

# VAYU

V/2023

*Aerospace & Defence Review*



## Indian Air Force at 91



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Cover: Once again we have an IAF Su-30MKI at Andravida AFB, Greece for Exercise Iniochos.

Photo by Philipp Vallianos and article/interview by Marcus Vallianos.

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# VAYU

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A special thank you to our Interns Rishav, Puranjay Chawla and Pratish Chaudhry for helping us with this issue.

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Admiral (Retd) Arun Prakash says....

## The South Asia nuclear zero

The nuclear tests, of May 1998, by India and Pakistan, marked an epochal juncture for South Asia. The Doomsday Clock maintained by the Bulletin of the Atomic Scientists, jumped from 11:43 to 11:51, or just “9 minutes to midnight.”

While, in India, the “Shakti” tests, do find celebratory mention, Pakistan observes the Chagai series of nuclear tests, as a national day, termed “Yom-e-Taqbir.” On the 25th anniversary of this event, Lt Gen Khalid Kidwai (Retd), currently, advisor, to Pakistan’s National Command Authority (NCA), delivered an address at the Arms Control and Disarmament Centre of the Institute of Strategic Studies, Islamabad.

Kidwai, who served, for 14 years, as the Director-General of Pakistan’s Strategic Plans Division (SPD), was at the heart of Pakistan’s NCA, and oversaw the operationalisation of its nuclear deterrent. Although his talk was for public consumption, given the historic absence of an Indo-Pak nuclear dialogue, some of Kidwai’s statements, if taken at face value, contain worrisome undertones, which need analysis.

After mentioning the rationale for Pakistan embarking on nuclear weaponisation (“humiliation of the 1971 War followed by India’s nuclear test of May 1974”), Kidwai proceeded to enlighten the audience about the implications of Pakistan’s new policy of Full Spectrum Deterrence (FSD) and how it kept, “India’s aggressive designs, including the Indian military’s Cold Start Doctrine, in check.”

While retaining the fig-leaf of Credible Minimum Deterrence (CMD), Kidwai went on to mention the “horizontal dimension” of Pakistan’s nuclear inventory, held by the individual

Strategic Force Commands of the Army, Navy and Air Force. The “vertical dimension,” of the Pak deterrent, he said, encapsulated “adequate range coverage from zero meters to 2750 kms, as well as nuclear weapons of destructive yields at three tiers: strategic, operational and tactical.”

While the missile range of 2750 km, corresponds, roughly, to the distance from a launch-point in south-east Sindh, to the Andaman Islands, and indicates the “India-specificity” of the Shaheen III missile, it is the mention of “zero metres” that is intriguing. Pakistan, already has the 60 km range, “Nasr” missile, projected as a response to

India’s Cold Start doctrine. Therefore, unless used as a colloquialism, Kidwai’s mention of “zero metres” range could only imply a pursuit of ultra short-range, tactical nuclear weapons (TNW), like artillery shells, land-mines, and short-range missiles, armed with small warheads, of yields between 0.1 to 1 kiloton (equivalent of 100 to 1000 tons of TNT).

By shifting from CMD to FSD, with the threat of nuclear first-use, to defend against an Indian conventional military thrust, Pakistan is a ping the, discredited, US-NATO Cold War concept of Flexible Response. Fearing their inability to withstand a massive Warsaw Pact armoured offensive, this 1967 doctrine saw the US and NATO allies deploy a large number of TNW to units in the field.

However, the dangers of escalation arising from the use of TNW, were soon highlighted, by US Secretary Defence, Robert McNamara’s, public confession: “It is not clear how theatre nuclear war could actually be executed without incurring a very serious risk of escalating to general nuclear war.” This marked a turning point in US-NATO nuclear strategy.

Kidwai’s speech contains three statements of note. Firstly, he attempts to dilute India’s declared policy of “massive retaliation” (MR), in response to a nuclear strike, by claiming that







Pakistan possesses an entire range of survivable nuclear warheads of desired yield, in adequate numbers, to respond to India's MR. He adds, "Pakistan's counter-massive retaliation can therefore be as severe (as India's) if not more."

Secondly, in an attempt to downplay India's (inchoate) ballistic missile defence (BMD), he declares that in a "target-rich India", Pakistan is at liberty to expand the envelope and choose

territories, "...there is no place for India's strategic weapons to hide" (emphasis added). The assumption, so far, was that, given its limitations in terms of missile accuracy, real-time surveillance and targeting information, Pakistan would follow a "countervalue" or "counter-city" targeting strategy. The specific targeting of India's nuclear arsenal, especially, if undertaken by conventional (non-nuclear) missiles, would add a new dimension to the India-

Pakistan nuclear conundrum.

Delivered in the midst of Pakistan's acute financial crisis, as well as the ongoing political turmoil and civil-military tensions, one may be tempted to dismiss Lt Gen Kidwai's recent discourse. However, as the longest-serving, former head of the SPD



from countervalue, counterforce and battlefield targets, "notwithstanding the indigenous Indian BMD or the Russian S-400" (air defence systems).

Far more significant is Kidwai's declaration that, since Pakistan's missiles can threaten the full extent of the Indian land mass and island

and architect of Pakistan's nuclear deterrent, his views are widely heard, and deserve our attention.

Having voluntarily pledged "no first use" (NFU), India's 2003 Nuclear Doctrine, espoused a "credible minimum deterrent" and promised "massive retaliation," in response to

a nuclear first strike. Since then, our two adversaries, China and Pakistan, have expanded and upgraded their nuclear arsenals, presumably, with corresponding updating of doctrines. India's strategic enclave has, however, not only maintained stoic silence and doctrinal status quo, but also defended the latter.

BJP's 2014 Election Manifesto, had undertaken to "revise and update" India's nuclear doctrine and to "make it relevant to current times," but this promise has not been kept. Thus, India, currently, faces a moral dilemma as well as a question of "proportionality": will the loss of a few tanks or soldiers to a Pakistani nuclear artillery salvo, on its own soil, prompt India to destroy a Pakistani city of few million souls? Since India, too, has developed a family of tactical missiles, capable of counterforce strikes, does it indicate a shift away from CMD and NFU, calling for a response from our adversaries?

These are just some of the manifold reasons why there is a most urgent need for initiation of a sustained nuclear dialogue between India and Pakistan, insulated from the vagaries of politics. Such an interaction, by reducing mutual suspicion and enhancing transparency, might slow down the nuclear arms race and mindless build-up of arsenals. ➡



*In the photo above is Admiral (Retd) Arun Prakash*

Admiral (Retd) Arun Prakash says....

# Delhi and Taipei, just friends

**T**he recent arrival in Taipei of three retired Indian service chiefs has led to media speculation about the message that Delhi was sending, about “India’s options” in case of a military operation by Beijing to reunite Taiwan with the People’s Republic of China (PRC). This speculation was lent a sharp edge by American analyst Ashley Tellis’s recent comment that India’s vulnerability to Chinese domination, “guarantees that New Delhi will never involve itself in any US confrontation with Beijing that does not directly threaten its own security.”

The three chiefs were in Taiwan to participate in a seminar on maritime affairs, organised by a Taiwanese think-tank. These Track-2 discussions would, obviously, be of an academic nature. But so prickly is China about Taiwan and so charged is the Sino-Indian relationship with mistrust that the visit may invite caustic comments from Beijing.

As a matter of fact, the Republic of China or RoC (the official designation of Taiwan and its associated islands) has, for many years, been welcoming senior retired officers of the Indian armed forces to participate in conferences and visit its military units and defence installations. The reason is quite simple: The RoC as one of the world’s most insecure nations welcomes any sign of support from any quarter – especially from India, a nation of consequence with which it has some convergence of security interests. The RoC lies a mere 112 miles across the Taiwan Strait from its giant neighbour, the PRC, which represents an omnipresent threat of military invasion and forcible integration. Beijing has denuded the RoC’s international support by bullying or bribing many nations into withdrawing formal recognition. The RoC is today, recognised by only 13 countries, including the Vatican and a handful of small Pacific islands.

The Republic of China was established in 1912, after the downfall of the Qing Dynasty, and the assumption of rule by the Kuomintang (KMT) party as the legitimate government. In 1927, a civil war broke out between the KMT and the Chinese Communist Party (CCP) but the 1937 Japanese invasion led to

a truce and the two parties formed a united front to fight the common enemy. Resumed after World War II, the civil war ended in 1949 with a Communist victory. The CCP under Mao Zedong took control of mainland China, and the defeated RoC government, headed by Generalissimo (a military rank above Field Marshal) Chiang Kai-shek fled to the offshore island of Taiwan.

Post-WW II, the RoC, having emerged as one of the victorious Allies, was granted a seat on the UN Security Council. However, with the Communists staking their claim as the legitimate government of China, the UN, in 1971, expelled the RoC and gave its seat to PRC. Even as the US switched its recognition from RoC to the PRC, Beijing declared that it would use force if the RoC ever declared independence. This brings us to the interesting US policy of “strategic ambiguity” with respect to the RoC.

After their 1972 détente, Nixon and Mao issued the joint “Shanghai Communiqué,” which acknowledged that “there is but one China and that Taiwan is a part of it.” Thus, Washington’s “one China” policy helped the US sit on the fence while maintaining good relations with both the PRC and RoC. Seven years later, in 1979, the US Congress passed the Taiwan Relations Act, which approved unofficial relations between the US and Taiwan and committed the US to providing Taiwan with “defensive weapons”. So far, the US has, through diplomacy and military posturing, conveyed a message of deterrence to China without actually committing itself to military intervention in the defence of Taiwan.

India’s relationship with the RoC can be traced back to the WW II deployment of the 100,000-strong Chinese Expeditionary Force (CEF) for the defence of Burma. Mauled by the Japanese, the CEF withdrew to India, where a centre was opened in Ramgarh for its re-training and re-equipping by the Americans. In February 1942, when Generalissimo Chiang Kai-shek visited Ramgarh, he was invited by the Indian National Congress to address its 53rd session (underway in Ramgarh).

