied by its re–equipment, a lot of the ageing aircraft were replaced by newer aircraft. The process of the modernisation also included the re–equipping of the reception of new radars and the air control centre was enhanced. The FAP started to participate in missions by itself or in support of missions that have been carried away under the scope of the United Nations (UN), NATO, or the European Union like Baltic Air Policing, Icelandic Air Policing, Operation Active Endeavour, Operation Atalanta, Operation Sea Guardian and the FAP also participated in missions in Angola (1992) and Guinea–Bissau (1998).

Also an important mission for the Portuguese Air Force was the air security of high visibility events happening in Portugal, aiming to protect them especially against terrorists attacks, like the UEFA Euro 2004, the Lisbon NATO summit 2010 and the visit of Pope Benedict XVI in 2010.

Base Aerea No. 5 – Monte Real

Base Aérea de Monte Real officially designated as Base Aérea No. 5 (BA5) was established in October 1959. Since its opening the base has been home of the Portuguese jet fighter aircraft like the North American F–86F Sabre, Fiat G.91, Lockheed T–33, Northrop T–38, LTV A–7 Corsair II and currently the General Dynamics F–16. On 28 June 1984, during a meeting of the NATO Commission of Infrastructures in Brussels, Monte Real was formally accepted as NATO infrastructure.

Esq201 – Falcões (Falcons) and Esq301 – Jaguares (Jaguars)

Sergeant Henrique Carvalho, Crew chief: "In August 1990 the Portuguese Air Force signed the Peace Atlantis I programme which consists of the delivery of twenty F–16 Block 15s, of which seventeen single seat F–16As and three twin seat F–16Bs, and also engines, spare parts, support equipment, logistic support, instructions for pilots and maintenance personnel and participation in the F–16 Technical Coordination Group. This was partly a payment for the use of Lajes Air Base on the Azores by the United States of America. The first four aircraft arrived in February 1994".

"In November 1998 the Portuguese Air Force signed the Peace Atlantis II programme which consists of the delivery of twenty five F–16 block 15s, of which twenty one single seat F–16As and four twin seat F–16Bs, to replace the ageing A–7 Corsair. Only twenty aircraft will be used to form an attack squadron, the other five will be used as spare sources. The first aircraft already arrived in 1999. After arrival the aircraft needed to be modified and got a Mid–Life Update (MLU) which was completed in 2003. Unfortunately we lost two aircraft by crashes and a total of seventeen F–16s have been sold to Romania, of which fourteen F–16AMs and three F–16BMs between 2019 and 2023. So at the moment we still have twenty–one F–16AMs and four F–16BMs operational. The first Romanian crew chiefs came to here and we trained them and later on we went to Romania to train more crew chiefs and also to help them with problems".

"We have the Quick Reaction Alert (QRA) task 24/7 and 365 days a year, so at every moment we are able to take–off with armed F–16s if it's needed, we have a total of four F–16s on QRA. Our F–16s are not only based here at Monte Real but we also have deployments during the year at Lajes, Azores and at Porto Santo, Madeira. At the moment four F–16s are based at Siauliai, Lithuania for Baltic Air Policing (BAP). With this deployment ten pilots and nine crew chiefs are involved. It's the fifth time that we participate in the BAP, before were in 2007, 2014, 2016 and 2018. We also participated the Islandic Air Policing mission once, in 2012. Every year the Portuguese Air Force hosts the international exercise Real Thaw at Beja Air Base in which we participate with many F–16s and during that exercise we work closely with other Air Forces to learn from each other and to understand each other better. In 1979 we joined the NATO Tiger Association and we participated and hosted the NATO Tiger meet many times".

Phase Inspection Maintenance Team

Every 300 flight hours, the F16 aircraft has to go through a comprehensive inspection required by the manufacturer, so it can be considered airworthy and return to operational status. This Inspection is known as the Phase Inspection. Currently the Portuguese Air Force (PRTAF) implemented a 4 Cell

process, with each Cell lasting 15 days, totalising 60 days and 420 hours to comply with. CELL 1, 2 and 3 are focused on removing, cleaning, inspecting, preliminary testing and re–installation off components from the various aircraft Systems. CELL 4 is focused on operational checkouts off all the systems required by applicable Technical Order (TO) or Job Guide (JG).

Although an actual Phase Inspection does not require so long to accomplish, this process introduced a Buffer on each Cell, that enables, when necessary, to perform some extra tasks as Time Compliance Technical Orders, malfunction trouble shooting, Aircraft Structural Integrity Programme inspections and minor structural repairs. The Phase Inspection process relies on a group off technicians, specialised on the aircrafts various systems and areas of maintenance such as Documentation, Crew Chiefs, Fuel and Hydrazine, Structural repair and corrosion control, Hydraulics and Environmental Control Systems, Electrical systems, Avionics, Non–Destructive Inspections, Egress, Engine, Loaders and Cryogenics. The assistance of Ground Support personnel and equipment is also fundamental to this process, requiring the right gear in the right place at the right time. The supply area provides the Phase inspection Kit with mandatory replacement parts and all the components found inoperative, to be replaced. Finally, a qualified test Pilot carries out the Functional Test Flight once the aircraft has completed all the required inspections, validating that all systems are operating properly, allowing therefore the F–16 to return to service. The successful accomplishment of this mission is only possible due to the exceptional commitment, competence, thorough planning, supervision and coordination of all involved.

Base Aerea No. 1 – Sintra

Base Aérea de Sintra officially designated as Base Aérea No.1 (BA1) was established in October 1939. Since its creation is has been home to the main training and instruction of the Portuguese Air Force's pilots and technicians. Types that have been based at Sintra are de Haviland Tiger Moth, North American T–6 Texan and the Cessna T–37 Tweet. Between 1939 and the late 1940s also ground attack and bomber units equipped with Junkers Ju–52s were based at Sintra. The base later became home to the Basic Flight Training Group which consisted of two Training Squadrons. From 1966 till 2009 the base was also home to transport, liaison and maritime patrol squadrons. Between 1989 and 1993 Esq101, equipped with the Aerospatiale Epsilon TB–30, was based at Sintra and transferred to Beja. Also the Air Force museum is based at Sintra.

Esq802 – Aguias (Eagles)

Major Luis Bernardino, Squadron Commander: "I started my career in 2003 when I came here as a cadet at the academy. After my graduation in 2008 on the TB–30 Epsilon I became an Alpha Jet pilot. I flew the Alpha Jet till 2010 and then I became an instructor on the TB–30 Epsilon. After ten years I transferred in 2020 to here and became instructor on the DHC–1 Chipmunk".

"The training of new pilots started in 1951 with a total of 66 DHC–1 Chipmunks but with the arrival of TB–30 Epsilon in 1989 a lot of the Chipmunks were sold and at the moment we only have six Chipmunks in active duty. One Chipmunk received a special colour scheme in 2021 to mark the 70 years anniversary of active flying with the Chipmunk within the Portuguese Air Force. At the moment we are the last Air Force that's flying the Chipmunk in the whole world and as a matter of fact the Chipmunk is even older than the Portuguese Air Force itself"!

"In 1989 the Chipmunks received an upgrade from Mk.10 to Mk.20 and this upgrade gave them more powerful engines. All maintenance on the Chipmunks has been done here at Sintra. We fly around ten sorties a day. However, during the summer, we fly next to twenty sorties each day, due to the Selection Training for the future Academy's cadets. During the Academy's course, the Student Pilots fly an elementary phase which includes Contact flight (Take–off, landing, aerobatics and basic flight), Visual Navigation and 2 Ship Formation. After the academy, the student goes to the Basic Pilot Training, flying the TB–30 Epsilon, where they become graduated".

"Next to the Chipmunks, in parallel, we also fly Ask–21 gliders to teach the students the basic aerodynamics. The training includes take–off, landing, some aerobatic maneuvers and thermal flight".

Major–General Rui Freitas, Commander Academia: "I entered the academy in 1983 here at Sintra and I graduated in 1987. Then I went to Phoenix, Arizona in the United States of America for pilot training for 1,5 years. After that I became an instructor on the T–37s from 102 squadron for pilot training. Two years later I returned to the United States of America to join the Euro–NATO Joint Jet Pilot Training programme (ENJJPT) at Sheppard Air Force Base for 3,5 years. Then I went back to Sintra to open the course for the Alpha Jets of 301 Squadron at Beja. When the course was running I became Operations Officer and Squadron Commander of 101 Squadron at Beja, flying the TB–30 Epsilon. In total I have around 3,000 flying hours, mainly on the T–37 as an instructor.

The Portuguese Air Force is working together with the Angolan Air force and for six months I was training them to learn to fly on the Cessna C–172. At the moment there are still two programmes running in Angola and possibly there will be a co–operation with Brazil. After that I became Chief Operational Command in Lisbon followed by the advisor of the Air Force and then I went to the NATO Headquarters as a delegate of the Portuguese Air Force. Than I was part of the Staff of the Air Force and after that I became Commander of Base Aerea No. 1 Sintra. Soon I will receive my third star and my future within the Air Force is unknown at the moment".

"At the moment there is a registered procurement law to replace the ageing Chipmunks. Students fly but not enough, it's a pre–start for the training but we want to improve it. Every course exists around twelve students. After six months the students which are not capable for flying will leave the academy, with new aircraft this could be seen earlier and the syllabus could be changed. The Chipmunk is very limited for flying with bad weather and cross winds.

If you like the Chipmunk you like flying! The students feel it very quick, the Chipmunk is perfect for this. In the air it's a nice plane to fly but it is much harder to land than other aircraft. The Chipmunk has a three point landing so you have to switch hands to use the flaps during landing. When you are taxiing the Chipmunk you have to make left to right turns to see where you are going because you are

lying back in the plane. All those little things give us a good look for the potential of the student".

By the time this article was made Major–General Rui Freitas became Lieutenant–General and he is no longer the commander of the Academy and it's unknown to us what his function within the Portuguese Air Force is at the moment.

Article and photos by: Lowpass Aviation – Bram Marijnissen and Rene Sleegers

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A decade of Atlantic Resolve

Non-stop US Army CAB deployments in Europe

Following the invasion and annexation of the Ukraine's Crimea peninsula by the Russian military forces in 2014, NATO decided to increase its presence in Europe. As a reaction, operation "Atlantic Resolve" was born and under this deterrence initiative, NATO allies moved defence units on a rotational base throughout Europe, focussing at the eastern flank.

An important solid and ongoing Atlantic Resolve element to be mentioned is the US Army which continuously deploys units to Europe for terms between 6 months to just under a year.

With a 10 years AR anniversary in sight in 2024, the 1st Infantry Division Combat Aviation Brigade (hereafter mentioned as 1 CAB) recently entered Europe to relieve 3rd CAB of their duties which lasted about 9 months. Moving such an US Army unit is an enormous operation and we were invited to Vlissingen harbour, The Netherlands to observe this logistic challenge.

Endurance

After a long and thorough preparation, the 1st CAB moved from their caserns at Fort Riley, Kansas USA, towards the port of Beaumont, Texas, to embark at the ARC Endurance by September. The Endurance is an American Roll–on–roll–off Carrier (ARC) capable for moving helicopters, vehicles and all other equipment which comes together with an Army unit. In the night

of 16 October, the ARC Endurance finished its Atlantic crossing and reached its destination and moored in the port of Vlissingen. Here we meet with US Army Colonel Rob Kellam, commander of the 598th Transport Brigade, responsible for the current operation in the port of Vlissingen. The unit of Col. Kellam is part of the Surface Deployment & Distribution Command (SDDC) which arranges and takes care of moving equipment and supplies of US military units during their deployments and re–deployments anywhere in the world. "Knowing our future assignment we start planning, which includes amongst others, contracting of appropriate port facilities together with sufficient storage capacities. During this initial process we have close contact with representatives of local national defence forces to agree on support which is essential to make the move as safe, smooth, efficient and as quick as possible when we are in their country" as Col. Kellam declared.

HNS

Within NATO, allies can request Host Nation Support (HNS) when their units are crossing international borders and have to make use of the infrastructure of another country towards their destination. This HNS programme started physically for The Netherlands sometime earlier prior the arrival of the ARC Endurance, where it was important to declare the contracted civil port facilities as a Temporary Military Zone (TMZ). First step was to separate a part of the premises of "Verbrugge Zeeland Terminals", from the other ongoing business operations. This was followed by thorough security inspections, including underwater assessment for potential threats, after which the now isolated TMZ area received permanent military guarding and patrols. In parallel, servicemen from the 598th Transport Brigade prepared the area for the arrival of 1 CAB. This included the installing of controlled lanes where every unloaded item should have its code scanned for arrival. Scan details provided further redirection instructions to a dedicated Verbrugge warehouse position to ensure a correct continuation towards its destination which could be in Germany, Poland or Baltic states. Additionally several appointed warehouses were pre–organised for helicopter storage, including some work places to bring the helicopters into fly worthy status. For Blackhawks, this looked simple by unfolding their attached rotor blades amongst others, where the Apaches and Chinooks had their rotor blades transported disconnected in containers.

Col. Kellam declared that for the unloading of 1 CAB in The Netherlands, around 300 persons coming from 1 CAB, SDDC and other contracted parties, were working in port. The ARC Endurance carried around 1400 vehicles and containers, as well as 49 helicopters from 1 CAB into Europe. "With the present capacity, we expect to download 250–300 pieces a day from the ship, so in approximately 5 days the Endurance should be empty," according Col. Kellam.

Fly ops

The helicopters included 6 CH–47F Chinooks, 16 AH–64E Apaches as well as 27 Blackhawks in 3 versions, namely the UH–60L, HH–60M and UH–60M. When offloaded, the helicopters were stored in the warehouses, before several maintenance teams made them safe and operable again, after which they were moved outside. Next to the warehouse a large improvised apron was installed, fenced of by walls of sea containers. For flight safety, fire trucks from the Dutch air force with their teams were on site. In this restricted zone, the flight crews of 1st CAB

conducted their necessary engine test runs and system checks, to make the helicopters available for the transit flights into Europe.

Lt Adam, one of the 1 CAB Blackhawk pilots, explains that the first leg of the transit will bring them to Woensdrecht, a Dutch Air Force Base at only 10 minutes flying distance. "For our take off out of the port of Vlissingen we are supported and guided by the Dutch Mobile Air Operations Team (MAOT) which is present on site. There are quite a few high obstacles in the direct vicinity like cranes, oil platforms and wind turbines and the MAOT provides us a safe fly route considering the wind direction of that day".

"Arriving at Woensdrecht, our fuel tanks are filled for our further transit to Germany or even further. Depending on the destination we may form helicopter groups at Woensdrecht to continue our travel in a formation flight. In the event that the weather does not corporate, we may decide to postpone our flights until the circumstances have improved. Under the HNS programme, the Dutch military offers facilities when we cannot continue our journey straight away. Lt Adams and his fellow aviators were prepared the months prior the deployment by the US army command providing academic sessions, like for flight rules and safety measures, which apply to their deployment areas and to become familiar with local procedures and regulations".

Col. Kellam declared that in parallel, another 35 helicopters and additional equipment from 1 CAB was carried from the US by the cargo vessel Cape Vincent and had meanwhile also arrived in Europe through the port of Thessaloniki, Greece.

Re-deploy

Depending on the weather etc, it may take the team of Col. Kellam around 2 weeks or so that all 1 CAB helicopters and equipment are sent off and that the quays and warehouses in Vlissingen are empty. "However the project does not stop, as immediately thereafter we prepare for the arrival of about 50 helicopters and much more other vehicles and containers from 3rd Infantry Division Combat Aviation Brigade which will re–deploy from Europe back to its casern at Fort Stewart–Hunter in Georgia," as Col. Kellam declares. For this re–deployment, Dutch HNS will be provided for the helicopters at Eindhoven air base instead of Woensdrecht before the final stop in the port of Vlissingen.

Text and photos by Peter ten Berg

Adieu to French C–135FR Stratotanker

At the end of 2023 an era came to an end when the last French Air Force C–135FR was taken out of service after 59 years of operations.

The first of 12 ordered C–135F Stratotankers entered service in 1964, which became C–135FR after an "R"enovation and modernisation programme late in the 1980's. The tanker capacity was increased by the purchase of another 3 aircraft during the nineties and consequently modernised to C–135RG models around 2013. A year later, in 2014, an order for 12 Airbus A–330 MRTT tanker aircraft announced the future end of the C–135 operations. Therefore in December 2023, with A–330 "Phenix" deliveries well underway, the French air and space forces terminated all flight operations of the iconic C–135FR. The 3 aircraft of the more recent modernised C–135RG tankers will keep the capacity at level towards 2025, when the last A–330 will be delivered. Although in operations for 59 years, it now appears that the former French FR models will continue their career in civil service with the US based company Metrea.

The French tankers operated out of Istres Air Base, in the Provence near Marseille in the south of France. Here they were part of Groupe de Ravitaillement en Vol (GRV), Air–to–Air Refuelling Wing 2/91 "Bretagne", which changed into ERVTS 01/031 due to the transfer to the A–330 in 2019.

For years the aircraft were the core element for the air refuelling capacity for extended fighter operations over France and Europe, or providing additional air refuelling and logistic support for remote deployed fighter units, like in Abu Dhabi, Djibouti, Niger and Chad. The French tankers were also heavily involved during international operations, like the 2 wars in Iraq, the no–fly–zone over Libya in 2011. Also nowadays the tankers regularly contribute to NATO operations like the Air Police missions in the Baltic and the Black Sea regions.

The C–135FR was equipped with a boom attached drogue system beneath the aircrafts tail section and below each wing attached pods containing a retractable refuelling systems. A normal crew for the C–135FR consisted out of 4,

being 2 pilots, a navigator and a refuelling operator.

Several years ago the author was privileged to join a C–135FR flight to see the crew at work during one of their regular training missions filling up fighter aircraft over France. On an early morning in June we had to report at "Base Aerienne" #125, Istres–Le Tube Air Base, where we joined the crew in their mission briefing. The aircrafts commanding pilot, Captain "H." described the mission as a training flight, not only for the additional refuelling operator onboard the C–135FR, but also for fighter pilots of various units all over France. The aircraft will carry 130.000 lb (58.000kg) of fuel, of which 53K is reserved for delivery to receiving fighter aircraft. Under callsign "Merlin400" our tanker with serial #738, manufactured in 1963, was scheduled for take–off at 10.35 hours and returning around 17.00 at the units ramp at Istres AB. The timeline declared "stepping" at 09.25, the time that all crew had to show up at the appointed aircraft to start all the individual and team flight preparations towards engine start up at 10.15. Consequently it was foreseen to start taxing at 10.25 and another 10 minutes where appointed to reach runway 15/33 which was entered at section "Alpha" for a take off in a north–west direction. At 10.35 the 4 engines made the aircraft accelerate gently though quickly towards rotation and lift off, bringing the tanker to flight level 270 in a northern direction. After about 45 minutes we reached our destination, being Air–to Air–Refuelling (AAR) track, or also called anchor, "Marie".

AAR track Marie is a confined air space in the north–east of France in the area over Strasbourg and Nancy.

The C–135FR enters the track to positions itself at FL230 and continue to fly in an oval pattern with a fixed course as prescribed for this mission. Our tanker will be on "station" in track Marie for about 3 hours, where we will have numerous rendez–vous (RV) with fighters, providing aerial refuelling training to French pilots from all over the country. During this session we see several types of Mirage 2000's coming from Luxueil, Nancy and Istres, as well as Rafales from Mont de Marsan and St.Dizier, providing plenty of opportunities to practice all procedures in detail, until we finally reach the end of our presence at track Marie.

Next destination of our C–135FR is the airport of Grenoble at the French east border near Switzerland. Here we will remain some time, to train a variety of specified approaching and landing procedures. During the next one and a half hour, we practice numerous approached including simulated emergency situations with aborted landing, steep decents, firm banking or break away and (single) engine problems. Finally "Merlin400" touches down again at Istres AB around 17.00 to conclude with the mission de–brief of the 6.5 hour flight.

Photos and text: Peter ten Berg

"Aeromedical Evacuation" EATC brings international specialists and aircraft together

The European Air Transport Command (EATC), a partnership of Belgium, Luxembourg, France, Germany, Italy, Spain and The Netherlands, to share and plan their aerial transport capacity in an efficient and cost effective way, has nowadays reached a daily average of 50 scheduled flights. Many know about the transport and aerial refuelling options, however the less known medical flights had meanwhile accumulated more than 15,000 transported patients. The EATC communications officer Major Andrea Colotti mentions that the EATC noticed the importance to bring its medical community together to share knowledge and info about the aeromedical evacuation solutions and capacity. "Therefore we had the first EATC Aeromedical Evacuation day at our Head Quarters at Eindhoven AB, The Netherlands, last November" as major Colotti explains.

The day brought several special aircraft and almost 100 participants together from member nations and invited guests from Denmark and the US. The programme included presentations, group discussions and visits to the aircraft with their various medical transport interiors. Onboard medical crews showed their special equipment and gave info about their work and experiences.

The Multinational MRTT Unit (MMU), a partnership between Germany, Belgium, Luxembourg, Norway, Czech Republic and The Netherlands to operate together 10 Airbus A–330 MRTT aircraft, participated at Eindhoven with one of its aircraft based at Cologne, Germany. The aircraft's front and middle section was installed with 6 Intensive Care Unit (ICU) stations, each equipped with medical pumps, ventilators for patients' breathing, various monitors to observe the patient's condition and other tools and supplies. The area also contained 8 medium and low care units (MCU/LCU) to carry less critical ill or wounded patients. These stations have an upper and a lower stretcher to provide a total capacity of 16 patients. The cabin also included a central PC work station where the medical crew has a collective overview on all IC patients onboard to monitor their condition. The back section of the cabin was equipped with normal seats. The MRTT commanding pilot explained that there is always 1 aircraft available for medical flights from Cologne and, although the concept prescribes 24 hour, it is normally ready with its required medical crew for takeoff in about 16 hours. The extra hours may apply when the first available flight crew has to come from Eindhoven. "We are with two pilots in the cockpit and sometimes take one pilot extra in the cabin who can jump in when needed so we can extend our

flight duration with about 3 hours for the more far destinations", as the commanding officer explains. He continues "additionally we have 1 or 2 loadmasters and sometimes we have to take our own ground/ maintenance crews if the destination requires. We remain in contact with the medical officer onboard to know about the medical condition of our patients and discuss any flight limitations, e.g. a preferred flight level related to the cabin pressure to assure good conditions for patients when needed.

The French AF arrived at the EATC Aeromedical Evacuation day with another A–330 MRTT "Phenix", a standard tanker belonging to the 31st Strategic Airlift and Air Refuelling Wing based at Istres AB, France. There is always one aircraft available which can be converted into medical configuration by placing the medical stations and be ready for a mission within 24 hours. FAF intensivist Candice Pierrou, a so called "Morphee AirEvac Crew Member", explained that their aircraft is able to have 6 patients who need high intensive care and 8 patients that need medium to low medical care, while the back cabin can place up to 88 ambulatory patients. "Our Morphee AirEvac team consists out of 10 persons, being 2 intensivists, 2 flight surgeons and 6 nurses, of which 2 are civilian", as Intensivist Pierrou explains. She continues "to come onboard, the high care patients must be in a stable condition necessary for the flight time which can go up to 12 hours. We are able to give all kind of treatment to the patients onboard, however surgery is excluded as our work space onboard is not stable enough. Our team and aircraft were also active during the Covid–19 period for transporting patients towards French hospitals with sufficient capacity".

Italy had a C–130J "Hercules" on display with Aircraft Transit Isolators (ATI). According flight nurse Roberto Vitalone, the ATI is in use when there is need to isolate the patient from its environment to ensure better health conditions or to protect the medical crew, like with contagious diseases, as in 2005 with Ebola and more recently with the Covid pandemic. The Italian military has a total of 20 ATI systems available. "In a C–130 we carry normally 2 ATI's and then our medical crew onboard counts 2 doctors, 4 nurses and an assistant for maintenance. When we use our B–767 aircraft we can carry 4 to 5 ATI's", as flight nurse Vitalone describes.

The Airbus A–400 is meanwhile an important asset within the EATC inventory and therefore the German AF showed up with such an airframe which can contain 6 Patient Transport Units (PTU). For the EATC day the A–400 was installed with 4 high care (IC) units and 2 low care units.

The MRTT, the C–130 and A–400 are all assets with a large patient capacity. For situations with less patients to transport, the EATC can make use of Luxembourg Air Rescue (LAR), a civil contracted company. LAR attended the event with its specialised air ambulance, a Challenger 605, which carries 1 IC unit and 1 IMC and can take 4 ambulatory seated patients.

The fixed wing assets require normal airfields with

a sufficient and lengthy runway. Therefore the military patients have to be transported from the incident location, towards an (intermediate field) hospital and from there to the airport where the EATC aircraft will take over, to fly to their home country or another location for adequate and or specialised medical treatment. When the incident location is in a combat area with hostile conditions, other specialised means are needed to bring the wounded troops into safety. For that reason the EATC had invited an external unit to their event, in this case a German AF CH–53 helicopter suited for Personal Recovery (PR) missions. Flight nurse Stephan Wagner explained that their medical evacuation helicopter operates together with other attack helicopters to provide protection against hostile elements around the extraction zone and during the flight. He continuous, "we operate according NATO procedures and although our medical environment onboard may look provisional, we have almost all equal (IC) medical equipment like the larger EATC planes and as team we have had the same medical training. Nevertheless our conditions to operate are much different as onboard we wear combat dress, a helmet and weapons adding another 15 kg, which makes it much tougher to provided medical support to the patients. Furthermore, our helicopter can go 'tactical' and make strong evasive movements avoiding any hostilities at any time during the flight, so the patients have to be secured to their stretcher and also the connected medical lines need special attention. The crew in the cabin is trained additionally to be able to withstand the forces while helping a patient and must attach themselves properly to the airframe, certainly when we fly with our back ramp open. My medical colleagues onboard include an emergency physician and 2 paramedics, which is enough for up to 3 patients. Our helicopter can carry external fuel tanks to give us a total reach of about 500 km. Our operational experiences, where we had a 'notice to move' of 30 or 60 minutes to provide medical help to our troops 'in contact' during terroristic attacks, include the earlier international missions to Afghanistan and Mali," as flight nurse Wagner concludes.

To assess each situation, find the best aeromedical evacuation asset, make a planning, and to execute and coordinate the whole process, the Aeromedical Evacuation Control Centre (AECC) is in place, an EATC team of dedicated specialists including medical know how.

The first EATC Aeromedical Evacuation day was marked as a success while sharing in depth information between international specialist users and make the participants more aware of what solutions are available to make a tailor made approach in the various options of medical transport support. The EATC intends to make this an ongoing scheduled event once every 2 years. It will be studied if there will be need for a multi–day event including training exercises.

Text and photos by Peter ten Berg

Atlantic Resolve rotation 11

The 3rd ARS, 17th Cavalry regiment, 3rd CAB passed through Eindhoven AB on its way to the port of Vlissingen.

1st CAB patch (courtesy of the 1st CAB/PAO)

In the period from October–December 2023 the United States Army 11th rotation of its combat aviation brigades in support of Atlantic Resolve took place. The first rotation, assigned to the 10th Combat Aviation Brigade, Fort Drum, New York commenced in February 2017. Since then they were followed by six colleague aviation brigades. All of which are rotating through Europe for a period of nine months.