While Chiang’s visit was meant to convey China’s solidarity with India in the fight against Japanese aggression, he also expressed support for India’s freedom struggle. In June 1942, Gandhiji wrote to Chiang, conveying that the Allied war effort would be far better served if Churchill assured India of self-determination, under the Atlantic Charter. Chiang promptly wrote to US President Roosevelt pleading India’s cause and seeking his intervention in the cause of “justice and equity.” (Srinath Raghavan, *The Most Dangerous Place*).

India recognised the PRC in 1950 and for years stood by a “one China” policy, without reciprocity from the Chinese about J&K and Arunachal. Though India-Taiwan relations have remained low-key because of apprehensions about China’s adverse reaction, the two countries established trade and cultural ties in 1995; diplomatic representatives were posted in New Delhi and Taipei.

India-China relations plummeted after the 2020 Galwan incident, which compelled India to counter-mobilise in Ladakh. While the Sino-Pakistan military nexus will ensure that India has its hands full on land and at sea, the compact but robust Indian Navy remains fully committed to safeguarding India’s interests across the Indo-Pacific. Consequently, there is as much chance of India involving itself militarily in a Taiwan Strait crisis as there is of US paratroopers landing in Ladakh.

Given a shared and ever-increasing threat from the PRC, there is a significant mutuality of interests between India and the RoC. Apart from the obvious benefits to be gained from the regular exchange of military intelligence, Taiwan’s unique position as the world leader in semiconductors makes it a desirable friend and partner.

While the three former chiefs would make their recommendations to the government, New Delhi must retain a degree of caution and scepticism in this emerging relationship because historically, the RoC is not only the originator of the vexatious 9-Dash Line in the South China Sea, but has also refused to recognise the McMahon line, and insists that “Southern Tibet” belongs to China. ➡



Admiral (Retd) Arun Prakash says....

## Three Years after Galwan

**A**head of the third anniversary of the India-China Galwan clash, Senior Colonel Zhao Xiaozhuo of the PLA Academy of Military Sciences, reminded us, at the recent Shangri-La Dialogue in Singapore, of China's "complex and systematic" build-up of defence capabilities, adding ominously: "India is unlikely to catch up to China in the coming decades because of its weak industrial infrastructure."

It is up to India's decision-makers to either dismiss this comment as an attempt at psychological warfare or to use it as a whip for accelerating the atmanirbharta campaign. The harsh fact is, that despite being a nuclear-weapon state and space power, with the world's third-largest defence budget, India remains a top importer of military hardware – much of it from Russia and Ukraine.

Russia's continued reliability as a supplier of defence equipment and spare parts has been cast in serious doubt by two developments. First, its growing friendship and dependence on Beijing will fetter Moscow's freedom of action. Second, Russia's military-industrial complex, burdened by the Ukraine war and hobbled by US sanctions, is no longer in a position to support our armed forces. It's time India explores alternatives.

Under these circumstances, the Indo-US relationship seems to have blossomed at the right time. A fortnight ahead of Prime Minister Narendra Modi's visit to Washington, Defence Minister Rajnath Singh and his US counterpart, Lloyd Austin, met in New Delhi, to firm up an ambitious roadmap for defence cooperation on an unprecedented scale.

There is much jubilation at the likelihood of an agreement for licenced-production of the General Electric F414 turbofan aero engine in India. This would be a welcome development for our aerospace industry as well as the military, since the uncertain availability of an aero-engine has been an imponderable, dogging India's indigenous fighter projects. However, euphoria about the overnight attainment of atmanirbharta needs to be tempered by past experience. The two terms most misused by India's technologists and misinterpreted by its military and politico-bureaucratic establishments are "indigenisation" and "transfer of technology." This anomaly is best illustrated by India's aerospace sector.

Hindustan Aeronautics Ltd (HAL), founded by visionary industrialist Seth Walchand in 1940, is today a giant defence PSU (DPSU). Post-independence, HAL delivered the first licence-built British Gnat fighter in 1962, followed by the Soviet MiG-21 in 1973. Over the years, HAL has produced 175 Gnats, more than 800 MiG-21s, 200 Sukhoi-30s and hundreds of other aircraft of Indian and foreign design.

HAL's Engine Division, which started by producing the British Orpheus jet-engine (for the Gnat and Marut fighters) in the late-1950s, has, since then, manufactured a few thousand British, French and Soviet jet-engines, of many types, under licence. These seemed commendable achievements for a nation still struggling with the challenges of industrialisation. We deluded ourselves by proudly believing that we were manufacturing "indigenous" hardware for our fighting forces.

The unfortunate truth was that our DPSUs were engaged merely in the assembly of kits or undertaking "licenced production", while claiming "indigenous production" and "transfer of technology" (ToT). The DPSUs (and DRDO) failed to seek, from the foreign licensors, transfer of "know-how" as well as "know-why" of aircraft and engine design. Our scientists and engineers, therefore, acquired only "screwdriver technology", and India's lack of design expertise became painfully manifest in two instances: DRDO's developmental GTX/Kaveri jet-engine project, which has languished since 1989, and the modernisation of HAL built MiG-21s, which had to be outsourced to Russia and Israel in 1996.

India's failure to seek and acquire technology from foreign manufacturers, even after prolonged production runs, was a missed opportunity, with much of the onus falling on the MoD. While successive defence ministers failed to formulate a long-term vision for the nation's giant defence industrial complex, MoD bureaucrats lacked the expertise and commitment to energise lethargic DPSUs and ordnance factories. The "stove-pipe" structure of MoD engendered a lack of synergy between the military leadership and the DRDO.

China, starting in 1949 from an industrial baseline similar to India's,

took a different route and is, today, vying with the USA for global technological leadership. This achievement bears analysis. In the early 1950s, the USSR had undertaken a massive transfer of arms to China, but as ideological fissures emerged and the Soviets threatened to stop aid, the Chinese leadership ordered the appropriation of drawings and technological data relating to Soviet weapons. Once the split actually occurred, in the mid-1960s, the Chinese launched a national mission of reverse engineering (guochanhua) of Soviet weaponry. Its first phase enabled China to establish serial production of Soviet-origin weaponry – tanks, artillery, submarines and jet fighters. Subsequent cycles of guochanhua have helped China acquire the latest military and dual-use technologies through purchase, coercion and, often, via industrial espionage.

In 1986, Chairman Deng Xiaoping ordered the development of an indigenous aeroengine to replace the Soviet supplied power plants in use by the PLA Air Force (PLAAF). Since the Russians refused to part with key technologies, China chose the Franco-American CFM-56 turbofan as the core technology template for their WS-10 project. After two decades and a few billion dollars, the performance and reliability of the WS-10 prototype was found wanting. There is an object lesson in the way China persevered with this project, and by 2020, the WS-10 was accepted by the PLAAF for powering its frontline fighters.

With China's belligerence showing no signs of abating, the prospect of a "path-breaking" defence industrial partnership with the US is welcome. Our decision-makers and negotiators must, however, take a long-term view, bearing two issues in mind. First, no state or corporation parts willingly with precious technology, and we must be prepared to pay a significant price – financial and/or political. Second, unless resolutely negotiated in the minutest detail, it is easy for foreign companies to fob-off "licenced-production" as ToT.

We must ensure that our technical personnel acquire advanced expertise in arcane disciplines, related to diverse fields so that they become future designers and creators – not mere assemblers of knocked-down kits. ➡

# The quagmire of Afghanistan... as Kabul, Kandahar in a power tussle

Down the ages, Afghanistan, the land where many “Great Games” have been enacted, continues to baffle its rulers and neighbours as it brings misery to its impoverished and fratricidal strife-torn suffering people. In the past two years, it has been ruled by its own fundamentalist regime, the Taliban, with no succour to its people but added fatalities, hunger and deprivation, besides the growing abuse of human rights.

Afghanistan is now at the brink of a humanitarian disaster. The hasty, inglorious American exit in August 2021 has contributed nothing but political instability for a people already plagued by various ethnic diversities. That the Taliban have reneged on most of its promises given to the US and the international community prior to the American exit, especially on freedom of speech, democracy and women's rights is a cause of much turmoil within Afghanistan itself, apart from causing dismay to the nation's well-wishers abroad. One of the reasons for the instability and the wide political and policy chasms in Afghanistan is the growing rift between the ruling Taliban in Kabul led by Maulvi Abdul Kabir as Prime Minister and its ideological masters led by their supreme leader, Emir Hibatullah Akhundzada, based in Kandahar. The latter has sweeping powers and since his appointment in August 2021 has issued numerous decrees in conformity with his strict interpretation of the Hanafi school of Sharia law.

This infighting among Afghanistan's ruling clique and its fundamentalist orientation and medieval policies is also preventing foreign recognition of the Taliban regime as the legitimate Afghan government. Afghanistan's economy faces a paralysis with virtually the non-existence of a suitable banking system, no foreign cash inflows and hardly any foreign exchange reserves, besides meagre food stocks, to feed its population. Basic aid from outside nations is virtually non-existent as the nations which wish to assist the Afghan people don't want to deal with the extremist regime of the Taliban. Only four nations — Russia, China, Pakistan and Turkmenistan — have accredited low-ranking diplomats to

Kabul, without any formal diplomatic recognition to Afghanistan. Most nations, especially the West, are utterly disdainful of the Taliban trampling upon the educational and other human rights of its women, not ensuring adequate security of its minorities and all ethnic tribes in a fair manner.

The Taliban will do well to ensure that apart from the Pashtuns who constitute the maximum number in its fraternity, they also reach out to the Shias, Tajiks and Hazaras and thus accord a level playing field to its entire population. Overall, the Taliban government in Kabul is trying to gain global acceptance of their rule but with their current stand on human rights and especially the abject cruelty inflicted on their female population, the world community is unlikely to grant them acceptance.

Even China and Pakistan, who recently signed a couple of agreements with Afghanistan for an economic bailout, have not formally recognised the Taliban regime.

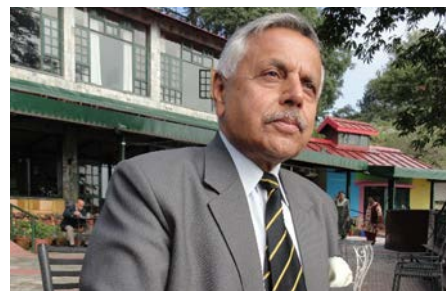
The Taliban, meanwhile, have to ensure the expanding terror footprint of the ultra-extremist Islamic State in Khorasan Province (ISKP), Al Qaeda and the Haqqani Network in Afghanistan is kept in check. This aspect of security, that has regional ramifications, must be carefully monitored by Afghanistan's neighbours, including India. The United States must influence Pakistan, its one-time protégé, not to fish in troubled waters, as terrorists have no loyalty to anyone except their inhuman agendas. The Taliban and Pakistan's bête-noire, the Tehrik-e-Taliban Pakistan, have strong links with each other, and for once Pakistan will be at the receiving end if it doesn't desist from the perennial mischief it has consistently played in neighbouring Afghanistan.

For centuries, India had civilisational and cordial links with Afghanistan and is highly respected among that country's ordinary citizens. India was significantly involved in Afghanistan's development before the Taliban came to power, and now has a Hobson's choice to make in establishing contact with the fundamentalist Taliban or not, and letting that country's people suffer. It will be in India's interests that it continues with its humanitarian aid

as it did during the Covid-19 pandemic and helping the needy Afghan people. It is commendable that the Indian government has released Rs 200 crores to assist Afghanistan and is sending a technical team to ascertain where it can help Afghanistan to tide over its food and basic medical facilities programmes. The Taliban too has expressed its gratitude to India. India, with the second largest Muslim population in the world, could use its moral authority to try wean away the Taliban from its fundamentalist moorings.

New Delhi should send some respected Islam-knowledgeable clerics from India to Kabul and Kandahar and endeavour to convince both Emir Akhundzada and Maulvi Hanif and their followers to move with the times and be receptive to the demands of the modern age and respect human rights, including of their women. But there's no harm in trying anyway.

The UN and its agencies and the West have their work cut out now in bringing back Afghanistan to some semblance of normalcy. The world must not regard Afghanistan as the forgotten frontier. In fact, the shadows of the current raging unjust war between Russia and Ukraine appears to have shrouded all other trouble spots of the world to the background. Afghanistan's future trajectory towards being a normal, harmonious and a civilised nation is crucial not only for itself but the region. Let India show the way with its magnanimity and endeavour to restore normalcy by economic and diplomatic efforts to extricate Afghanistan from the quagmire it has descended into. ➡



*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.*



**Air Marshal (Retd) Brijesh Jayal says....**

## **India has achieved success in space; now, govt needs to focus on aeronautics, where we remain far below potential**

**I**n anticipation of Prime Minister Narendra Modi's recent official visit to the US, followed by one to France as chief guest for the Bastille Day Parade, aspects relating to cooperation in aeronautics and space have been subjects of considerable debate and discussion in the media.

Of the two, the defence and civil aeronautics markets are not only fiercely competitive but due to their technological, security and industrial impacts, envelop a much wider strategic, economic and geopolitical canvas.

Space, on the other hand, is the preserve of just a handful of countries, among whom India, due to the foresight of its successive political and scientific leadership, finds a rightful place. Indeed, an unintended but significant message conveyed by ISRO to the international community was when, during PM Modi's visit to France, ISRO successfully launched the Chandrayaan-3 mission with the objective of a soft landing on the moon. A successful soft landing would put India alongside the US, Russia and China as the only countries to have accomplished this.

Since both of these fields are at the forefront of science, technology and innovation, it is not surprising that they should form an integral part of discussions involving strategic partnerships and cooperation among the leaders of our countries.

Reflecting this reality and our own achievements, the ground covered at the conclusion of visits to both countries with reference to space programmes indicates an element of partnership and equality and not one of a 'giver-receiver' relationship, as unfortunately is the case with aeronautics, where we remain far below our potential.

In aeronautics, we still remain at the mercy of technology and design from overseas in spite of India having made an earlier beginning in aeronautics as compared to space when, in the early sixties, we joined the ranks of a few

select countries to have designed our own trans-sonic fighter aircraft.

Prior to the PM's visit to France, the Defence Acquisition Council had approved the Navy's procurement of 26 Rafale N aircraft, sending a positive message to the host country. There was considerable media anticipation of this being announced during the visit. The fact that no formal announcement was made of either this or the proposed joint production of a jet engine for an indigenous fighter aircraft could be either due to the nature of the visit or, one suspects, to avoid unnecessary controversy domestically.

Keen observers of space and aeronautics in India are acutely aware that India has the organisational, scientific and technological capacity to march alongside advanced nations in both fields if it demonstrates the political will to do so. While it does so in space activities, it needs to catch up in aeronautics by doing what many experts have been proposing for decades. Proposals that continue to fall on deaf ears.

In 1970, Vikram Sarabhai proposed to the Administrative Reforms Commission an organisational model with a ministry of advanced technologies comprising separate commissions for atomic energy, space, earth sciences and aeronautics. It speaks for his foresight that in all the fields except aeronautics, the government followed the suggestion and the nation is at par internationally. Aeronautics regrettably remains confined to the folds of bureaucratic governance, resulting in continuing dependence on imports.

It was to address this weakness that the Aeronautical Society of India had, in 1994, under Abdul Kalam's presidency, proposed a National Aeronautics Policy, where the Preamble stated: "Aviation is one of the most significant technological influences of modern time and empowers the nation with strength for international partnership. It is a major tool for economic development and has a

significant role in national security and international relations...."

Further, it was noted that industrial aeronautics was an area where many commonalities existed between the rapidly expanding civil aviation sector and military aviation and, from a defence-industrial policy point of view, could contribute to economies of scale and hence an international footprint.

This proposal lost its way in our bureaucratic jungle and an updated version was prepared and submitted by the AeSI in 2004, in the preparation of which this writer was actively involved along with a team of experts. The proposal was formulated after in-depth consultation among all stakeholders, both civil and military.

If, as a follow-up to PM Modi's recent visits to the US and France, there is awareness at the highest political levels of our strengths and weaknesses in the fields of space and aeronautics, respectively, and suitable actions follow, the visits would have served as a useful catalyst in furthering the cause of Indian aeronautics within the larger vision of 'atmanirbharta.'



*In the photo above is Air Marshal (Retd) Brijesh Jayal*

## BEL and IAI MoU for SR-ADS

**B**harat Electronics Limited (BEL) and Israel Aerospace Industries (IAI) have signed an MoU for cooperation in addressing India's requirements in the domain of Short Range Air Defence Systems. The MoU was signed by Mr K V Suresh Kumar, Director (Marketing), BEL, and Mr Avi Elisha, VP and General Manager, Missile Systems Division, IAI, in the presence of Mr Bhanu Prakash Srivastava, CMD, BEL, in Bengaluru. The partnership marks yet another significant step towards cementing the synergy between the two companies which have a long history of association.



## Value of defence production

**T**he value of defence production has crossed the figure of Rs one lakh crore for the first time ever during financial year 2022-23. Government has taken several policy initiatives in the past few years and brought in reforms to encourage indigenous design, development and manufacture of defence equipment by Indian Industry including MSMEs and start-ups, thereby promoting ease of doing business in defence manufacturing and technology in the country.



## HAL orders 10 turrets from Nexter

**N**exter will supply 10 THL 20 remotely operated turrets for helicopters of Hindustan Aeronautics Limited (HAL); this new order reinforces a partnership launched in 2006 to equip the Indian Army's light helicopters. The THL 20 turret is armed with Nexter's 20M621 20mm cannon, which fires eight NATO compatible 20x102mm ammunition. Ultra-light, it is

controlled by the pilot's helmet and the helicopter's optronic system. The THL 20 is the main armament of the Indian Army's Advanced Light Helicopter (ALH) and Light Combat Helicopter (LCH). It currently equips a fleet of 110 aircraft.



## 4 years of INAS 313 with Do-228s

**I**ndian Navy's fifth Dornier squadron, INAS 313 (Sea Eagles), successfully completed four years on 22 July 2023. The Squadron operates the Dornier 228 aircraft manufactured by HAL from Chennai.



## INS Kirpan for Vietnam Navy

**O**n completing 32 years of service to the nation, Indian Naval Ship Kirpan has been decommissioned from the Indian Navy and handed over to Vietnam People's Navy (VPN) on 22 July 2023 at Cam Ranh, Vietnam. INS Kirpan, since commissioning in 1991, has been an integral part of the Indian Navy's Eastern Fleet and has participated in many operations over the last 32 years.





## L&T and Navantia agreement for P-75 (I)

Larsen & Toubro and Navantia, Spain signed a Teaming Agreement (TA) for the purpose of submission of a techno-commercial bid for the Indian Navy's P75 (India) submarine programme. Project 75(I) requires the Indian bidder to tie up with a Foreign Collaborator and execute the programme for delivery of six conventional submarines equipped with Air Independent Propulsion (AIP), while achieving targeted indigenous content.