Host Nation Support

To deploy its Combat Aviation Brigades, not only the helicopters but also vehicles and other equipment are moved, the United States submit a request for Host Nation Support (HSN). It is sent to the Commander of the Armed Forces (CDS) of the Netherlands. The request is then reviewed by the Ministry of Defence and other (civil) ministries. The Chief of Staff replies to the request with agreed or rejected.

A HSN request can be rejected. However, this will only occur in extreme cases where the MoD is unable to support such request. The MoD supports all request in support of the defense of EU and NATO territory which is one of their main tasks.

As soon as the HSN request is approved the Operational Planning Process commences. All support requested by the US Army is prepared and coordinated with the civilian, commercial and military parties involved.

After a short ferry flight from the port, an HH–60M arrives at Woensdrecht AB.

The operations directorate of the CDS sends the operational order to the Royal Netherlands Air Force, Army, Navy and Marechaussee (military police) and all the other defence components involved. The order sets out what all the branches must provide in terms of capacity, support/services in time and space. The order also documents command and control aspects. Who is accountable to whom and who is responsible at any given moment during the period HNS support is provided.

Except the Ministry of Defence also the Ministry of Justice and Safety is involved. The department, through the National Coordinator for Security and Counterterrorism (NCTV), sent a letter to all civil authorities announcing the HSN operation. This refers to all the security regions and the mayors of cities where HSN operations will take place. The final stages relate to the execution and coordination of the HNS operation.

Air Bases and ports

During the phase described above, the Air Bases and the port used to facilitate the transfer in or out, occasionally both, are selected. This process is done by the host nation. Although the US Army can request the use of a specific port the host nation decides if that request can be granted. All involved departments are consulted related to an overview of road works, rail and inland waterways because the equipment must be transported further after its arrival in the port. From the port to the final destination roads, railways and rivers must be available to move the CABs vehicles and equipment to the east.

Members of the US Army through the 21st Theatre Sustainment Command often replied that they would like to use multiple NATO countries and their facilities to get an CAB in and out of Europe. Thus far ports in Belgium (Zeebrugge), Denmark (Esbjerg), France (Dunkirk and La Rochelle), Germany (Bremerhaven), Greece (Alexandroupoli, Volos) and The Netherlands (Rotterdam and Vlissingen) have been used. The helicopters and other items of a CAB are split between part being shipped to Southern Europe with Greece providing HSN. From their based on requirements the battalions or its companies move to their base(s) in Greece and Romania. The other part of the CAB arrives in Western Europe and continue to their destinations in the Baltic nations, Germany and Poland.

A UH–60M taxis to its parking area. For the duration of the movements, the taxiway was closed and used to park and service the helicopters.

Within The Netherland, it's remarkable that for the last Atlantic Resolve rotations, the port of Vlissingen was used. The RNLA spokesperson answered that "in the future Rotterdam might be used again. By the way, not all transit operations are reported to the media. There are transit operations where we as a host country provide less support and/or where commercial carriers van handle operations because of the nature of that cargo".

Until 2021, Eindhoven was the sole RNLAF Air Base supporting the helicopters movements. From then also Gilze–Rijen and Woensdrecht were used. "The decision which Air Base to use is related to physical availability and the desired/needed form/type of support or host country support".

During the eleventh AR rotation Woensdrecht Air Base hosted the incoming 1st CAB, while Eindhoven Air Base hosted the outgoing 3rd CAB with their Apache, Blackhawk and Chinook helicopters.

While an HH–60M is being prepared for the overnight stay, a UH–60M arrives at Woensdrecht.

Deployment of the Netherlands armed forces during HSN

It is difficult to provide the number of defence personnel, both civilian and military, involved in the supporting the current HSN operation. These numbers vary per HNS operation. For Vlissingen, which is transformed into a temporary military object, 75 soldiers and civilians from all commands and defence units are active. The RNLA oversees safety and security of the Verbrugge International premises. The company provides a warehouse where helicopters are assembled/disassembled as well as a temporary apron to support helicopter arrivals and departures. The RNLN has divers assigned to check the waterways. From the RNLAF its Gilze–Rijen based Mobile Air Operations Team (MAOT) has a team onsite supporting air traffic control. The Marechaussee obviously also plays it part in security and safety operations. Other personnel is working on the air bases while transport planners and other colleagues are working from their offices in The Hague and Utrecht (HQ RNLA).

Atlantic Resolve rotations

The first, then Operation Atlantic Resolve, rotation took place in 2017. 10th Combat Aviation Brigade, 10th Mountain Division was the first CAB to commence a nine month rotation. The US Army has 12 active duty CABs. Two of these are permanently based outside the United States. 2nd CAB in South Korea and 12th CAB in Germany. Both the 16th CAB based at JB Lewis–McChord, WA and the 25th CAB based at Schofield Barracks, HI deploy within the Indo–Pacific region.

In November 2021 (AR rotation 7) the 1st CAB battalions staged through Gilze–Rijen. The helicopters assigned to 1–1 ARB arrived after sunset.

While an HH–60M assigned to C/2–1 GSAB taxies to its parking area, its colleagues from B/2–1 GSAB arrive at Gilze–Rijen (AR rotation 7 in November 2021).

Either 82nd CAB or 101st CAB are kept on a 48 hour alert notice. As the 82nd CAB deployed to the US Central Command area of responsibility by the end of 2023 the 101st CAB is now on 48 hour standby.

From the United States to Europe

Except all work done in The Netherlands to provide host nation support to both Combat Aviation Brigades a lot of work as to be done in the United States before the CAB can deploy. Captain Jordan A. Beagle (PAO) provided some background into the preparation of the deployment of the 1st CAB and their lessons learned during their two previous rotations.

1st Combat Aviation Brigade organisation

Each US Army division is subordinate to a Corps which itself is responsible for four divisions. The divisions oversee their regiments with a further breakdown down to brigades, battalions, companies (or a troop in case of a Cavalry regiment). When not deployed the 1st Infantry Divisions reports to III Corps. When deployed outside the continental United States this is changed to the appropriate Corps.

The 1st CAB will be operating in the European theater until the July/August 2024 timeframe. A colleague brigade will then start the twelfth Atlantic Resolve rotation. During their nine months rotation the men and women of "Above the First" will support and take part in several exercises as well as take the opportunity to train with colleagues from allied NATO nations.

The author would like to thank USAR 1st CAB PAO CPT Jordan A. Beagle and RNLA spokesperson Jacqueline for her assistance in writing the article.

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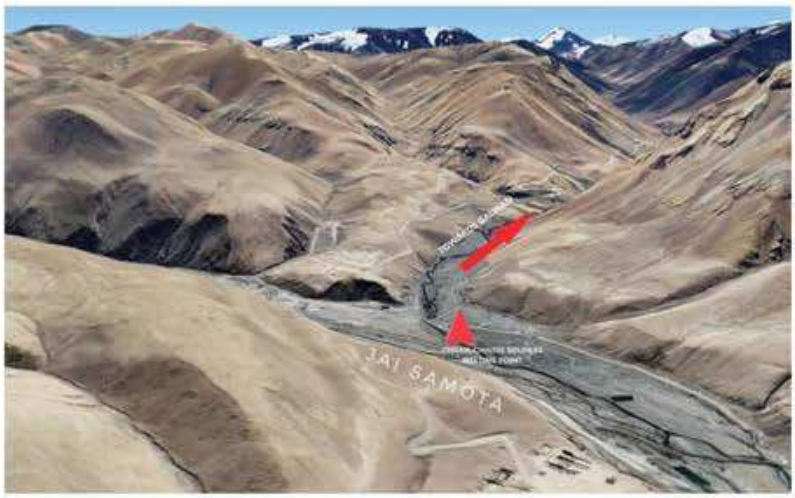
Galwan: A Lost Story

1962 War Series



Towards Galwan

Establishment of Galwan post as termed by the Chinese was an attempt of cannibalisation by the Indian government. Galwan is one of the most used terms by the general public during the past three years of India–China stand–off in Ladakh. Though both posts of 1962 and 2020 are located at different positions. Here is the story of the actual gunfight that happened at Galwan in 1962.

Audacious Alpha

The day was 18 April, Alpha company of the 5 Jat left Uri for Leh under the command of Major Srikant Sitaram Hasabnis. The unit began moving in the direction of Chushul after adjusting. The Corps Commander, Lt Gen Bikram Singh, visited the Alpha when it arrived at Chushul in mid–May. The company was busy conducting routine tasks and building defences. It received a directive in August to take the reins of ITB Hill from the Gorkhas.

After spending a month and a half in Chushul, the CO, Lt Col Bakhtawar, ordered A company to move to Hot Springs. It walked along the banks of the Pangong Tso to Phobrang before continuing on to the hot springs. Next came the climb up the pass to Marsimik. At 18300 feet, Marsimik La was a difficult ascent. Alpha arrived at the hot springs after navigating the pass and turning into the Chang Chenmo River valley to the north.

At Hot Springs, A company was to replace a company of 1/8 GR led by Major Modak. Alpha took control of the Hot Springs Company's defence during the following few days. The Gorkha company now started to withdraw in small detachments to Chushul. Major Ajit Singh led the Bravo company of the 5 Jat to the hot springs. Major Ajit Singh's company was to proceed and take over the post of Galwan from the Gorkhas, as per an order from CO Lt Col Bakhtawar Singh.

Galwan

Galwan complex was situated at an altitude of 17000 feet, approachable by foot via Jinan pass. It was established when higher officials decided to establish an isolated post deep within the Galwan Valley in June 1962. On July 4, CO 1/8 Gorkha Rifles, Lt Col Hari Chand, MVC, established a platoon sized post opposite the Chinese post at Samzungling on orders from Army Headquarters. On July 10th, around 300 Chinese surrounded the Galwan post, which was manned by Naib Subedar Jang Bahadur and 30 other ranks of 1/8 GR. The Chinese had left the surrounding area the next day, but they were still close to the post. They continued to demoralise the troops with propaganda slogans. Major VP Bhasin of the 1/8 Gorkhas arrived a few days later with a reinforcement column to strengthen the post. The Chinese used to cut off the supply route through the patrol base. Once they stopped a platoon sized Yak loaded supply patrol and insisted the patrol return to the base immediately. No fire was exchanged during the incident. After three months at this post Jats were asked to relieve Gorkhas.

Lt Col Bakhtawar reached Hot Springs one day and ordered that Major Ajit relocate to Galwan, but due to some sensitive factors and his assertion that moving to Galwan would be a suicide mission, Alpha company was instead asked to do so. Everyone was taken aback by this decision because Alpha was consistently handed the most challenging assignments.

The remaining 60 soldiers of A company were to enter Galwan by helicopter while a platoon from the company was assigned to seize control of the Gorkhas' minor outposts north of the Chang Chenmo River. Captain HN Paul, a doctor, was assigned to Alpha for the post in Galwan.

Galwan 1962

Galwan 1962 route map

Jats at Galwan

Major Hasabnis and two soldiers were helo–lifted to Galwan on October 3. This relief operation lasted until 12 October. The Alpha company now had total control of the Galwan post. Including the OC and the doctor, the company had 60 personnel. Numerous difficulties beset the Jats at Galwan. Snow started to fall, and the Chinese posts totally closed off the land route. The post was entirely dependent on air supplies, which could only be delivered during clear weather. On occasion, supplies would also land on the enemy side. The Chinese kept bothering the soldiers, encircling the station, and yelling propaganda slogans like 'Hindi Chini Bhai Bhai'.

The Jats had prepared four posts in the complex:

- Company HQ + 1 Section
- 1 Platoon under Subedar Hoshiar Singh
- 1 Section under Naik Inder Singh
- Remaining men under Subedar Nihal Singh

Between the posts, there was no communication and supplies were in limited numbers. Sixteen soldiers were without any kind of weaponry. Even the radio connection between Coy HQs and Bn HQs was on a set schedule because the cold used to cause batteries to deplete quickly. Every soldier felt some level of fear, but none of them uttered a word. They all felt as though they had been thrown in a death trap.

The Battle

Since the final Jat had landed at Galwan, a week had passed, yet the Chinese had continued to protest at the soldiers. On the tragic day of 20 October, Major Hasabnis was in his tent when he heard a machine gun fire towards his post at around 0400 hours. He could see incendiary bullets being shot at his post in order to burn it down as he peeked outside the tent. All the posts at Galwan were immediately shelled by artillery and mortars. There were no bunkers or deep ditches to stand vigil in. Fire started from all directions. Bullets from rifles, machine guns, and artillery were pelting the ground. The operator sat peacefully with his hands on his hands while Maj Hasabnis approached the tent with the radio to alert the battalion and brigade HQs that they had been attacked by the Chinese. "Did you inform the headquarters?" he inquired. At this hour, there was a radio silent period. That meant that nobody was present, not even in headquarters where the radio was off. Therefore, it was impossible to alert HQ. They had no contact with the outside world at all. They were now left to tackle this battle by themselves!

The remaining company positions were out of sight. Heavy blows from the firing were being delivered to a Company HQ soldier who was sitting out in the open. Someone questioned him, "Why are you doing this?" He said, "Wait, Saab." He was waiting for the shot that

Lt Col SS Hasabnis, he was Major and Company Commander, Galwan 1962

would kill him. He was one of the 16 unarmed men in the company. Even Major Hasabnis had a single pistol.

Subedar Nihal Singh

Subedar Nihal Singh's post was pounded by artillery. After the shelling stopped for a while, Chinese infantry launched a battalion sized assault on the forward defences. Those valiant Jats were fighting from their crumbling defences. Heavy weapons were not available to support the Indian troops. Subedar Nihal Singh was moving from one man to another to inspire them to fight till the end. Subedar Nihal Singh was hit by a shell and was fatally wounded as the men continued to battle and resist; upon noticing this, Sepoy Bhopal Singh immediately ran to the unconscious JCO, gave him aid, and moved him to a safe location. He found his LMG 1 severely wounded when he returned to his trench, so he took control of the weapon and dealt severe casualties to the enemy. His gun had been hit by a shell, leaving him with only grenades. He lobbed grenades, causing fatalities, but eventually the front line defences crumbled and Bhopal Singh was killed.