## Heron Mk.2 in Indian skies?

13 August 2023 was abuzz when it was reported that the IAF had inducted 4 IAI Heron Mk.2 UAVs. While it is not sure whether they are leased or manufactured in India, their presence is definitely a game changer for the Armed Forces. We had reported last year: "IAI is cooperating with defence public sector company Hindustan Aeronautics Ltd pursuing a broad activity in the field of UAS. Under this cooperation, the two companies will pursue localisation and expansion of current and future UAS system integration and production under the Indian Government's new policies of moving to local sourcing and acquiring the platforms and weapon systems for the armed services. As for product support, IAI has expanded its cooperation with the private sector company ELCOM Systems Pvt Ltd to provide UAS Maintenance, Repair and Overhaul (MRO) for all operators of IAI's UAS in the Indian subcontinent".



Screenshots from ANI's video of the Heron Mk.2 (poor quality images)

## DCAS flies HAL's HTT-40



Air Marshal Ashutosh Dixit, Deputy Chief of the Air Staff flew the Hindustan Turbo Trainer Aircraft (HTT-40) Basic Trainer Aircraft, on 8 September 2023 at Bengaluru. Manufactured by Hindustan Aeronautics Limited (HAL), the aircraft has been indigenously designed and developed by the Aircraft Research & Design Centre of HAL and is based on the training requirements of the Indian Armed Forces. The HTT-40 is a fully aerobatic aircraft, powered by a four bladed turbo-prop engine. It is fitted with a state-of-the-art glass cockpit, modern avionics and latest safety features, including a zero-zero ejection seat. The trainer has a maximum speed of 450 kilometers per hour and a maximum service ceiling of six kilometers. The IAF signed a contract with HAL for the supply of 70 aircraft, the induction of which will commence on 15 September 2025 and continue till 15 March 2030.



## Embraer holds C-390 Millennium Day in India

Embraer concluded its C-390 Millennium Day in New Delhi which brought together key private and public entities from the Indian aerospace and defence industry. Earlier this year, the Indian Air Force issued a Request For

Information for a new fleet of Medium Transport Aircraft (MTA) aircraft which Embraer has responded to, offering the C-390 Millennium as “the platform of choice”. The C-390 Millennium was on display at Aero India in February 2023 where guests toured the modern military tactical transport aircraft.



## GSL and MIPL in JV

Goa Shipyard Limited (GSL) and Maritronics India Pvt. Ltd. (MIPL) Chennai have joint hands to indigenously develop crucial navigation equipments such as Radars, Electronic Chart Display & Information Systems (ECDIS) and Fiber Optic Gyros (FOG) for the sea going vessels of Indian Coast Guard and Navy.

## 8th P-8I of IN inspection completed

Boeing India says, “In partnership with Air Works, we’ve completed the eighth P8 airframe heavy maintenance inspection for the Indian Navy, successfully returning all aircraft to service on time to ensure fleet readiness in support of India’s maritime defence”.



## Swathi Mountains inducted

The lighter version of Weapon Locating Radar, Swathi Mountains, developed by BEL and LRDE was inducted into Indian Army on 6 August 2023. Lt Gen J B Chaudhari, Dy Chief of Army Staff (CD&S) flagged off the radar system which “will bolster Army’s battlefield surveillance capabilities”.



## “Heavy Drop System” successful

The Indian Air Force recently successfully tested the “Type V Heavy Drop System” from a cargo aircraft. With the help of this system, arms/equipment/ammunition weighing up to 20 tonnes can be easily transported and dropped with the help of parachute in the battlefield or at inaccessible places including high altitudes. Officials said that the Type V Heavy Drop System has been designed and developed at Aerial Delivery Research and Development Establishment, Agra (DRDO). The testing was jointly completed by Aerial Delivery Research and Development Establishment, Indian Armed forces Users and Airbornics Defence & Space Pvt. Ltd. (Defence Division of JCBL).



## KSSL unveils ECARS

The North Tech Symposium witnessed a ground-breaking moment as the Minister of Defence Rajnath Singh, unveiled the Enhanced Collaborative Autonomous Rover System (ECARS), a cutting-edge 4x4 multi-terrain unmanned ground



vehicle (UGV). This event marked a significant milestone in the realm of autonomous military technology and national security. ECARS, developed by Kalyani Strategic Systems Ltd, a fully-owned subsidiary of Bharat Forge is designed to perform a wide range of missions including surveillance, security, safety and rescue operations.



## Naval Group India's technical workshop at Karwar

The opening of Naval Group India's technical workshop at Karwar industrial area signifies its long-term commitment towards Indian Navy and the industry. It is strategically located close to the Indian Navy's Naval Ship Repair Yard at Karwar that shall be home to Indian fleet of aircraft carriers, warships and Kalvari class submarines (based on Naval Group Scorpene design). Naval Group India is the first subsidiary of any Original Equipment Manufacturer (OEM) platform designer to establish its physical presence at Karwar, supporting the Government of India's vision and mission of INS Kadamba also referred as Project Sea Bird.



## BAE Systems and L&T team up for BvS10

BAE Systems and Larsen & Toubro Limited (L&T) have partnered to bring the Articulated All-Terrain Vehicle (AATV), the BvS10, to the Indian market. The two companies have signed an agreement to offer the BvS10 for an Indian Armed Forces programme. Under the agreement, L&T is the prime bidder for the Indian market, with the support of BAE Systems Hägglunds, the Swedish manufacturer of the successful BvS10 family of vehicles. BAE Systems and L&T have upgraded the BvS10 to meet the specific requirements of the Indian Armed Forces. This new variant will be known as the "BvS10 Sindhu".



*Representative image (Photo: Wikimedia)*

## BIKAR Aerospace selects Aequs' BAC

BIKAR Aerospace GmbH has zeroed in on the Belagavi Aerospace Cluster (BAC), operated by Aequs Infrastructure, to establish an advanced Aerospace Service



Centre. To further expand BIKAR's market presence and strengthen its position as a premier international supplier of aerospace materials, the company has opted for a strategic presence at Aerus SEZ in Belagavi, North Karnataka. In future, BIKAR will provide storage and customised processing of semi-finished products made of aluminum, titanium, super alloys and other aerospace metals.



## Indian Army orders RPAVs through iDEX

Indian Army signed a contract for procurement of Indigenously developed Remotely Piloted Aerial Vehicle (RPAV) developed through the iDEX channel. The state-of-the-art airborne platform would enhance the surveillance, targeting and tracking capability and carry out precision targeting of enemy targets.



## Garuda Aerospace unveils Vayu drone

At Viva Technology, Garuda Aerospace showcased its Vayu drone, specifically designed for mapping and surveying purposes. Boasting an impressive payload capacity of 1.5 kg and a maximum take-off weight of 13.5 kg, the drone's high-resolution 20 MP camera offers clarity and precision for capturing detailed images and data during mapping and surveying missions. With a remarkable range of 150 km and a flying speed of 27 m/s, the Vayu drone "stands as a game-changer in the field of unmanned aerial technology".



## MoU between ICG and PCG

In a significant step towards bolstering the bilateral cooperation between India and Philippines, DG Rakesh Pal, Director General Indian Coast Guard hosted a five member delegation led by CG Admiral Artemio M Abu, Commandant, Philippine Coast Guard (PCG) in India for signing of a Memorandum of Understanding (MoU) on Enhanced Maritime Cooperation followed by the 1st bilateral meeting between both the Coast Guards. During the visit, the delegation was also provided with a customer demonstration flight on the Indian Coast Guard Advanced Light Helicopter ALH Mk.III. The delegates also visited Indian Coast Guard Ship Sujeet which is made by Goa Shipyard Limited.



## Air India finalises LEAP order

Air India and CFM International have finalised the order of LEAP engines that will power the airline's new fleet of 210 Airbus A320/A321neos and 190 Boeing 737 MAX family aircraft, which was first announced in February. Both



companies also signed a multi-year services agreement that will cover the airline's entire fleet of LEAP engines. Air India has been a CFM customer since 2002, when the airline began operating Airbus A320neo aircraft powered by CFM56-5B engines.



## MEHAIR orders 50 PHA-ZE 100

Mumbai based Maritime Energy Heli Air Services Pvt Ltd (MEHAIR) the pioneers of seaplane services in India since 2011 has signed an order for fifty, electrically powered regional amphibious aircraft PHA-ZE 100 with Switzerland based Jekta. With this agreement, MEHAIR will be the first customer to receive the aircraft in Asia, with initial deliveries starting in 2029.



## Embraer and Star Air in agreement

Embraer has signed a long-term Pool Programme services Agreement with Star Air to support the airline's growing E175 fleet. Star Air has leased four E175s in 2022 and two of them have started operations since May 2023. The contract provides access to the Pool Programme, which includes component exchanges and repair services for a wide range of repairable components for the airline's E175s.



## Akasa Air orders four 737-8s

Boeing and Akasa Air have announced an order for four additional 737-8 jets. Akasa Air, which launched operations in 2022 with its first 737-8, has rapidly grown its market share and fleet to 19 airplanes across 16 destinations to support the fast growing market in India. With the order of four additional aircraft, the Indian carrier's order book comprises 76 airliners.



## Pratt & Whitney and AWIROS launch Percept

Pratt & Whitney has announced the launch of Percept – an advanced AI-based Aircraft Engine Analysis Tool. Percept is a computer vision product that operates on top of the Awiros Video Intelligence Operating System (OS). Its cloud-based interface allows users to capture images and videos of aircraft engines on their mobile devices and receive real-time

responses on parts availability. This helps enable faster and cost efficient turn around of leased engine assets. Instead of an inspector having to examine an engine and check part by part, Percept automates this inspection and reduces time taken by nearly 90%.



## Akasa Air completes one year of operations

Akasa Air, on 7 August 2023, completed one year of commercial operations in the Indian skies. With an initial fleet induction plan of adding one brand new aircraft every 15 days, Akasa Air has created the record of becoming one of the fastest growing airlines in the 120 year history of global aviation by virtue of achieving a fleet size of 20 new aircraft within 12 months of commercial operations.



Photo: Boeing

## Airavat Aviation launches private air travel

Airavat Aviation, a new venture by Transworld Group, a leading global logistics conglomerate, is set to redefine luxury private jet travel in the Middle East and India with its launch of personalised services. Airavat's fleet of Hawker 4000 super-midsize business jets is poised to take to the skies, offering on-demand flights to Europe, Africa, Asia and the Middle East from its Dubai base. India will be one of the major markets, among the Asian countries.



## Spirit Air India Lol for 6 Islander's

Bangalore based domestic commuter airline Spirit Air has Signed a Letter of Intent for the purchase of 6 factory new BN2T-4S turboprop Islander aircraft from UK aircraft manufacturer, Britten-Norman. The BN2T-4S Islander is powered by twin Rolls Royce (Allison) Model 250 turboprop engines and benefits from an extended cabin, allowing one extra row of seats compared with the standard piston Islander.



## Honeywell's new AGL facility

Honeywell has announced the launch of its Airfield Ground Lighting (AGL) manufacturing facility in Gurugram, India. AGL is a Make in India product engineered and manufactured completely in India. AGL plays a crucial role in airport operations and is subject to comprehensive safety and compliance regulations by global aviation standards and regulatory bodies.





## Skanda Aerospace Technology Pvt Ltd, (SATPL) and aerospace gears

Hyderabad-based Skanda Aerospace Technology Pvt Ltd, (SATPL) a collaborative effort between Raghu Vamsi Machine Tools (Hyderabad, India) and Rave Gears LLC (Texas, USA), inaugurated its State-of-the-Art Gear and Gear Boxes Manufacturing facility. This pioneering initiative, the first of its kind in India, is dedicated to crafting aerospace-standard gears, marking a modest yet promising step in elevating aerospace manufacturing in the country. ➡



## APPOINTMENTS

### DG Rakesh Pal appointed as DG, ICG

DG Rakesh Pal has been appointed as the 25th Director General of the Indian Coast Guard (ICG). He is an alumnus of the Indian Naval Academy and joined Indian Coast Guard in January 1989. He has undergone professional specialisation in Gunnery & Weapons Systems at Indian Naval School Dronacharya, Kochi and an Electro-Optics Fire Control Solution course from the United Kingdom. The Officer holds the recognition of being the First Gunner of ICG.



### S Paramesh is ADG ICG

Additional Director General AS Paramesh, has been appointed as Additional Director General Coast Guard at Indian Coast Guard Headquarters New Delhi. The Flag Officer was at the helm of Coast Guard Region (East), Coast Guard Region (West) and Coast Guard Commander (Eastern Seaboard) before assuming Additional Director General Coast Guard. The Flag Officer is an alumnus of the National Defence College, New Delhi and Defence Services Staff College, Wellington.



### Vice Adm Rajesh Pendharkar is FOC-in-C, ENC

Vice Admiral Rajesh Pendharkar, assumed charge as the Flag Officer Commanding-in-Chief (FOC-in-C), Eastern Naval Command (ENC) at a Ceremonial Parade held on 1 August 2023. Commissioned into the Indian Navy in January 1987, Vice Adm Pendharkar an alumnus of the National Defence Academy and graduate of the Defence Services Staff College, Wellington, Naval War College, Karanja, and Naval Command College, Newport, Rhode Island, USA.



### Air Marshal Nagesh Kapoor is AOP

Air Marshal Nagesh Kapoor took over as Air Officer-in-Charge Personnel (AOP) on 1 September 2023. An alumnus of the Defence Services Staff College and National Defence College, the Air Marshal was commissioned in the fighter stream of Flying Branch of the Indian Air Force on 6 December 1986. In a career spanning over 36 years, the Air Marshal has held various key field and staff appointments. Prior to his present appointment, he was Senior Air Staff Officer at HQ Central Air Command, Prayagraj.



# Orders and contracts in India

## DAC approves AoN for nine capital acquisition proposals

India's Defence Acquisition Council (DAC) has accorded Acceptance of Necessity (AoN) for nine capital acquisition proposals of Rs 45,000 crore. The meeting was held under the chairmanship of Raksha Mantri Rajnath Singh on 15 September 2023. All these procurements will be made from Indian vendors under Buy [Indian-Indigenously Designed Developed and Manufactured (IDMM)/Buy (Indian)] category which will give substantial boost to the Indian defence Industry towards achieving the goal of Aatmanirbhar Bharat.

To enhance protection, mobility, attack capability and increased survivability of Mechanised Forces, the DAC accorded the AoN for procurement of Light Armoured Multipurpose Vehicles (LAMV) and Integrated Surveillance and Targeting System (ISAT-S). The DAC cleared AoN for procurement of High Mobility Vehicle (HMV) Gun Towing Vehicles for swift mobilisation and deployment of Artillery Guns and Radars.

The DAC also approved procurement of Next Generation Survey Vessels for the Indian Navy which will greatly enhance its capabilities in performing Hydrographic Operations.

The DAC also accorded AoN for proposals of the Indian Air Force which included avionic upgradation of Dornier aircraft to improve the accuracy and reliability for operations. The procurement of Dhruvastra Short Range ASM as a potent indigenous precision guided weapon for indigenously built ALH Mk-IV helicopters has been cleared by the DAC. The AoN for procurement of 12 Su-30 MKI aircraft with associated equipment from Hindustan Aeronautics Limited (HAL) was also accorded.



## DAC approves proposals worth Rs 7,800 crore

A Defence Acquisition Council (DAC) meeting has also accorded Acceptance of Necessity (AoN) for capital acquisition proposals worth approximately Rs 7,800 crore; to enhance the efficiency of the Indian Air Force, the DAC has granted AoN for procurement and installation of Electronic Warfare (EW) Suite on Mi-17V5 Helicopters under Buy (Indian-IDDM) category which will enhance better survivability of helicopters. The EW suite will be procured from Bharat Electronics Limited (BEL).



The DAC has also accorded AoN for procurement of Ground-Based Autonomous System for mechanised infantry and armoured regiments which will enable various operations like unmanned surveillance, logistic delivery of ammunition, fuel and spares and casualty evacuation in the battle field.

Proposals for procurement of 7.62x51 mm Light Machine Gun (LMG) and Bridge Laying Tank (BLT) have also been given go ahead by the DAC. While induction of LMG will enhance fighting capabilities of infantry forces, the induction of BLT will result in faster movement of Mechanised Forces.



The AoN for procurement of Ruggedised Laptops and Tablets for the Indian Army under Project Shakti has also been accorded. All these procurements will be sourced from indigenous vendors only.

To enhance the operational capability of the MH-60R helicopters of the Indian Navy, the DAC has accorded AoN for procurement of weapons for the same.



## BEL receives orders worth Rs. 3,000 Crore

Bharat Electronics Limited has also received an order of Rs.2,118.57 Crore from Cochin Shipyard Limited for supply of various equipment consisting of sensors, weapon equipment, fire control systems and communication equipment for six numbers of Next Generation Missile Vessels (NGMV), class of anti-surface warfare corvettes for Indian Navy. This project will have participation of Indian electronics and associated industries, including MSMEs, which are sub vendors of BEL. The Company also received orders worth Rs.886 Crore to upgrade AFNET SATCOM N/W, upgrade of Akash missiles with RF seeker, Inertial Navigation System and other equipment with accessories and spares etc.



Mr Bhanu P. Srivastava, CMD, BEL, receiving the LoI /order worth Rs 1,075 Cr for BEL from Cmde Hemant Khatri, IN (Retd), CMD, Hindustan Shipyards Limited, for supply of CMS, Communication Systems, EW Systems and other sensors for Fleet Support Ships.

## BEL receives orders worth Rs. 3,289 Cr

Bharat Electronics Limited (BEL) has received new defence and non-defence orders worth Rs. 3,289 Cr during July and August 2023. Orders are for supply of Low Level Light Weight Radars, SONARS, IFF Systems, SATCOM Systems, EO/IR Payloads, TRM/DTRMs, Jammers, Encryptors, Data Link Systems, Fire Control Systems, Radars for Directed Energy Systems, Semi Rugged Telephone Exchanges, Software Defined Radios and various others types of radios, Electronic Voting Machines, AMC and Spares. These also include the LoI/order worth Rs 1,075 Cr received from Hindustan Shipyards Limited for supply of CMS, Communication Systems, EW Systems and other sensors for Fleet Support Ships. ➡



# Defence modernisation



There is no meagre allocation of resources for defence modernisation and allocation for modernisation under total Capital Outlay for defence services has gone up from Rs 80,959.08 crore in FY 2019–20 to Rs 1,32,301.27 crore in FY 2023–24. The projected and allocated funds under Capital Acquisition (Modernisation Budget) in BE 2023–24 are as follows:

The allocated funds are optimally utilised towards operational activities. If required, the schemes are reprioritised to ensure that urgent and critical capabilities are acquired without any compromise to operational preparedness of the Defence Services.

With a view to encourage indigenous industry to contribute to defence modernisation, funds for the financial year 2023–24 have been earmarked in the ratio of 75:25, where 75% i.e. Rs 99,223.03 crore is for Domestic procurement and 25% i.e. Rs 33,078.24 crore is for Foreign procurement.