Major Hasabnis, in the rear position, continued to repulse Chinese attacks with his remaining troops. Doctor Captain HN Paul was advised to exit the tent and enter the trench by Major Hasabnis, but before he could do so, the tent caught fire due to a shell, and he had no choice but to remain inside where he must have died. Under severe shelling and machine gun fire, Havildar Banwari Lal, the CHM, continued to organise supplies and ammunition. While moving, he was killed by a shell burst as he continued to sprint from trench to trench supplying ammo and inspiring his comrades to fight to the bitter end.

Heavy shelling and an infantry attack were both carried out on Subedar Hoshiar Singh's isolated location. Although the initial waves of the enemy were repelled, the sheer quantity of them was overwhelming as they continued to attack the post. The end appeared to have arrived. It was clear to Subedar Hoshiar Singh that it was an alarming situation. He gathered his remaining supplies and came forward to rally his troops. Then, his LMG operators had sustained mortal injuries. He personally carried the LMG and dealt damage to the adversary before being shot.

A four times larger enemy targeted Naik Inder Singh's weak section. The section gave it all it had to fight, but after an hour they had nothing left, and the enemy had taken control of the position.

The hail of gunfire ended quickly, just as it had begun. Unsettling silence suddenly descended onto the Galwan complex. Hand–to–hand combat broke out as soon as the adversary closed. Soldiers who were hurt could be heard screaming. After several hours of fighting, the Chinese were able to take control of the post, killing 30 Indian soldiers out of 60 overall, including Captain (Dr.) HN Paul of AMC. 18 men suffered serious injuries. The men fought until the last bullet was shot. Those men, even though they knew death and defeat were staring them in the eye, knew there was no way out, but they did not raise the white flag of surrender. They were vastly outnumbered. Major Hasabnis and his surviving soldiers were taken prisoner by the enemy under duress. Galwan had been seized. Two tents filled with enemy casualties and one with Indian casualties were shown to Major Hasabnis. While in captivity, Subedar Nihal Singh and 1 OR lost their lives and Sepoy Roshan Lal lost his limbs.

On 21 October, Chinese soldiers opened fire on Indian helicopters as they flew over the Galwan position. The pilot was unable to get in touch with the post. The pilot stated that there was no indication of life on the post when he arrived back. It was believed that every single man was missing in action.

The captives were repatriated on 10 May 1963. Subedar Nihal Singh was awarded Vir Chakra in recognition of his bravery and leadership.

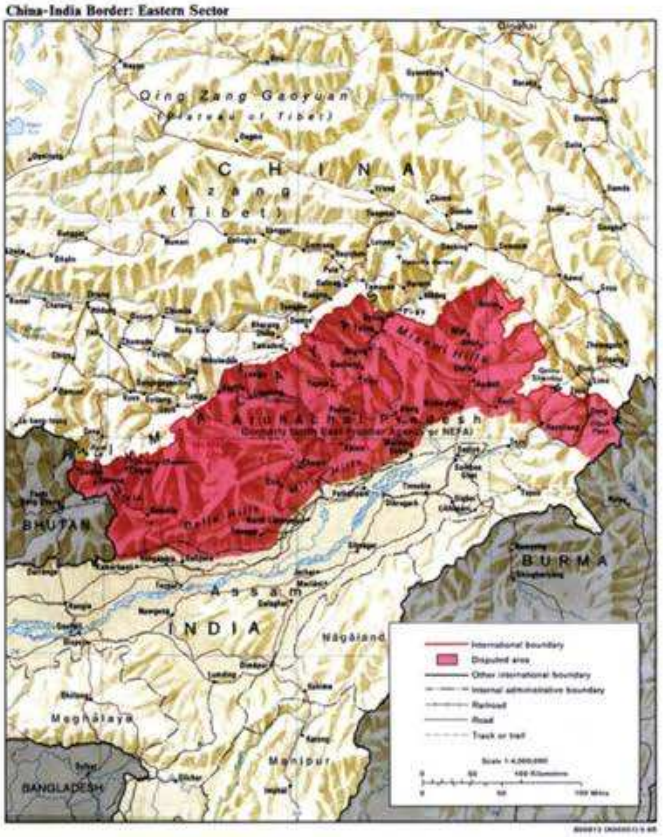
Not a single Jat hesitated going to Galwan despite knowing it was a suicide mission, or should I say a death trap. They endured the cold and the terrain despite the limited access to basic necessities like food and water, and ultimately fought determinedly against the stronger foe.

Gorkha troops with Chinese troops

Article by Jai Samota (email: jaisamota411@gmail.com)

Photos and maps specially arranged and made by the author. Lt Col SS Hasabnis's photos courtesy Hasabnis family.

Heroes of the lost war



Brigadier Gurbux Singh who saw action in Bomdi La in 1962, shared his account with us a few years ago before passing away at a ripe age of 94.

The 48 brigade was in Ambala, training for an operational role in Punjab when in October, maybe 22nd or 23rd, we were ordered to proceed with two battalions to Tezpur. We reached in about 2–3 days on October 26 and reported to the Corps HQ and were asked to proceed to Bomdi La with whatever transport we could lay our hands on. At Bomdi La, 1st Madras was already in position and the rest of the area devoid of troops.

India–China War 1962

India–China War 1962

So after a recce, I deployed the 1 Sikh LI on the left flack with their 4 companies and retained the 5 Guards in a depth position. Battalion parties went to prepare camps for company localities.

The troops arrived and moved into the areas, all moving on foot and carrying a rifle and just 50 rounds of 1st line ammunition. We had no heavy stuff like 3" mortars, no

digging tools, barbed wire, mines, or even machetes to clear the jungle.

Three days later, on orders of the Div HQ, I sent one of my four companies of 1 Sikh LI to guard the road to Bhutan and 1 Madras was asked to provide one company to the Div HQ in Dirang Dzong and the Guards were told to move one company to Poshing La (to the north) and marry up with an Assam Rifles unit posted there.

So the brigade has just 9 companies left for a defence area that required 16. I asked for another battalion (4 companies), this was accepted, but only in principle. Two or three days later on 12 November, the first movement of the Chinese on the Poshing La was seen, so I was ordered to send all of 5 Guards. I demonstrated and said there will be no Brigade depth position left, I was told that Bomdi La had no tactical importance as envisaged then.

But before it could reach, the Chinese struck and the Guards and Assam Rifles were overwhelmed at Poshing La, and when the bulk of the Guards reached Thembang in the evening of 16 November, they came under attack the following day and within hours, ran out of ammunition and requested to withdraw, I permitted them to do so. I was left with 6 companies and to top it all, that night I was told to send two companies with the two light tanks I had to Dirang Dzong to connect up with the Div HQ.

The Corps Commander (Kaul) came on the line and told me to move the forces regardless of the consequences. As

Chinese artillery

anticipated, the column was attacked as it left Bomdi La and the tanks were set on fire. Now I had three companies left in a place that required 16 companies to defend. The Chinese occupied all the hills on top of Bomdi La and we at the Brigade HQ began coming under fire on 18 November.

Next day on 19 November about noon, having lost all heights and contacts with any of the battalions and the Div HQ, I gave orders to withdraw from Bomdi La.

On the way down, I met the 3 Jammu & Kashmir Light Infantry and I told them to turn back and take up positions in the next set of heights at Rupa where I reached at about 10 pm. Then I heard that some forces had been left behind at Bomdi La, so I went back there and found them sitting there without taking up defensive positions, and I told them to withdraw. Late at night, the Chinese attacked the Rupa positions and after a short fight, we had to again withdraw, this time to Chaku.

By that time, no control was left over the troops and they were more like stragglers moving down to the foothills.

The war saw a failure of military and political leadership of the country. Our intelligence, too, was not very good. In any case, I don't see why we are opening these old wounds. Why are we wallowing in our defeat. It was a bad show, we should forget it and move on.

Air Marshal (R) Harish Masand says...

I learnt more than flying from them: MINHI BAWA

All above images from Wikipedia

Air Marshal Mohinder Singh "Minhi" Bawa was yet another Air Force luminary that I met rather late in my service career. By the time I reached Adampur in December 1972 to join 101 Squadron, "The Falcons of Chhamb", Minhi Sir had finished command of the other Su–7/22 squadron colocated in Admapur, 26 Squadron, in late 1970 and had moved on in his career to Jaisalmer. However, I did hear some stories about his feats in Jaisalmer as the Station Commander during the 1971 War and Jaisalmer's role in the Battle of Longewala. Since there was not much in writing about this battle, or even the entire 1971 War, by that time and one only heard stories by word of mouth in the old Indian tradition of the Guru giving gyaan to his disciples. Much later, I was to hear the story from the horse's mouth, so to speak, from Minhi Bawa himself. Later, by the time I came to Jamnagar to TACDE for the FCL course in March 1978, he had just left for greener pastures in the UK for the RCDS course for senior officers. Our paths in the Air Force finally crossed when Minhi Sir took over as Chief Instructor (Air) in Defence Services Staff College, Wellington in late November1985.

I had been on the staff at DSSC since October 1984 and had just got back in November after many months in Madras (as it was called those days) representing the Staff College for the court case in Madras High Court filed by some Air Wing students. So, in our first meeting, Minhi Sir wanted to know all about this case and how we had won it. Thereafter, in the very first staff meeting of the Air Wing, Minhi Sir laid out his vision about what and how we should be conducting our instructions and exercises. Having done over a year as a teaching DS, I had been put in the training team under the well–known HOTT (Head of Training Team) Air, Gp Capt Vapilla "Vaps" Nair. Vaps and I had hit it off well and under his directions and the free hand he had given us, we were already working on revising the exercises with the objectives of moving away from the set solutions for the students, or the "Pinks", thus encouraging original and out of the box thoughts and also free up their time for more self–study, time in the library for research as also greater interaction with the Army and Navy students to develop a better understanding of the ethos of the other services and their operations. While Minhi Sir largely agreed with these objectives laid out by Vaps, he did differ on a few modalities and, highlighting his experiences in Jaisalmer in the Battle of Longewala, wanted us to focus a little more on tactical air operations. I admired the way Minhi Sir let everyone have their say, without imposing his thoughts and ideas on us, even though many of us voiced differences with his approach and wanted the future generations to give due importance to strategic air operations and strategic thought. Minhi Sir also showed an open mind and finally accepted what most of us had to say.

Even within the air wing staff, Minhi Sir encouraged original thinking and free and frank voicing of opinions. I got a real taste of that when on 15 April 1986, the United States carried out a bombing raid on Tripoli, Libya in retaliation to the alleged terrorist bombing of a discotheque in Germany and/or the alleged Libyan retaliation to the sinking of two Libyan ships in the Gulf of Sidra a month earlier in March 1986. Whatever be the reason for President Ronald Reagan to order this raid, I was listening to the Voice of America while getting ready for work on the morning of 15 April, as was my habit for many years, when I heard this piece of news. When I went to work, I reported this to Vaps Nair as also the CI, Minhi Bawa. Minhi Sir heard me out and immediately took me to the Commandant Staff College, then Lt General Billimoria, and asked me to narrate what I had heard on the radio. Minhi Sir also volunteered

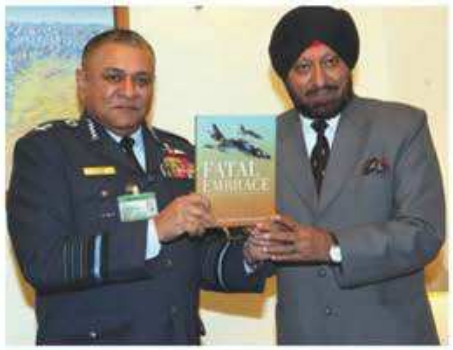
to the Commandant that by the end of the day, he would give a detailed report on our assessment of how this air operation had been carried out. Quite obviously, he promptly handed out the task to me and asked me to give him the report by the evening. Imagine my plight in those days of limited information with no internet, social media reports or even TV channels broadcasting such news 24x7. I had to struggle through the day in Chanakya, the Library of Staff College, to piece together whatever information was available on the US Navy in the area as also US Air Force assets in the United Kingdom and then theorize on how they may have carried out such a raid successfully, without any major reported losses, the routing, refuelling enroute, the profiles as also the likely force package. Fortunately for me, my estimates submitted that evening were pretty close as revealed by reports later. I still have a copy of the routing chart with markings of the types of aircraft and estimated refuelling areas somewhere in my personal papers.

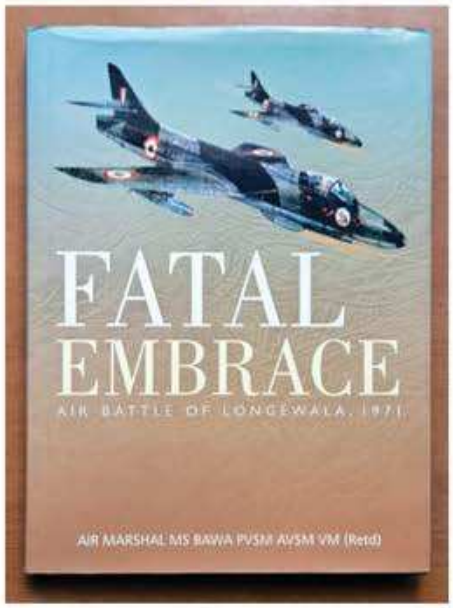
On the social front, the DS lot at that time in Staff College was a lively, and, perhaps a bit mischievous, one led on that front by Vaps Nair and Sunith "Su" Soares. The Bawas, however, participated in all our socials and did not ever mind the bit of rowdy fun that we indulged in. Mrs "Vimma" Bawa herself was a charming, warm hostess with all the diplomatic niceties, having recently returned from the UK after their Air Advisor stint in the High Commission in London. The Bawas were generous hosts and Malini and I enjoyed their hospitality on many occasions at "Cedar", the home of the CI (Air). They were also very caring for their flock and looked after each one. I still recall an incident in mid–1986 when I had a nasty cut from a hang–glider's wires, which had snapped, just below my left eye which required nine stitches and a few days of hospitalisation. The Bawas not only visited me regularly but also scolded me lovingly for indulging in such activities with risks towards medical fitness particularly when I was due for command of a squadron. Fortunately, I did not miss out on the command tenure because the wire had missed the eye by a few millimetres and just cut the lower eye lid.