Further, the Government has taken several policy initiatives in the past few years and brought in reform to encourage indigenous design, development and manufacture of defence equipment, thereby promoting self-reliance in defence manufacturing and technology in the country. These initiatives, inter-alia, include according priority to procurement of capital items from domestic sources under Defence Acquisition Procedure (DAP)–2020; Notification of four ‘Positive Indigenisation Lists’ of total 411 items of Services and four ‘Positive Indigenisation Lists’ of total 4,666 items of Defence Public Sector Undertakings (DPSUs), for which there would be an embargo on the import beyond the timelines indicated against them; Simplification of Industrial licensing process with longer validity period; Liberalisation

of Foreign Direct Investment (FDI) policy allowing 74% FDI under automatic route; Simplification of Make procedure; Launch of Mission Defspace; Launch of innovations for Defence Excellence (iDEX) scheme involving start-ups and Micro, Small and Medium Enterprises (MSME); Implementation of public procurement (preference to Make in India) Order 2017; Launch of an indigenisation portal namely SRIJAN to facilitate indigenisation by Indian Industry including MSME; Reforms in Offset policy with thrust on attracting investment and Transfer of Technology (ToT) for defence manufacturing by assigning higher multipliers; Establishment of two Defence Industrial Corridors, one each in Uttar Pradesh and Tamil Nadu; Opening up of Defence Research & Development (R&D) for industry, start-ups and academia with 25 percent of Defence Research and Development budget; and progressive increase in allocation of Defence Budget of military modernisation for procurement from domestic sources, etc. ➡

Courtesy: Indian MoD





# Tata's TLMAL and TBAL in deliveries



*Tata Lockheed Martin Aerostructures Limited (TLMAL), on 9 August 2023, achieved a significant milestone with the delivery of the 200th C-130J Super Hercules empennage.*

## TLMAL delivers 200th C-130J Super Hercules empennage

**T**LMAL, a joint venture between Tata Advanced Systems Limited (TASL) and Lockheed Martin Aeronautics, was established in 2010 in Adibatla, Hyderabad. TLMAL exemplifies the Make in India initiative and has the distinction of being the single global source of C-130J empennage assemblies that are installed on all new Super Hercules aircraft produced in Marietta, Georgia, in the United States.

An empennage is the tail structure located at the rear of an aircraft. Empennage assemblies produced by TLMAL include the aircraft's horizontal and vertical stabilisers along with leading edges and tip assemblies. The TLMAL team also previously manufactured center wing box components for legacy C-130 model aircraft, and introduced a new cutting-edge 4,700 square-meter metal-to-metal bonding facility in April 2018. TLMAL currently employs 650 people.

In March of this year, Lockheed Martin and Tata Group signed a Memorandum of Understanding to begin the implementation of fighter wing production after the team at TLMAL demonstrated the capability to produce one of the most technologically complex aerostructures: a fuel-carrying 9G, 12,000 hour, interchangeable/replaceable fighter wing. This effort not only strengthens Lockheed Martin's partnership with India but "also demonstrates to India, and to the world, the degree of confidence that exists in our F-21 offering for procurement

of 114 new fighter aircraft, exclusively for India and the Indian Air Force, by proving additional indigenous production capability".

"The C-130J is known as the world's workhorse not just for its large global presence, but also for its international supply chain partners including TLMAL," stated Rod McLean, vice president and general manager of the Air Mobility & Maritime Missions line of business at Lockheed Martin. "Each TLMAL produced empennage literally helps the mighty Super Hercules take flight to support critical missions that impact lives and make history. While it takes many parts and pieces to build an empennage, it also requires a group of highly dedicated and skilled individuals, traits that are continually exemplified by our TLMAL teammates."

TLMAL empennages are included in C-130Js operated by seven nations, including India. These C-130Js support critical worldwide search and rescue, peacekeeping, combat delivery, maritime patrol, special operations, aerial refueling, commercial cargo transport, medevac and humanitarian response missions.





“Today, we take immense pride in reaching the momentous milestone of producing the 200th empennage for C-130J right here in India. Over the course of more than a decade, this partnership has achieved unrivalled manufacturing and operational excellence,” stated Sukaran Singh, CEO and managing director, Tata Advanced Systems Limited.

The C-130J Super Hercules is the proven standard in tactical airlift, providing a unique mix of versatility and performance to complete any mission, anytime, anywhere. It is the current variant of the C-130 Hercules and is the “airlifter of choice” for 21 nations around the world.

## Boeing and TBAL begin production on IA Apaches

Boeing is starting production of the Indian Army’s Apaches in Mesa, Arizona. The company will deliver a total of six AH-64E Apaches fulfilling the Indian Army’s requirements.

Earlier this year, Tata Boeing Aerospace Limited (TBAL) delivered the Indian Army’s first AH-64 Apache fuselage from its advanced facility in Hyderabad, India.

“We are pleased to reach yet another significant milestone, highlighting Boeing’s unwavering commitment to support India’s defence capabilities,” stated Salil Gupte, President, Boeing India. “The advanced technology and proven performance of the AH-64 will enhance the Indian Army’s operational readiness and strengthen its defense capabilities.”

In 2020, Boeing completed delivery of 22 Indian Air Force E-model Apaches and signed a contract to produce six AH-64Es for the Indian Army. The delivery of the Indian Army’s Apaches is scheduled for 2024.

“The AH-64E continues to be the world’s premier attack helicopter,” stated Christina Upah, Vice President of Attack Helicopter Programmes and senior Boeing Mesa site executive. “The AH-64 provides customers with unparalleled lethality and survivability, and we are thrilled to provide those capabilities to the Indian Army.”





# Argentina and HAL LoI on LUH/MUH helicopters

**H**AL and the Ministry of Defence of The Republic of Argentina have signed a Letter of Intent (LoI) on productive cooperation and acquisition of Light and Medium Utility Helicopters for the armed forces of the Argentine Republic. The LoI was signed on 20 July 2023 by Mr Jorge Taiana, Argentinian Defence Minister and Mr CB Anantha krishnan, CMD, HAL in the presence of Mr Francisco Cafiero, Secretary of International Affairs, Ambassador Hugo Javier Gobbi, Ambassador Dinesh Bhatia and other senior officers from Argentinian side and HAL.

The Argentinian Defence Minister remarked that the day was interesting and a step on the road to an ever growing and strong collaboration with HAL. CMD HAL and other senior officers of HAL briefed the visiting dignitaries on various activities of HAL and a presentation was made on the occasion. During the day-long programme, the

Argentinian Defence Minister and his team viewed the flying display of various HAL products at HAL Airport. The team also paid a visit to LCA, Helicopter Divisions and evinced keen interest in HAL products.

## HAL and FAdA of Argentina Sign MoU

HAL and Fabrica Argentina de Aviones (FAdA), Argentina signed a MoU during the Paris Airshow 2023 in June 2023 towards exploring the possibilities of collaboration in the field of MRO and to meet any offset requirements in case of probable sale of HAL made platforms in LATAM region. Similar to HAL, FAdA is an Argentinian state owned Aerospace company under the administrative supervision of Ministry of Defence involved in design, manufacture and maintenance of civil and military aircraft.

## India/Argentina to deepen defence ties

Raksha Mantri Rajnath Singh held talks with the visiting Minister of Defence of Argentine Republic Mr Jorge Enrique Taiana in New Delhi on 18 July 2023. Both Ministers discussed the ongoing defence cooperation initiatives, including measures to enhance defence industrial partnership. Earlier in the day, the Argentine Defence Minister visited the National War Memorial and laid a wreath while paying homage to the fallen heroes. A Tri-service Guard

of Honour was also presented to the visiting dignitary before the talks with the Raksha Mantri.

Mr Jorge Enrique Taiana arrived in New Delhi on 17 July 2023 on a four-day visit to India. He was accompanied by Secretary International Affairs, Argentine Ministry of Defence Mr Francisco Cafiero. The Argentine Defence Minister visited BrahMos Aerospace and interacted with leading think-tanks in Delhi. He also travelled to Bengaluru and visited HAL facilities and separately interacted with the defence start-ups in an event organised by Innovations for Defence Excellence (iDEX).

India-Argentina relations were elevated to the level of Strategic Partnership in 2019. An MoU on defence cooperation too has been in force since 2019 while both sides are engaged to conclude further instruments to deepen the engagement. India and Argentina are working closely together to make defence engagements an important facet of their strategic partnership. ➡



# Godrej Aerospace: Fuelling India's space sector with exceptional contributions



*Maneck Behramkamdin, AVP and Business Head (left) of Godrej Aerospace; Anil G. Verma, CEO of Godrej & Boyce.*

While the country takes immense pride in the successful launch of Chandrayaan-3 from the Sriharikota launch station on 14 July 2023, Godrej Aerospace also held a press meet pre-launch tour to their Mumbai facilities on 10 July 2023 to share its contribution to the country's space programme. The media tour was conducted at Godrej Aerospace's facility in Vikhroli Mumbai where Anil G.Verma, the CEO of Godrej & Boyce and Maneck Behramkamdin, AVP & Business head of Godrej Aerospace briefed about the organisation's roadmap aiming to further contribute in the aerospace sector of the country. The media tour was then followed by a visit to their state-of-the-art manufacturing facility spread over an area of 20,000 sqmts.





Vayu got an opportunity to get first-hand details about the company's contribution to providing critical components for space missions including the Chandrayaan lunar missions and upcoming Mangalyaan-II interplanetary mission. Furthermore, the company also informed about certain special projects in civil aviation for global majors and defence industry in India.

Godrej & Boyce also revealed its aim to invest 250 crores in Khalapur, Maharashtra to establish a state-of-the-art facility spread over 80,000 sqmt area for advanced manufacturing and integration processes. The new facility will be almost 4 times the current facility in Vikhroli.

Having an experience of 35+ years domestically and 15+ years globally

and GSLV launch, making noteworthy contributions to ISRO's strategic and technological progress, including the recent successful launch of the NVS-01 Satellite.

The company also talked about its major collaborations with Rolls-Royce, Boeing and General Electric to strengthen the growth of the civil aviation sector, both within India and for exports. Godrej and Boyce have also actively worked with the defence sector in India by manufacturing some of the most critical elements for indigenous Light Combat Aircraft and were, in fact, the first private company to manufacture DRDO engine modules of a particular class of engine. ➡

**Report by Pratish Chaudhry**

**Photos by Rishav**



***Happy faces of employees!***

in the aerospace sector, the company has perfected its skills in producing vital components for space endeavors since the 1980s, such as ground system antennae capable of operating in X and S-band, liquid propulsion engines with a thrust range of 10–100T, satellite thrusters in the domain of 10–800N, and under development 200T semi cryogenic engine. These valuable contributions have been instrumental in prestigious missions like Chandrayaan and Mangalyaan, bolstering India's position as a front runner in space exploration. The company's products have been consistently utilised in every PSLV

## Godrej Aerospace on Chandrayaan-3 mission by ISRO

“The launch of Chandrayaan-3 not only reflects India's dedication to space exploration but also underscores our nation's reputation as a leading force in the field. As an integral partner to ISRO, Godrej Aerospace is proud and honored to have played a vital role in the Chandrayaan-3 mission. The launch of Chandrayaan 3 reinforces our commitment to pushing the boundaries of technological innovation and strengthens our resolve to propel India's space exploration endeavors towards greater achievements and scientific breakthroughs. We take great pride in supplying hardware liquid propulsion engines like the



Vikas Engine, CE20 Engine, and satellite thrusters”, stated Mr. Maneck Behramkamdin, AVP & Business Head, Godrej Aerospace.

## Godrej Aerospace on India's civil aviation

Godrej Aerospace foresees a remarkable growth exceeding 100% in the Indian civil aviation segment within the next three years. The company's focus on innovation and exports in the Europe region is expected to fuel this exponential growth, solidifying its position as a key global player. Considering the growing opportunities in the civil aviation and space sector, Godrej Aerospace is actively capitalising on international market trends. The industry's upward trajectory, particularly the demand for single aisle aircraft and their engines, presents a favourable market environment. In FY23, Godrej Aerospace reported Euro 10 million revenue in the civil aviation segment.

The company has secured significant new orders, particularly in sheet metal brackets, complex fabrications, tubings and ducting, which will serve as the foundation for its growth trajectory. These orders present tremendous opportunities to expand its customer base and strengthen its foothold in the civil aviation sector internationally.

# A 40 Year Bond: GE's ties to India grow with new investments

**A**ero India 2023 was a showcase for a nearly 40 year partnership between GE and India's commercial and military aviation sectors, a relationship that had been significantly broadened and deepened by the end of the show. On the commercial side, Air India announced the biggest-ever purchase by an Indian airline of aircraft and jet engines, including 400 single-aisle and 70 twin-aisle planes powered by engines built by GE and CFM International, a 50-50 joint company between GE and Safran Aircraft Engines. The blockbuster deal, ranking near the top of all deals worldwide, signaled the recovery of

commercial aviation after years of Covid shutdown.

At the same time, GE executives also announced agreements that deepen the company's investment in India's military. One expands GE's most significant partnership within the Indian armed forces; its work with Hindustan Aeronautics Limited (HAL), the government's aerospace and defence manufacturing firm.

The relationship dates to 1986, when the companies collaborated on an engine for a prototype fighter. More than 30 years later, HAL continues to assemble the GE F404 family of engines that have powered each generation

of the Tejas, the light combat aircraft (LCA) that evolved from that project. In addition, HAL's Industrial and Marine Gas Turbine Division in Bengaluru has assembled and tested every GE LM2500 marine gas turbine destined for the Indian Navy. The aeroderivative engine has powered India's frigates since the 1980s.

Now the two companies are planning to broaden their collaboration. GE announced that it will partner with HAL to build and test a 4 megawatt gas generator, based on GE's LM500 engine, to power electrical systems on Indian naval vessels.



*LCA Tejas uses GE's F404*



“It was a natural choice to go with HAL,” stated Rahul Gadre, GE Aerospace’s sales director for military engines and systems. “HAL knows us; we know them. With HAL’s capabilities, we can get to work quickly.”

GE also announced that it has agreed to outfit the LM2500 engines on the INS Vikrant, the first Indian-designed-and-manufactured aircraft carrier, with a package of digital enhancements. Included is GE’s Smart Signal software, which alerts operators to equipment conditions that could cause engine damage. The LM2500’s internal sensors, which monitor load, temperature, pressure and other conditions, will send readings to an onshore “digital twin,” a virtual simulation of the engine. “Sitting at your desk, you’ll see exactly what is happening in the heart of the turbine,” Gadre said. Smart Signal’s predictive analytics technology can help naval officers address problems quickly, shortening downtime and lowering operational costs.

As GE and its partners celebrated their new projects, GE’s booth at Aero India showcased the company’s long history with the Indian aerospace industry. Some highlights: Working with the Aeronautical Development Agency (ADA), the Indian military’s research arm for aircraft development, GE developed a high-thrust variant of the F404 engine, called the IN20, to power the Indian Air Force’s current fleet of supersonic fighters. GE has supplied more than 60 F404 engines for the Tejas, with 99 IN20s on order. In addition, GE T700 turboshaft engines power attack helicopters across the Indian military made by Boeing and Sikorsky. “It’s been a mutually rich learning and rewarding experience collaborating with GE over the last 40 years,” stated Girish S. Deodhare, director general of the ADA. “They have been able to clearly understand India’s needs for indigenous fighter programmes.”

GE’s history in India also includes a commitment to Prime Minister Narendra Modi’s campaign to transform the nation into a global mass-production powerhouse, a campaign he calls “Make in India.” The initiative urges foreign companies to set up shop in India, something GE has a long head start on. “We’ve been making stuff in India for decades,” stated Youngje Kim, GE’s military sales lead for Asia. “And not only for India; we’ve been buying from Indian manufacturers and selling internationally.”

In fact, 13 Indian companies supply



*The GE Aerospace team at the Aero India show (from left): Dave Peddie, Harry Nahatis, Youngje Kim, Rahul Gadre, Satya Prakash, Shawn Warren and Amol Deshmukh.*

GE’s global aviation factories; other local facilities build GE products that are bound for customers closer to home. In addition to its collaboration with HAL – which will soon expand to include the manufacture and testing of a variant of the GE F414 engine to match customer specifications for the

next-generation Tejas fighter – GE has established a manufacturing facility in Pune, which produces aircraft engine parts, locomotive technology, wind turbines, and water treatment units for the nation’s military and industry. ➡

**Article by: Christine Gibson**

## GENx engine family surpasses 50 million flight hours

The GENx engine family has surpassed the 50 million flight hour mark in less than 12 years, the fastest rate ever for a commercial widebody engine. The GENx-1B, which powers the Boeing 787 Dreamliner family, has accumulated nearly 32 million hours since entering service in 2012. The GENx-2B has accumulated 18 million hours since entering service in 2011 on the Boeing 747-8. Combined, the GENx engine family is currently in service with more than 70 operators around the world and is averaging a total of over 450,000 flight hours monthly. It achieved the 50 million flight hours mark faster than GE’s other widebody engine lines. Representing a giant leap forward in propulsion technology, GENx uses lightweight durable materials and advanced design processes to reduce weight, improve performance, and lower maintenance.



# IN/ICG: Keel laying, launches and orders

## Launch of Y-12654 Mahendragiri

Mahendragiri, the seventh Stealth Frigate of Project 17A being built at MDL, was launched on 1 September 2023 at the shipyard. Project 17A Frigates are the follow-on class of the Project 17 (Shivalik Class) Frigates, with improved stealth features, advanced weapons and sensors and platform management systems. Seven Project 17A Frigates are under various stages of construction at MDL and GRSE. The design of advanced stealth frigates also showcases the prowess of the Warship Design Bureau, in designing technologically advanced warships for the Indian Navy. With the launch, the Nation's indigenous expertise and engineering capabilities receives a major boost, reducing India's dependence on foreign suppliers, promoting self-reliance and fostering a robust defence industrial base. Over 75% of the orders of Project 17A have been placed on indigenous firms including MSMEs.



## HSL in contract for 5 FSS for IN

Ministry of Defence, on 25 August 2023, signed a contract with Hindustan Shipyard Limited (HSL), Visakhapatnam for acquisition of five Fleet Support Ships (FSS) for the Indian Navy at an overall cost of approx Rs 19,000 crore. The FSS will be employed for replenishing ships at sea with fuel, water, ammunition and stores, enabling the Indian Naval Fleet to operate for prolonged periods without returning to

harbour. These ships would enhance the strategic reach and mobility of the Fleet and induction of these ships will significantly enhance the blue water capability of the Indian Navy. The ships can also be deployed for evacuation of people and human assistance and disaster relief (HADR) operations. The Fleet Support Ships of 44,000 tons will be the first of its kind to be built in India by an Indian Shipyard. This project will generate employment of nearly 168.8 lakh mandays over a period of eight years.

## GRSE launches its Neerakshi AUV

Kolkata based Defence PSU Garden Reach Shipbuilders and Engineers (GRSE) Ltd, launched an Autonomous Underwater Vehicle (AUV) on 28 July 2023. In a pioneering move towards the development of AUVs, GRSE has collaborated with Aerospace Engineering Private Ltd. (AEPL). The AUV was named Neerakshi (meaning Eyes in the Water).

The lightweight and man-portable AUV has been designed to operate in a totally autonomous manner and its modular design enables it to carry out a variety of roles depending on the payload. The 2.15m long AUV will have an endurance of nearly 4 hours and is capable of operating up to a depth of 300m. These AUVs once in operation by the Armed Forces, could play an important role in mine countermeasure operations and also make excellent reusable targets during Anti-Submarine Warfare (ASW) practices by warships.





## Launch of 2nd MCA Barge, Yard 76 (LSAM 8)

The second Missile Cum Ammunition (MCA) Barge, Yard 76 (LSAM 8) was launched by Cmde G Ravi, Warship Production Superintendent (Visakhapatnam) on 18 August 2023 at Guttenadevi, East Godavari, Andhra Pradesh (launch site of SECON Engineering Projects Pvt Ltd). Contract for construction of 8 x MCA Barge was concluded with SECON Engineering Projects Pvt Ltd, Visakhapatnam, a MSME, in consonance with “Aatmanirbhar Bharat” initiatives of the Government of India. This Barge is being built with a service life of 30 years.