Soon thereafter, sometime in July 1986, my name came out for conversion to the MiG–29 in the USSR with likely command of 28 Squadron later on return. I do not know for sure how it came about but suspect that Air Vice Marshals Minhi Bawa in Staff College and "Suppi' Kaul as DPO in Air HQ had something to do with it because of the remarks against me by "Lala" Dass earlier though neither of them ever talked about it then or later. Immediately, I was sent off to Coimbatore for my medical which was supposed to be a routine affair since I was hale and hearty without any ailments. Unfortunately, the doctors in Coimbatore found a small patch on my lung the size of 25 paise coin and suspected either TB or cancer. I knew about this calcified patch from childhood which was there even when I had done an earlier X–ray of the chest when joining the Air Force in 1965 and later in 1972 during the medicals before converting on supersonic aircraft. Unfortunately again, my medical documents in Med–7 at Air HQ went conveniently missing and the doctors had nothing to compare this patch with and sent me off to Command Hospital, Bangalore for further investigations.

Minhi Sir and Vimma came around to our house when I returned to Wellington to collect my stuff for a possible long stay in hospitals and told me not to lose heart at this turn of events, and particularly not worry about the strange case of the missing medical record at this crucial juncture in my career. After a few days in Bangalore where the doctors could not find anything positive, I was routed to CTC, Poona. To cut the long story short, two other benefactors entered my life then and saved me from a biopsy and low medical category for years. This meant cutting my chest open and as good as a death sentence for fighter flying for many years, and certainly a goodbye to the MiG–29. The first was an angel of a doctor named Wg Cdr Madhusudan Verma who suggested that I gamble Rs 2000/– or so on getting a CT Scan done, a procedure not yet recognised by the armed forces medical authorities. The second was the doctor at Ruby Hospital in Poona turned out to be another angel who took the trouble of finding the calcification value for the patch. This was accepted by the Commandant CTC as a temporary reprieve for me with a proviso that I come back for a review after I return from the USSR and move to Poona where the Squadron was to be re–equipped with the MiG–29.

Fortunately, there was no change in the patch, as expected, and I remained medically fit through my service career with this patch annotated in my medical documents. The point of this long story is that throughout this travail, Minhi Sir kept in touch with me almost every





day and kept my morale up with his encouraging words and prayers. The Bawas also visited Malini regularly to keep her spirits high too. That showed the concern the Bawas had for their subordinates and their wellbeing. On the side, "Suppi" Kaul also helped by making sure that this vacancy was kept open and I was allowed to join the preparatory phase with the language course and briefings a little later than the rest of the batch in Delhi. The conversion to MiG–29 and subsequent turn of events actually shaped my future career for which I owe big time to Minhi Sir as well as Suppi Kaul.

By the time I came back from the USSR in March 1987, Minhi Sir had moved to Jodhpur as SASO South Western Air Command (SWAC) and I soon followed him by moving to 2 Wing, Poona, which came under SWAC and where the MiG–29s were to be located. While we were still awaiting the aircraft to be assembled at Ozar and handed over to 47 and 28 Squadrons, AOC Poona, then Air Cmde JP Singh, was asked to participate in a paper exercise being conducted by SWAC in May 1987 wherein he was to act as the Pakistani counterpart as AOC Sindh and present a plan to counter SWAC in the event of hostilities. JP Sir naturally turned to me and handed over the task to me since I had been DS in Staff College. I formulated an out of the box solution and plan and presented the draft to JP Sir. In his usual style, JP Sir said, "Harish, you are going to get me killed" but accepted the plan. We presented this plan in Jodhpur at SWAC HQ in the presence of the Chief, Air Chief Marshal Dennis LaFontaine. Due to its radical approach to the air operations, the C–in–C, Air Marshal "Polly" Mehra, was quite upset but to his credit, Minhi Sir intervened, politely countered the C–in–C at the risk of his future career and said that we should consider

such possibilities since these would only strengthen the capabilities of SWAC should the enemy adopt such an approach. Fortunately for him, the Chief also supported this approach and JP Sir and I came back unscathed with a huge sigh of relief. Once again, this episode showed that the moral courage to differ with your seniors for one's beliefs is an important quality in military professionals, particularly as you grow in service.

As the SASO, Minhi Sir discreetly kept monitoring the formation and re–equipment of both MiG–29 squadrons in Poona and my work–up for the Low–Level Aerobatics displays on the MiG–29 through Vaps Nair, the Ops–1A, and always encouraged me to try new manoeuvres with due preparation and caution. As it happened, after I came back from Delhi for the planned display on Air Force Day on 7 October 1987, he was visiting Poona. Having received about 12 aircraft by then, including the two trainer aircraft, we had planned to commence flying for the Squadron on 16 October. I requested Minhi Sir to be the Guest of Honour, preside over the small inaugural ceremony with breaking of the usual coconut and then fly the first inaugural sortie with me in the trainer. While briefing him on the planned mission, I also told him that we would do a loop straight after take–off to announce the launch of the First Supersonics on this type with a bang. This was a manoeuvre that I had been earlier prevented from attempting on the borrowed 47 Sqn aircraft but which I had introduced in my on–base display routine while practicing for the Air Force Day display in Hindon. However, I had never done it on a trainer which had just a slight difference in the stick restriction for the maximum angle of attack. Without batting an eyelid, Minhi Sir agreed with the words, "Harish, with you I am in safe hands, show me whatever you want". Needless to say, the whole flight went off without a hitch and Minhi Sir came back beaming after trying a few manoeuvres himself on the aircraft. The finale was, of course, the short landing with deployment of the tail parachute just before touch down on 28 dumbbell and clearing off the runway at the first exit for our squadron dispersal with all personnel and some families watching and cheering. That was another example of him leading from the front and trust in his subordinates to not let him down and do anything stupid or unsafe with his life on the line.

Soon after that, in December 1987, when we had barely completed the short operational syllabus for most of the pilots, the Command AD Officer, Gp Capt IJS "Bops" Boparai called me up and said that the SASO wanted our squadron to participate in an air defence exercise from Jamnagar. Bops wanted me to confirm that my pilots were sea–qualified since most of the exercise would be over the Gulf of Kutch. Bops should have known better and the answer since we had received the MiG–29 aircraft barely two months before but, realising that the SASO had, once again, reposed his trust in the squadron, I assured him that we were all sea–qualified on type, and went ahead with the exercise using it as the means to expose all my pilots to flying over the sea, including at extremely low levels in the MiG–29.

Minhi Sir soon left on promotion as C–in–C Central Air Command in end February 1988 and we lost touch for a while since we were serving in different areas. However, we kept in touch, particularly after he retired and settled down in Safdarjang Enclave in New Delhi in early 1991. I was then attached to Air HQ for a long while preparing to go to Turkey as the Military Naval & Air Attache

and called on the Bawas many times. That was the time I heard more of his stories including his fight in court over taking possession of his house at B–2/10 Safdarjang Enclave from a tenant. I also played golf with him a few times and enjoyed his competitiveness. Then and every time, Mrs Bawa and the Air Marshal were hospitality personified and always insisted that I/we stay back for a meal. My visits to them became more frequent when I was myself in Court in 2004–05 and both of them always sympathised with my predicament and supported my struggle.

Later, when Outlook magazine published a false story about my aerobatics for a Bollywood starlet Mrs Bawa always joked and said I was doing these over the starlet's house thus finding something to pull my leg in jest. That is when I remind her that in Staff College days, when Amitabh Bachchan and Meenakshi Seshadri had visited, the younger DS including me were kept away from Minhi Sir's office and they were whisked off to the Commandant's house for lunch without as much as an introduction to us. So, Minhi Sir was the one who never brooked any competition against such starlets. Such mutual leg–pulling carries on till date whenever we speak on the phone or I visit them.

After retirement in 2006, I also got to read his book on Longewala as also Major General Atmaram's account who, as the AOP pilot at that time, landed then Wg Cdr Minhi Bawa at Longewala after the rout of Pakistani armour by the Hunters based at Jaisalmer on 4th and 5th of December 1971. Minhi Sir also writes and recites a lot of poetry, particularly "shers" and whenever I visit them, I always get to hear some new ones.

We were fortunate to have known the Bawas in the Air Force to learn a lot from them and to remain a friend in later retired life till date which has enriched our lives and further added to our experiences and memories.

The author of this series, Air Marshal (R) Harish Masand, seen above.

AIR MARSHAL MS BAWA
16TH DECEMBER 1932 – 15 FEBRUARY 2024

On completion of Fsc, he joined the Indian Air Force in 1951 and was commissioned on 1 April 1953. During his illustrious long career of 38 years, he saw the Air Force grow from 'Piston Engine' to a 'Modern Jet Force'. During his distinguished service, he held many prestigious Command and Staff appointments. As a Wing Commander, he commanded the first Sukhoi Su–7 Squadron and was awarded Vayu Sena Medal and later took over as Chief Instructor of Armament Training Wing. In the 1971 war, he commanded Jaisalmer Air Base which created history at the 'Air Battle of Longewala', and was awarded the Ati Vishisht Seva Medal. After this, he returned to Jamnagar as a Group Captain to command the prestigious Tactics and Air Combat Development Establishment and the Armament Training Wing.

A Flying Instructor and a Fighter Combat Leader, he did the Long Defence Management Course, is an alumnus of the Defence Services Staff College and obtained his MSc Defence Sciences degree from Madras University. He has the distinction of attending the Royal College of Defence Studies in the UK and later returning there as Air Advisor and, concurrently, Military and Air Attache to Sweden. As an Air Commodore, he commanded Ambala, one of the important and foremost Fighter Stations in the Air Force and 'reared' the Jaguar force. In the rank of Air Vice Marshal, he was appointed as Chief Instructor (Air) at the Defence Services Staff College, Wellington. On promotion to the rank of Air Marshal, he was appointed as Senior Air Staff Officer in an Operational Command.

The Air Marshal, as first Commanding Officer of the first Su–7 squadron, was rightfully honoured as Commodore Commandant of No.26 Squadron, Air Force. He took over as Air Officer Commanding–in–Chief, Central Air Command and retired with distinction on 31 December 1990.

Air Marshal (Retd) Shashi Ramdas recounts....

....The Father Figure

At the annual reunion of retired senior Air Force officers, in New Delhi on 6 October 1996, he had worn his nameplate on his civilian suit. While chatting with a small group of officers, he remarked that people do not forget faces but often forget names, so it would avoid embarrassment if we all wore our nameplates on such get–togethers. I said to him, "Sir, you don't need to wear a nameplate. Everyone knows you". He looked me straight in the eye and said, "Young man (I was 63 year old at that time!), if I don't wear a nameplate, how do I set an example?" That was so typical of Marshal of the Indian Air Force Arjan Singh DFC.

There have been a number of Chiefs of the Air Staff of the Indian Air Force, but the one who left an indelible mark on the Service is the legendary Marshal of the Indian Air Force Arjan Singh DFC. His life story is a virtual history of the Indian Air Force.

Born on 15 April 1919 in Lyallpur (now Faisalabad in Pakistan), he was in the first batch of Indian cadets sent for training to the Royal Air Force College Cranwell, UK in 1938. He was commissioned as a Pilot Officer in December 1939, returned to India and joined No. 1 Squadron in Ambala. Thereafter his squadron moved to Karachi and the NWFP. He later flew Hurricanes in Burma during World War II and, in 1944, was awarded the Distinguished Flying Cross (DFC) by Lord Mountbatten, for gallantry in action.

After World War II, he served in and commanded various units of the Indian Air Force where he gained a formidable reputation as a thoroughly professional and dedicated officer. He took over command of his first Station in 1947, when he was just 28 years old. In December 1950, at the age of 31 and in the rank of Air Commodore, he took over as the Air Officer Commanding Operational Command, then the sole operational Command of the Indian Air Force, where he served for two years. He served another tenure in the same appointment, from December 1955 to May 1959, during which time he was promoted to the rank of Air Vice Marshal, in 1958, with the designation of Air Officer Commanding–in–Chief.

As the AOC Operational Command he had his own characteristic way of carrying out inspections of his operational Wings. He would fly in unannounced, in a fighter aircraft, without a Staff Officer or even an ADC. He would then drive himself round the whole Station, alone in an ordinary jeep, visiting every nook and corner, from Airmen's Mess to bomb dump, from squadron dispersals to Air Traffic Control, observing the routine functioning of the various sections and stopping to have an informal word with officers and airmen in each of the places. After a few hours, he would return to the squadron dispersal where his aircraft was parked, have a glass of tea and an informal chat in the Crew Room, get back into his aircraft and fly back to Delhi. No ceremonial reception, no guard of honour, no fancy car, no silver tea service, no formal dinner, no unnecessary fuss. All he wanted to see was the operational preparedness of the Station.

On 1 August 1964, he took over as the Chief of the Air Staff, in the rank of Air Marshal, and continued in that appointment till July 1969 when he retired at the age of 50. During that tenure, he was promoted to the rank of Air Chief Marshal on 15 January 1966, the first IAF officer to be given that rank. He led the Air Force, with great distinction, in the Indo–Pak war of 1965 and was awarded the Padma Vibhushan, by the President of India, on 24 November 1965.

After his retirement, he was appointed the Indian Ambassador to Switzerland and, later, the High Commissioner in Kenya. On his return to India, he was appointed Lt Governor of Delhi.

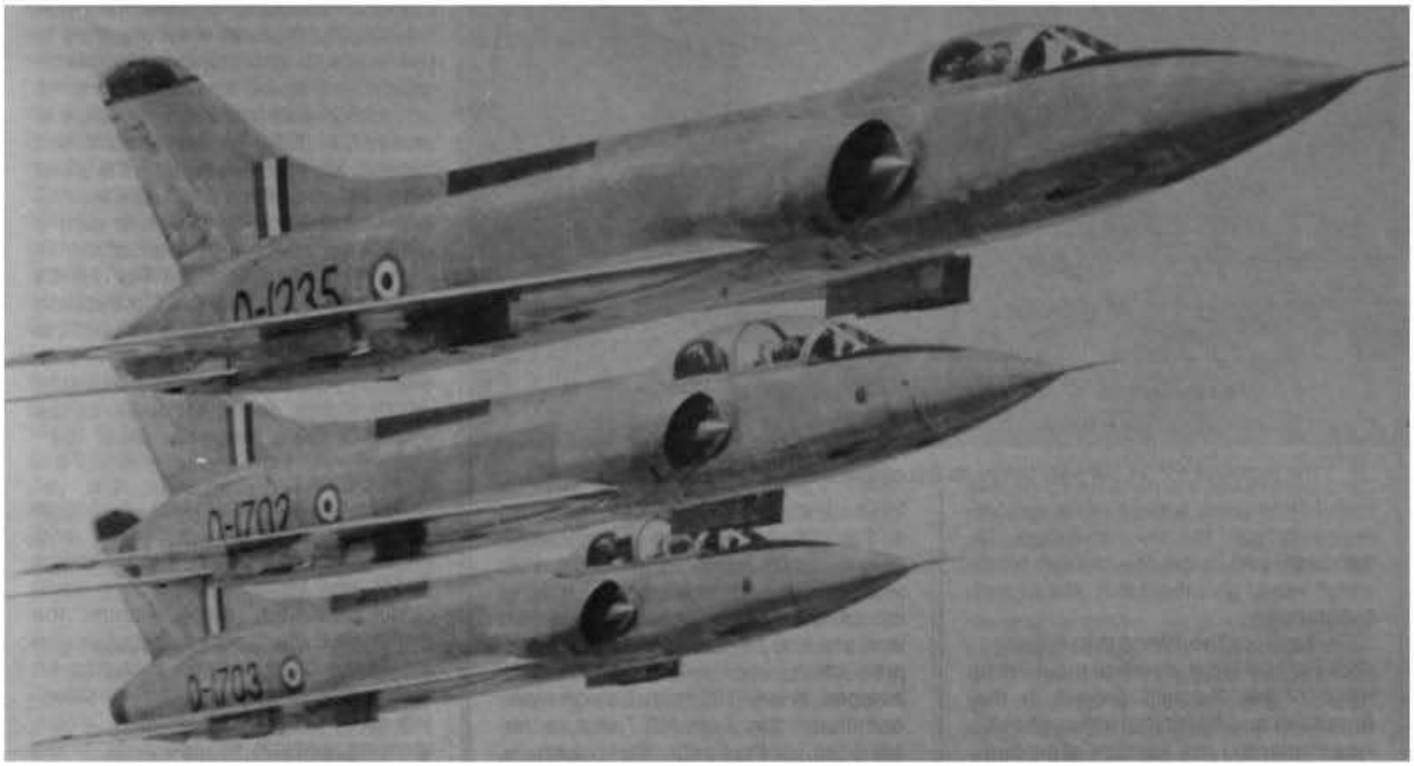
In recognition of his distinguished service and dedicated contribution to the growth of the Indian Air Force, he was made the first Marshal of the Indian Air Force, on 26 January 2002, a serving rank he held for life.

The Marshal was respected, loved and adored by all who served with him. He diligently nurtured the Air Force, while in service, and led by example. He insisted on the highest standards of integrity and professionalism. Even after retirement, he kept in constant touch with the officers and men of the IAF, graciously attending all official functions and informal reunions and being a great source of inspiration and encouragement to everybody.

Marshal of the Indian Air Force Arjan Singh DFC has truly been the Father Figure of the Indian Air Force. May his soul Rest in Peace.

Air Marshal (Retd) Shashi Ramdas

HISTORY: FROM VAYU ISSUE-I JAN/FEB 1987



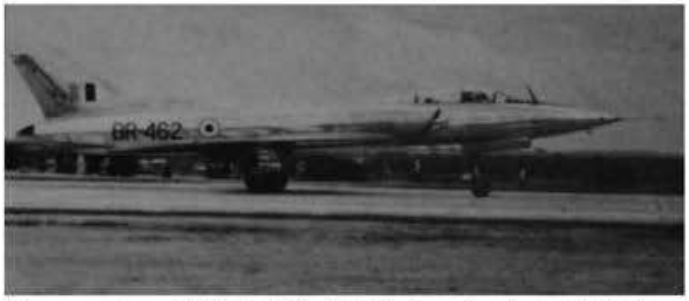
ONCE BITTEN... STORY OF THE HF–24 SANS POWER PLANT

In late September 1986, the Government of India signed a letter of intent for eleven General Electric F.404 jet engines with the giant U.S. powerplant–manufacturer. The F.404 is intended to power the Indian Light Combat Aircraft (LCA) and was selected after some years of study which also considered the Rolls Royce RB. 199, the Snecma M. 88 and Tumansky R. 33D, besides the ongoing indigenous GTX–35 which is being developed by the Gas Turbine Research Establishment (GTRE) at Bangalore. The LCA project itself was formally underway since 1983 when the Government gave its "go ahead" and assigned the responsibility to fund, manage and monitor the project to the specially constituted Aeronautical Development Agency (ADA) at Bangalore. The LCA's aerodynamic configuration, a tailless delta based on the feasibility studies of MBB, led by Dr. Wolfgang Herbst whose association with Indian aircraft designers goes back over a decade, was more or less frozen after wind tunnel testing and extensive calculations till mid–1986 but eagerness to select a suitable powerplant even before the Project Definition Phase (PDP) had begun, reflects the psychological scars that must smarten whenever the HF–24 Marut story is recollected. And therein lies the tale which began almost exactly thirty years earlier when, in August 1956, the legendary Dr. Kurt Tank first arrived in India to lead the design team which would eventually result in India's first in–country designed, developed and produced combat aircraft.

Even while the Indian Air Force was evaluating the next generation of jet aircraft to modernise its Vampire and Ouragan–equipped fighter–bomber squadrons in the mid fifties, the Ministry of Defence had approved an Air Staff Requirement for an advanced combat aircraft which would, by the late sixties, supplant the Mystere IV As and Hunters then being contracted for.

The A.S.R. called for a multirole aircraft to be employed for both the high altitude interception as well as low level ground attack duties within a performance envelope of Mach 2 speed at altitude, 60,000 ft. ceiling and a 300–mile radius of action. The requirement further specified that it should be possible to develop an advanced trainer, night fighter and 'navalised' version of the basic aircraft.

In pursuance of the national objective of attaining self reliance in the design and production of combat aircraft, it was also directed that this aircraft be developed within the country. Hindustan Aircraft Limited, as the present Bangalore Division of Hindustan Aeronautics Ltd. was then known, was given the task of preparing itself for the project. In retrospect this decision seems brave



The prototype HF-24 (BR-462) before its first official test flight on June 24th, 1961.

but its immediate acceptance brash for there, simply, existed no infrastructure to support such a programme and the extent of technological requirement was barely appreciated at the time. What did exist, and in unbridled quantity, was enthusiasm and the will to "make it!" HAL had at the time been engaged in the manufacture of Vampire FB.52s and Vampire T.55s under licence but its total design experience after 1947 added up to the HT-2 primary trainer, which first flew in August 1951. Five years later, in August 1956, Dr. Kurt Tank, accompanied by his deputy, Herr Mittelhuper, arrived in Bangalore in response to the invitation to establish and head the design team which would give the A.S.R. shape and substance.

Dr. Tank, of the World War II Focke-Wulf FW190 fame, came to India in the wake of his Pulqui II project in the Argentina and found that although HAL was immersed in a number of production programmes, there were only three senior Indian design engineers and the infant design department had a total strength of 54. The prototype shop had a complement of some sixty men, including supervisors, and 13 men constituted the entire strength of the Production Engineering Department. There was no hangar space available to build the prototype, no machine shop for prototype engineering, no test equipment, structural test rigs, flight test laboratory. In fact, not even a suitable runway, the existing 6000 feet 'humped' runway not being considered as suitable for prototype development trials.

The entire infrastructure had to be built up from grass roots and, by the time of the Hindustan Fighter 24 (HF-24)'s first flight, Dr. Tank had, in addition to 18 German design engineers, a design department of 150 men, the prototype shop having increased its personnel strength to 592 workers and 59 supervisors while the production engineering department boasted of over 100 men. Design work commenced in June 1957 and, in the spirit of enthusiasm that such a pioneering effort generated, the work was completed rapidly, the final mockup conference, finalising requirements around the full scale wooden layout simulating the aerodynamic envelope, being held on 10th April 1958. First drawing of the prototype was received on 12th Febraury 1959. In keeping with the style preferred by German fighter designers, a full scale wooden glider was constructed and glider trials were initiated on 1st April 1959, the test pilots involved at this stage being Wing Commanders Suri and Kapil Bhargav. As the glider was a two-seater (in tandem), Dr. Kurt Tank was able to make a couple of flights as an observer, the rear seat otherwise housing test equipment and a remotely controlled camera taking shots at four frames per second focussed on the rear instrument panel. A second camera, attached on the fin, was focussed on tufts of wool attached to the wings to determine the angle of attack and speed characteristics. An advantage was that it was possible to study full flight characteristics and incorporate modifications on the glider itself. Alternates were actually tried as in the case when the saw tooth leading edge was adopted instead of the 6-inch high wing fences. The HF-24 glider was towed by a C-47 and usually released from between 12,000 to 15,000 feet, and last flew on the 24th March 1960, having completed a total of 78 flights devoted largely to low speed handling characteristics.

First Flight

Assembly of the first prototype (HF-001) began in April 1960 and, eleven months later, on the 11th March 1961, taxi trials under power could commence. For three months the prototype underwent a comprehensive ground test programme including an involved testing of systems, functioning of controls, air brakes, flaps, steering, cockpit escape drills, brake performance etc. The old humped runway at the HAL airport, Bangalore had been supplemented by a 10,850 foot runway and the first flight of the HF-24 was on 17th June 1961 with Wing Commander (later G/C) Suranjan Das at the controls. W/C Das, then 41, had graduated from the Empire Test Pilots School in 1949 and was well known for his sterling displays in the Gnat at Farnborough. The first official flight took place a week later, on June 24th 1961, the prototype, now sporting IAF roundals and the serial BR 462, giving an half hour flying display in the presence of the then Defence Minister, V.K. Krishna Menon and a large number of defence and press invitees.

By November 1961, a structural test airframe had been completed and this was subjected to extensive structural and functional tests in rigs designed and fabricated at Bangalore. The airframe underwent ground resonance, material property and endurance tests, under simulated inertia loads, which led to destructive testing while a nose-section was fitted out for armament trials. As the rig tests and flight testing of individual components progressed, BR462 was joined by the second prototype aircraft, (BR 463) which first flew on the 4th October, 1962 and flight development continued with Group Captain Suranjan Das as the Chief Test Pilot, Wing Commanders (then Squadron Leaders) Inder Chopra being largely involved with stability trials, W.M. Tilak with the armament and instrumentation work and 'Bobby' Dey with powerplant trials, the last three mentioned being IAF test pilots on loan to HAL. BR-463 featured a repositioned pilot head boom and incorporated a tail brake-parachute.

The third pre-production HF-24 (BD-830) in flight.

One of the early production HF–24s (of No.10 Squadron) at Jodhpur in the early seventies.

The Powerplant Problem

The basic HF–24 design had been based on the 8170 lb.st. (3700 kg.) after burning Orpheus B.Or.12 which was originally being developed for the NATO light weight strike fighter and the supersonic Gnat Mk.2 interceptor. By 1959, however, further development of the engine was in jeopardy when British authorities confirmed that they had no requirement for the powerplant and neither the Indian Government nor the manufacturers would underwrite the development costs. Bristol Siddeley had been faced with a further expenditure of about $10 million to complete development of the B.Or.12 and although under no obligation, contractual or otherwise, to complete development, Bristol Siddeley were reported prepared to expend upto $1 million further on development provided the Indian Government accept the balance in financial liability or request a subsidy from the British Government. Discussions between Bristol Siddeley and the Indian Government were reportedly held in 1960 and 1961 with a view of completing development of the B.Or.12 or of continuing development of the much later BS75 turbofan. However the Government of India declined to underwrite the development costs and an effort by Britain to compromise by offering a loan for the general purpose of aviation development and not specifying the Orpheus project as beneficiary, was not accepted by the Defence Minister, Krishna Menon in mid–1962. This left the design team with little choice but to adopt the unreheated Orpheus 703, developing 4850 lb.s.t. (2200 kg.) as the powerplant for the interim Mark 1. The Indian Government took a decision, late in 1962, that rather than postpone further development and manufacture, 18 pre–production aircraft followed by 60+ series–production Mark 1s would be ordered although the Indian Air Force's initial reluctance to accept an aircraft which offered only a marginal improvement upon the Hunter, was responsible in some manner for the protracted delivery schedules.

Simultaneously began the frustrating search for an alternate powerplant and this was to continue till the mid–seventies! In 1961, the Russian Government was approached with the Klimov VK–7 turbojet in mind and several engines were subjected to evaluation tests. The centrifugal flow VK–7 could not, however, be fitted to the existing HF–24 airframe without major design changes and attention was shifted to the RD–9F axial flow engine, six of which were imported in late 1961 and bench tested at Bangalore. A programme to manufacture the RD–9F in India had been discussed in July 1962 at Moscow but in 1963, the RD–9F was rejected technically as it had proved extremely prone to surging while also the TBO was very short. Negotiations for the licence manufacture of this Russian engine were discontinued at the beginning of 1964 as development of RD–9F to beyond its rated Mach 1.4 compressor stress limit was an uncertain proposition.

An alternate was considered in the shape of the E–300 turbojet, designed by Dipl. Ing. Ferdinand Brandner, an Austrian repatriate from the Soviet Union against an Egyptian contract. A relatively simple lightweight turbojet with a 9–stage compressor and a 2–stage turbine, the EGAO E–300 was to develop an afterburning thrust of 10,580 lb., the reheat providing a 40% thrust augmentation. In 1962 it was considered that a smaller afterburner version, the EI–300 with reheat thrust of 9,240 lb could be developed for the HF–24.

The collaboration agreement was signed in Cairo on 2nd November 1964, the Indian Government furnishing, in July 1966, a specially modified pre–production Marut (HF–020) given the type designation—HF–24 Mk.1BX, and seconding two test pilots, Wing Commander Kapil Bhargav (who was then Chief Test Pilot with the Messerschmitt designed HA–300 flight test programme) and Squadron Leader Inder Chopra, with maintenance crew. The modified Marut had a redesigned fuselage able to accomodate either the Orpheus 703 or E–300 (the changing time between engine types being 20 days) but form drag was considerable. Test flying with the EI–300 began at Helwan, Egypt, on March 29th 1967 with S/L I.M. Chopra at the controls of the unmarked Marut. The HF–24 retained, initially, one of its two Orpheus 703s and a total flying time of 106 hours was completed on 150 flights and upto an altitude of 26,000 feet. Flight testing was satisfactory but after the June 1967 Arab–Israeli war, development work was reduced drastically and the Indian team had virtually little to do. The EI–300 engine had not been developed upto expected specifications and the maximum speed attained by the modified HF–24 with two EI–300s did not exceed Mach 1.1. By December 1967, the Government of India appeared to be losing interest in the venture, finally recalling the test team on July 1st, 1969. The Indian Government however, presented the trials HF–24 to the UAR Government, an action generous but ill advised as the entire Egyptian supersonic fighter and engine project was abandoned and the gifted HF–24 remained, derelict and useless at Helwan.

Late in 1964 there was a luke warm Bristol Siddeley proposal to employ the high pressure inner spool of the Pegasus married to the HAL produced Orpheus 703 thereby theoretically offering a similar performance to that of the abandoned B.Or.12. Underwriting the development costs were, naturally, stipulated and could have been accepted but

The sole Marut abroad HF–24 Mk.IBx, undergoing intake flow measurements at Helwan, Egypt.

Marut flypast at the Republic Day in January 1978.

the Indian Government was, at that time, most reluctant to enter into any further dialogue with Bristols.

The issue was also confused at the time by apparent Indian hopes that the United States would provide support in the HF–24 project and early in 1964, technological aid for the development of a suitable powerplant for the HF–24 Mk.2 had been formally requested for. Experts from the USAF Research and Development Centre at Dayton, Ohio together with representatives of Rolls Royce, visited India in July 1964 to investigate ways and means of improving the performance and rate of production of the HF–24 but apparently concluded that the project would require some years and considerable western aid in design, tooling and finance to mature into a supersonic weapons system. The prospect of US assistance dated back to June 1961 when the US and British Governments were working on an arrangement to counter the MiG–21 supply and manufacturing deal being extended by the Soviet Union. The USA had considered underwriting part of the cost of Lightning fighters to be supplied to the IAF by Britain and also the development of a suitable engine for the Marut. In the event, the possibility of US assistance was delayed by the finalisation of the MiG–21 supply deal and abandoned in September 1965 by the Indo–Pakistan War, the USA declaring an embargo on military supply or assistance.

As an indigenous exercise, the Indian Government directed, in 1963, that the development of an afterburner for the Orpheus 703, be undertaken by the Gas Turbine Research Establishment at Bangalore. Aiming for a 36% boost in reheat thrust (to 6600 lb.), design of an afterburning system progressed and in 1964, a 18% boost (to 5720 lb.) was reported.

Operational Status

Meanwhile the first pre–production HF–24 Mk.1 (BD 828) had made its initial flight in April 1963 and was joined by BD829 and BD830 within the year. Two of the pre–production aircraft were handed over by the then Managing Director of HAL, Air Vice Marshal Ranjan Dutt to the CAS, Air Marshal AM Engineer at a ceremony on 10th May 1964 at Bangalore. The aircraft, now named the MARUT, or the spirit of tempest and thunder, were taken over by the IAF's Aircraft and Armament Testing Unit, an organisation evaluating aircraft and weapon systems at Kanpur. Joined by increasing numbers of pre–production aircraft, they underwent service and weapon system trails (the latter at the Armament Training Wing) for nearly three years, leading to the re–formation of No.10 Squadron, the first to be equipped with the MARUT, on 1st April 1967.

Of the eighteen pre–production aircraft ordered, three were retained by HAL for equipment and avionics development work, two became experimental prototypes fitted with the reheat system, one was involved with the Egyptian E–300 engine project, the balance being handed over to the Indian Air Force. A close liaise was developed between the IAF and HAL during the period of service evaluation, aircraft being updated and modified as dictated by the Air Force's lo–lo ground attack profile requirement envisaged for fulfilment by the Marut Mk.1. Weapon systems and avionics were suitably selected, the Ferranti AIRPASS radar not being adopted nor was any provision made for installation of air–to–air homing missiles.

All major flight testing had been completed prior to the handing over of the pre–production aircraft to the IAF and some 1800 test flights had been completed by the time the first series production Mark 1 aircraft (HF–022) flew on 15th November 1967. The development phases of the HF–24 were fairly uneventful and the aircraft gave little trouble. By and large, the original design concepts proved themselves and there were no major problems which may have necessitated a major redesign in the structure or systems. Although the Marut had fine aerodynamic qualities, drag reduction studies continued as did flight testing of new systems desired by the IAF.

After flight of the first pre–production aircraft, the number of Germans on the design staff progressively reduced, down to ten in 1964 and only Dr. Kurt Tank was left by 1965, the venerable designer completing his assignment and retiring to Germany in late 1967. The relationships between the Germans and Indians at Bangalore were always correct and cordial and natural differences in temperament were assuaged by the spirit of the contract and challenge of the assignment.

While with HAL, the German team was only involved with the design development and were not associated with

Ground view of HF–24, clearly showing its clean aerodynamic lines, shock air–intakes and airbrakes extended.

HF–24s in final assembly at HAL, Bangalore.

production engineering, tool design or manufacturing activity. The Indian test pilots were entirely satisfied by the willingness of the German designers to appreciate and endeavour to incorporate the practical suggestions made during the flight testing. Dr. Tank earned admiration and universal praise at Bangalore, not the least for his farsighted genius which is apparent in the potential of the HF–24 design. The HF–24 was planned so as to offer scope for the introduction of some five successive generations of power plants and it is unfortunate that the aircraft has had to continue with the Orpheus 703, its very first engine type. Another pay–off from his foresight is the practical feature of a "quick–change" space behind the pilot's seat, which was designed, and has been utilised, for extra fuel tanks, special avionics, the internal rocket pack or a second seat.

Marut Trainers

Development of the Mark IT trainer and other versions of the HF–24, became the responsibility of an all–Indian team under Mr. S.C. Das in 1967. The prototype Marut Mk.IT tandem seating operational trainer (BD–888) was the forty sixth airframe and, piloted by the then Chief Test Pilot, Wing Commander R.D. Sahani, made its first flight on April 30th, 1970. Retaining all features, and dimensions of the Mark 1, the trainer version differed only in the removal of the internally–housed Matra rocket pack in which place the rear seat was installed. The minimal differences between the fighter and its trainer derivative meant a reduction in development costs and ease of spares interchangeability. Performance ratings were identical with the Mark 1, complying to the AP–9–70 specification. The Mk. 1T had dual controls and a wide selection of systems enabled the aircraft to be used for several advanced roles including instrument and armament training.

The second Mk.1T (BD 889) followed in March 1971 and these two aircraft completed over 300 tests flights and the type cleared for operational service in 1973.

The power Plant Problem–Second Round

Development flying of the Marut with re–heat suffered a severe setback when, on 10th January 1970 the prototype Mk.IR (HF–032) flown by Group Captain Suranjan Das, crashed just affer take off. India's finest test pilot being killed in the accident. Although it was rumoured at the time that one of the engines had completely failed and there may have been a partial failure of the second, the official enquiry attributed the accident to a malfunctioning of the canopy locking system. The Mk.IR prototype had been fitted with a clamshell–type unit replacing the earlier sliding canopy and the rapid decay in speed at the critical stage was fatal. Development of the reheat system was thus put back by a considerable period and trials (with the second prototype Mk.1R, BD 884) was only in the final stages of flight testing, in late 1972 the aircraft involved having modified, wider, rear fuselage, the rise in form drag being considered acceptable for the purpose. The overall performance improvement had not, however, been too encouraging and a production order for the Mark IR was not been considered as justified.

The first Marut with reheat, a modified Mark 1, HF–005 and this flying testbed was known as the Mk. 1A. Initially scheduled to fly in late 1964, acceptance trails were not entirely satisfactory and, in fact, it was only in September 1966 that the Defence Ministry announced that the re–heat Marut prototypes had initiated test flights. By 1970, two Mk.1Rs and the Mk.1A were involved in the reheat developments trials at which time the Orpheus 703 afterburning system had progressed to provide a 27% boost (to 6160 lb s.t.). This simplified reheat system designed by the Gas Turbine Research Establishment operated at 1700°K and since the Orpheus 703 was low pressure engine, the thrust increment with reheat was limited to 27%. The Indian Air Force was reluctant to order the Mark I and induction of aircraft and formation of operational units was peddle pushed as the service and HAL, kept hopes alive of finding a solution to the powerplant problem. The IAF's decision to go in for the Sukhoi Su–7 ground attack fighter as an interim measure was also a result of the HF–24 Mk.II delay.

Next to be considered was the RD–172/T.260 Adour reheat twin spool turbofan, evaluated intermittently for some years by the Indian Government with negotiations beginning in 1970. However, the Indian Air Force would only consider placing an order for the Marut Mk.II (as the production Mk.1R was to be known) if a modified and further augmented (by 20%) Adour were made available. The Mark II, capable of a Mach 1.4 performance at altitude, would incorporate updated navaids, instrumentation, systems etc., and a large production of the structural drawings had already been released.

HAL also put up certain proposals to augment the dry thrust of the Orpheus 703. The project proposed an increase in the T.E.T. to extract more thrust from the same airflow and size of the engine. This would have necessitated

Line up of HF–24s at a squadron dispersal.

a change in the turbine material—from Nimonic 90 to Nimonic 115. With an increase in the r.p.m. of the engine, a slight increase in the mass flow and pressure ratio plus adoption of a shroud turbine would increase efficiency of the turbine itself.

No zero–compressor stage was planned but the proposed modifications would increase the thrust of each engine by approximately 450 lb. No external aid in technological terms was contemplated, the development being considered well within HAL's limited resources and expertise. While this would have considerably enhanced engine performance, it remained only a paper study.

The powerplant problem–third round

The RB.153 two–shaft turbofan was briefly considered for the HF–24, with Rolls Royce/Motoren and Turbinen Union putting forth a development proposal but HAL was not able to accept the terms of contract nor, at the time, ready to consider the major redesign of the fuselage and possibly unacceptable form drag which adoption of the RB.153 would have entailed.

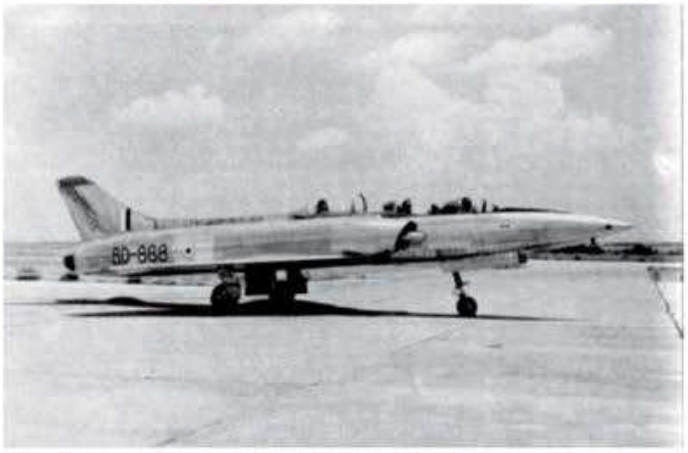
SNECMA of France also offered the Atar 09K–53 single–shaft augmented turbojet of 15.875 lb s.t. with reheat. While this proposal was not considered seriously, the follow up M.53 'Super Atar' created much more interest and a single–engined, M.53–powered, derivative of the Marut, HF–24–M.53, was subject of some preliminary design studies.

Finally, the Soviet Tumansky R.25 engine, rated at 16,535 lb. s.t. with afterburning, powering the MiG–21 bis also to be build under licence by HAL at Koraput, was considered as a potential solution and HAL's Design and Development Bureau under S.C. Das carried out fairly detailed work on the derivative aircraft, numbered the HF–25. This possible option, too, was not cleared by the Government of India and HAL's hopes of finding a solution to the vexed powerplant problem receded rapidly.

The powerplant problem–the last round

In 1973, MBB of West Germany made a dramatic offer to help redesign the HF–24 with two RB–199 turbofans which were then under final development for the European Multi Role Combat Aircraft (MRCA), later known as the Tornado. A high–level MBB team visited HAL in early 1973 and the designers, led by Dr. Wolfgang Herbert, carried out a feasibility study redesigning the HF–24 with the RB.199.

The resultant aircraft, numbered the HF–73, would finally meet the performance potential of the design which the genius of Dr. Kurt Tank had forseen fifteen years earlier. The HF–73 had an impressive performance, even though it was in half jest referred to as "the second hand MRCA". The HF–73 concept was received with great enthusiasm and Governmental support was forthcoming as it was considered that the entire developmental cost would be some 25% (Rs.100–150 Crores) of what would otherwise be needed for an entirely new project and result in an indigenous fighter of contemporary performance in the shortest possible time. It was envisaged that development of the HF–73 would take 4–5 years and the type ready for



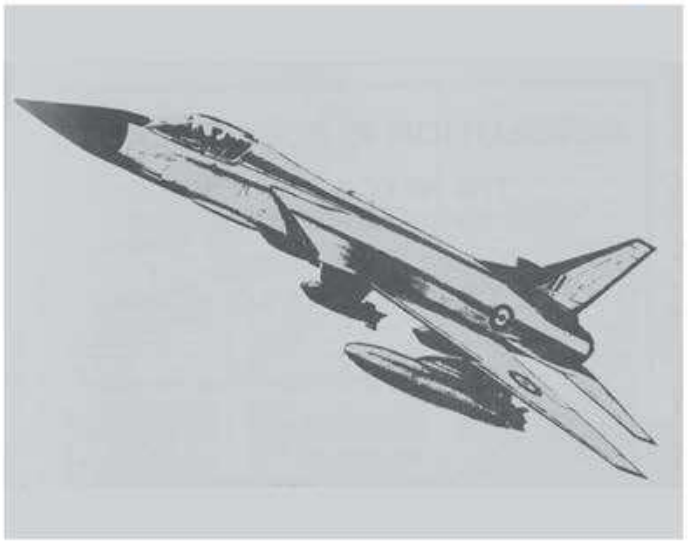
The first tandem–seating HF–24 MK. 1T operational conversion trainer.

squadron service by 1981–82, providing the IAF its deep penetration strike aircraft of the eighties.

Neither happened. The manufacturers of the RB.199 were unable, or unwilling to release the powerplant for the Indian project in the mid–seventies, the IAF was in a hurry to finalise its 7 years search for a DPSA. The Jaguar was selected in 1978 and the HF–73 project work consigned to the dusty cabinets of history.

Ten years later, the now fully mature, and further developed, RB.199 was again considered, this time for the single–engined LCA. However, the Government of India had by now widened its options and reached out to across the Atlantic where, in departure from earlier policy, the United States Government approved the sale of General Electric's F–404.

The HF–24 served operationally with three squadrons of the Indian Air force, in war and peace, and was well beloved by the pilots who flew it. Its premature phasing out still rankles deep within the hearts of those who knew it but if the saga of its powerplant search is a lesson learnt well, the HF–24's contribution to indigenous combat aircraft development will not have been forgotten.



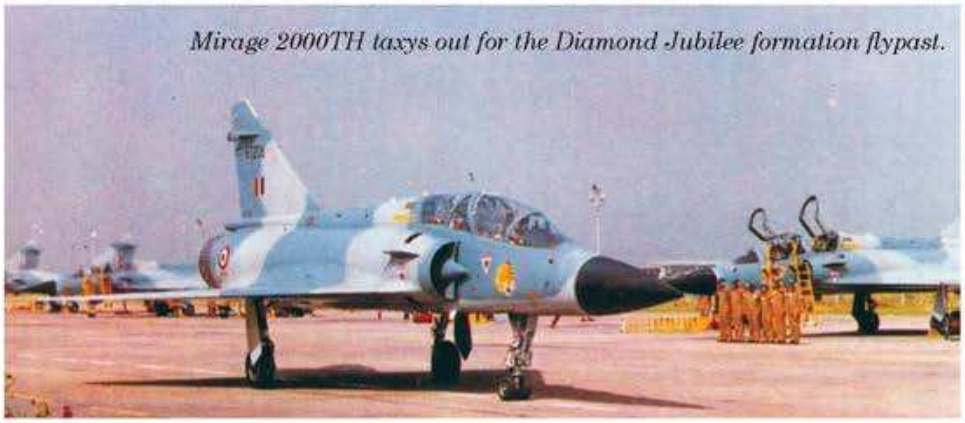
Artists' depiction of the proposed HF–73.

HISTORY: FROM VAYU ISSUE-2 MAR/APR 1993

1st April 1993, Maharajpur Air Base, Gwalior

The significance of the event was not just that the Diamond Jubilee of No.1 Squadron (the Tigers") was being marked but that, verily, this was the 60th year of the establishment of India's air arm, because on this day, six decades ago, "A" Flight of No.1 Squadron came into existance, the first military unit of the IAF. For three years, "A" Flight were to remain the sole symbol of the Indian endeavour to attain an airforce of their own but No. 1 Squadron got to form its "B" and "C" Flights only by 1939, the year that the Second World War broke out. The evolution of the Tigers, equipped from the Wapiti IIA army cooperation biplane of 1933 to the Mirage 2000H digital–delta multi–role fighter of 1993, and the events encompassed, is to record the

Outside No. 1 Squadron Headquarters.



Mirage 2000TH taxys out for the Diamond Jubilee formation flypast.

After the Diamond Jubilee flypast: Standing (left to right), Wg. Cdr. Anil Chopra, Air Marshal B.D. Jayal, Air Chief Marshal N.C. Suri, Air Cde. Adi Ghandi, Sqn. Ldr. D. Singh ('Delta'). Kneeling are Manish, Kadu, Gun, Dicky and Suraj.

Air Marshal Brijesh Jayal, Commodore Commandant, No. 1 Squadron.

Wg. Cdr. Anil Chopra, Commanding Officer.

Air Chief Marshal Arjan Singh and Air Marshal T.S. Brar.

history of military aviation itself, the passage of time through a world war, a number of other campaigns including police actions and full fledged wars, reequipment with nine fighter aircraft types (Audax, Hart, Lysander, Hurricane, Spitfire, Tempest, Vampire, Mystere IVA and MiG–21FL) before receiving the advanced generation, bi–sonic Mirage 2000. The small band of pioneers who formed No. 1 Squadron at Drigh Road (Karachi) sixty years ago would have been very proud indeed to witness the Squadron today, professional to the core and shouldering the responsibility of ensuring invincibility of the Indian skies.

The 1st and 2nd April 1993 witnessed the Tigers past and present at their most resplendent. No. 1 Squadron, commanded by Wg. Cdr. Anil Chopra, were the hosts and the galaxy of distinguished visitors included Air Chief Marshal Arjan Singh DFC (who commanded No. 1 Squadron in the second Burma campaign 1944–45), Air Marshal Y.V. Malse and Air Marshal A. Pandit (who had flown Hurricanes in war during that period), Air Marshal T.S. Brar, who commanded the reinstated squadron in 1953–55, Air Commodores Bhattacharya and Omi Taneja (who had commanded the Tigers during the 1961 Goa police action and 1965 war with Pakistan respectively) and Air Marshal Brijesh Jayal, the present AOC–in–C South Western Air Command, who commanded the Squadron in the mid–seventies on the MiG–21FL and currently the Tiger's Commodore Commandant.

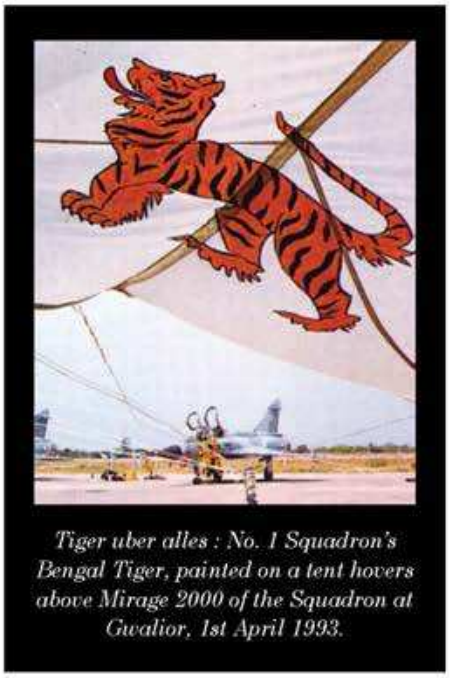
Gracing the occasion with their presence were Mrs. Sharda Mukherjee, whose husband Air Marshal Subroto Mukherjee had been the first Indian to command No. 1 Squadron (in 1939) and then to become Chief of Air Staff (in 1954), and Mrs. Srilatha Katre, whose husband Air Chief Marshal Lakshman Katre, had joined the Squadron in 1946 and had led the non–muslim personnel back to India on partition in August 1947.

The Tiger Family at the Residency Officers Mess, 2 April 1993.

The present Chief of Air Staff Air Chief Marshal Nirmal Suri, attended the Diamond Jubilee celebrations on 1st April, inspecting a guard of honour, flying in lead of the seven Mirage formation that depicted the figure "1" over the Gwalior airbase, taking part in the Bara Khana with the

Air Marshals Y. V. Malse and A.P. Pandit with mounted Tiger presented to the Squadron in 1981.

officers and men in the Squadron DSS hanger and the grand dinner–dance in the evening. Earlier, the Squadron museum had been inaugurated by Air Marshal Brijesh Jayal who released the commorative booklet on the Squadron History the next morning (published by The Society for Aerospace Studies). A congratulatory message was read



Tiger uber alles : No. 1 Squadron's Bengal Tiger, painted on a tent hovers above Mirage 2000 of the Squadron at Gwalior, 1st April 1993.

out from the C.O. No. 28 Squadron Royal Air Force (presently based in Hong Kong) which formation had flown together in battle alongwith No. 1 Squadron in the NWFP, first and second Burma campaigns. On the 2nd April were in–door sporting events put up by the Squadrons personnel and families, culminating in the Anniversary lunch at the Residency Mess. Truly, an event to remember.

25 Years Back

From Vayu Aerospace Review
Issue II/1999

India test fires Agni II

India's "extended range" Agni–II Intermediate Range Ballistic Missile (IRBM) was successfully test fired from the new launching site (IC–4) at Wheeler's Island off Balasore in Orissa on 11 April 1999.

Insat 2E launched

Described as India's most advanced satellite to date, Insat–2E was successfully launched on 3 April 1999 by an Ariane space vehicle (Ariane 42P) at Kourou, French Guyana in South America.

Air Defence Ship programme cleared

The long awaited "go ahead" for building an air defence ship (light aircraft carrier) in Indian dockyards has been given by the Ministry of Defence. Construction work on the project is expected to start in the year 2000 according to Vice Admiral Madhvendra Singh, Flag Officer Commanding–in–Chief of the Western Naval Command at Bombay.

Naval affairs: New indigenous ships

Clearance for the indigenous construction of an air defence ship (the euphemism for an aircraft–carrier) by the Cabinet Committee on Security is expected soon, the Chief of the Naval Staff Admiral Sushil Kumar stated on 26 March.

IN's 30 year submarine programme

Mazagon Dockyards at Bombay were upgraded in 1985 to become the centre of the Navy's 30 year indigenous submarine building programme. INS Shankul, the second SSK submarine was completed here in 1994 with HDW of Kiel in Germany transferring the knowhow after earlier supply of the first two submarines.

IN sans air cover at sea

After return from the Gulf, and participating in a major naval exercise with the Prime Minister onboard, the Indian Navy's sole aircraft carrier INS Viraat is going to the dockyards for a major refit and modernisation programme which will last 18–24 months during which period the Indian Navy will not have organic air cover at sea.

"Preliminary talks with Sukhoi"

According to Defence Minister George Fernandes, the Government of India has held preliminary talks with Russian authorities for the phased manufacture of the Sukhoi Su–30 aircraft in India. However, "a final decision on the matter was yet to be taken".

Indian Army to get T–90S

Joining issue with former Prime Minister HD Deve Gowda who has questioned the T–90S deal, the Government has assured him that the tank being sought from Russia is "qualitatively superior to any tank now in service or being sought from other sources".

Air India pulls out of Frankfurt

In an unexpected move, but in order to reduce its losses, Air India is pulling out of Frankfurt, a major European hub, as part of its efforts to cut down on loss making routes. This is seen as a considerable setback for the national flag carrier and will affect its visibility in the European market.

Vayu Shakti 1999

The Indian Air Force conducted a Fire Power Demonstration at the Pokhran Air Armament Ranges of the Rajasthan desert on 7 March 1999. Over 80 frontline aircraft of the IAF took part in the 90 minute demonstration which involved live firing of a range of ordnance and employment of various weaponry in the IAF's inventory.

HAL delivers A320 doors

Talking to Vayu Aerospace Review, Dr Kiran Rao, President, Airbus India, said that they are pleased with the quality of the forward passenger doors supplied by HAL for the A320 family of aircraft.

Pak–China defence ties bolstered

The Chinese Defence Minister General Chi Haotian led a high level military delegation to Pakistan from 19 February when a broad range of agreements were reached on the supply of military equipment including sales, transfer of technology and co–production of land, air and sea weaponry.

Tale Spin

We're a diversified company!



Vayu Aerospace Review is a very diverisfied group as you know! As part of our Swachh Bharat/Clean India Mission campaign, do visit our loos when you feel the need. We're into cooling systems as well as evident at yet another event. Plus if you feel the need to use our CNG (Compressed Natural Gas), do call us! (Photos by Rishav Gupta, Abhishek S. Chauhan and Rachhadiya Raj). PS: This is obviously a joke!

Hungry anyone?

In January 2024, twitter/X was somehow full of images of red jets. One couldn't help notice the similarity of a popular North Indian dish (the tandoori chicken) with these other flyworthy delectables!




Summer is coming fast!

As it begins to get hotter, personnel of the Indian Armed Forces have found ways to cool off. Also, it's time to start washing and cleaning up their respective aircraft as one can see with the Indian Navy MiG–29K, IAF Rafale and IN Il–38SD.

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