## Delivery of 2nd ACTCM barge

Contract for construction and delivery of eleven ammunition barges was concluded with Suryadipta Projects Pvt Ltd, Thane and the 2nd Barge of the series LSAM 16 (Yard 126) was delivered to Indian Navy on 6 September 2023.

The Barge has been built under the classification rules of Indian Register of Shipping (IRS) with a service life of 30 years. With all major and auxiliary equipment/systems sourced from indigenous manufacturers, the Barge is proud flag bearer of “Make in India” initiatives of Ministry of Defence.



## Launch of DSC A 20 (Yard 325)

‘DSC A 20’ (Yard 325), the first ship of Five (5) Diving Support Craft (DSC) project being built by Titagarh Rail Systems Ltd (TRSL), Kolkata (formerly known as Titagarh Wagons Ltd (TWL)) for Indian Navy, was launched on 31 August 2023 at Titagarh, Kolkata (WB) onto Hooghly River. Contract for building five Diving Support Craft (DSC) was signed between MoD and Titagarh Wagons Ltd (TWL), Kolkata on 12 February 2021. These ships are designed to undertake operational/training diving operations in harbours and coastal waters. They are 30m long catamaran hull ships, with a displacement of approx 300 tons. All five DSC are anticipated to be delivered to Indian Navy in FY 2024–25.



## Keel laying of 4 Coast Guard FPVs

Goa Shipyard Limited witnessed the Keel Laying Ceremony of 4 Coast Guard FPVs and Inauguration of GSL Integrated Stores Complex on 25 August 2023. It has an overall Length of 51.43mtrs, Breadth is 8mtrs, Draft is 2.15mtrs and complement of 42 that includes 7 Officers and 35 Sailors. The ship is propelled with twin engine, with CPP arrangement with maximum speed of 27 Knots. It has endurance of 1500 Nautical Miles at Cruising speed (12–14 Knots) with 25% reserve fuel. Displacement of the vessel is approximately 320 tons. ➡





# Launch of 6th Project 17-A (Y-3024) frigate Vindhyagiri



on foreign suppliers, promoting self-reliance and fostering a robust defence industrial base. Over 75% of the orders of Project 17A, have been placed on indigenous firms including MSMEs, keeping in line with the Government's vision of 'AatmaNirbhar Bharat'. Economic development, employment generation, growth of MSMEs and ancillary industry in the country, are positive spin offs of the shipbuilding project.

During the event, the President of India conveyed her profound satisfaction and heartfelt appreciation for the remarkable achievements of the Warship Design Bureau and other Naval Teams, for fulfilling the nation's aspiration of self-reliance in warship building. She also lauded GRSE for its unwavering commitment and steadfast support to warship production. The shipyard effort, has significantly enabled the Indian Navy to successfully execute its ship induction plan and emerge as a formidable force in the Indian Ocean Region. ➡

**V**indhyagiri, the sixth Stealth Frigate of Project 17A being built at GRSE, was launched on 17 August 2023 at the shipyard by the President of India, Smt Droupadi Murmu. Mr. CV Ananda Bose, Governor of West Bengal, Ms Mamata Banerjee Chief Minister of West Bengal, Mr. Ajay Bhatt Raksha Rajya Mantri, Admiral R Hari Kumar, Chief of Naval Staff, other senior officers from the Indian Navy and MoD, were amongst the several dignitaries who attended the launch ceremony.

GRSE has established itself as a reliable partner of the Indian Navy, with a record of multiple successful conventional launches in the past. Vindhyagiri's launch is yet another milestone in the illustrious journey of the Shipyard, reflecting its commitment to deliver quality warships. Following the launch, 'Vindhyagiri' will join its two sister ships at the Outfitting Jetty at GRSE, to progress remaining activities and equipment trials, in the run up to their delivery and commissioning.

Project 17A Frigates are the follow-on class of the Project 17 (Shivalik Class) Frigates, with improved stealth features, advanced weapons and sensors and platform management systems. Seven Project 17A Frigates are under

various stages of construction at MDL and GRSE. The design of Advanced Stealth Frigates also showcases the prowess of the Warship Design Bureau, in designing technologically advanced warships for the Indian Navy. With the launch, the Nation's indigenous expertise and engineering capabilities receives a major boost, reducing India's dependence





# ISRO's Chandrayaan-3 mission a success



**C**handrayaan-3 is the third Indian lunar exploration mission under the Indian Space Research Organisation's (ISRO) Chandrayaan programme. It consists of a lander named Vikram and a rover named Pragyan, similar to those of the Chandrayaan-2 mission. The propulsion module carried the lander and rover configuration to lunar orbit in preparation for a powered descent by the lander.

Chandrayaan-3 was launched on 14 July 2023 with the mission objectives of getting the lander to land safely and softly on the surface of the Moon, observing and demonstrating the rover's driving capabilities on the Moon, and then conducting and observing experiments on the materials available on the lunar surface to better understand the composition of the Moon. The spacecraft entered lunar orbit on 5 August, and the lander touched down in the lunar South Pole region on 23 August 2023 at 12:32 UTC, making India the fourth country to successfully land on the lunar surface, and the first to do so near the lunar South Pole.

The lunar South Pole region holds particular interest for scientific exploration due to studies that show large amounts of ice there. Mountainous terrain and unpredictable lighting conditions not only protect the ice from melting but also make landing scientific probes there a challenging undertaking. This ice could contain solid state compounds that would normally melt under warmer conditions elsewhere on the Moon, compounds which could provide insight into lunar, Earth and Solar System history. Ice could also be used as a source of drinking water and hydrogen for fuel and oxygen for future crewed missions and outposts.

The European Space Tracking network (ESTRACK), operated by the European Space Agency (ESA), and Deep Space Network operated by Jet Propulsion Laboratory (JPL) of NASA are supporting the mission. For the Chandrayaan-3 mission, ESA is coordinating routine support from its Kourou station in French Guiana and from Goonhilly Earth Station Ltd in the UK. These stations compliment support from NASA's Deep Space Network and ISRO's own stations. ESA's 35-metre antenna in New Norcia, Australia, provided additional tracking support during the lunar landing, serving as a backup for ISRO's own ground station. New Norcia received the stream of vital signs from the Chandrayaan-3 lander, information about its health, location and trajectory, in parallel with the ISRO station. This type of back-up support is common during key moments of a space mission such as a landing.

It was this stream of telemetry that was ultimately used to confirm the success of the landing. Under a new cross-support arrangement, ESA

tracking support could be provided for upcoming ISRO missions such as those of India's first human spaceflight programme, Gaganyaan, and the Aditya-L1 solar research mission. In return, future ESA missions will receive similar support from ISRO's own tracking stations.

Chandrayaan-3 comprises three main components: a propulsion module, lander, and rover. The 2,148 kg propulsion module carries the lander and rover configuration to a 100 kilometres lunar orbit. It is a box-like structure with a large solar panel mounted on one side and a cylindrical mounting structure for the lander (the Intermodular Adapter Cone) on top. The propulsion module carries Spectro-polarimetry of Habitable Planet Earth (SHAPE) to study spectral and polarimetric measurements of Earth from the lunar orbit in the Near Infrared (NIR) wavelength range (1–1.7  $\mu\text{m}$  [ $3.9 \times 10^{-5}$ – $6.7 \times 10^{-5}$  in]).

The 1,752kg Vikram lander is programmed for the soft landing on the Moon. It is also box-shaped, with four

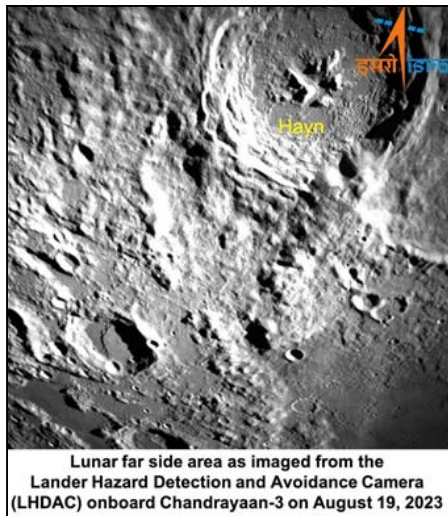


landing legs and four landing thrusters capable of producing 800-Newtons of thrust each. It carries the rover and various scientific instruments to perform on-site analysis. The lander for Chandrayaan-3 has four variable-thrust engines with slew rate changing capabilities, unlike Chandrayaan-2's lander, which had five, with the fifth one being centrally mounted and capable only of fixed thrust.

The 26 kg Pragyan rover is a six-wheeled vehicle with a mass of 26 kgs. It is 917 millimetres x 750 millimetres x 397 millimetres in size. The rover has undertaken multiple measurements to support research into the composition of the lunar surface, the presence of water ice in the lunar soil, the history of lunar impacts, and the evolution of the Moon's atmosphere. Payloads include an Alpha Particle X-ray Spectrometer (APXS) to determine the elemental composition (Mg, Al, Si, K, Ca, Ti, Fe) of lunar soil and rocks around the lunar landing site, and Laser Induced Breakdown Spectroscopy (LIBS) to derive the chemical composition and infer the mineralogical composition of the lunar surface.

Chandrayaan-3 was launched aboard an LVM3-M4 rocket on 14 July 2023, at 09:05 UTC from Satish Dhawan Space Centre Second Launch Pad in Sriharikota, Andhra Pradesh, India, entering an Earth parking orbit with a perigee of 170-km and an apogee of 36,500-km.

After a series of earth bound manoeuvres that placed Chandrayaan-3 in a trans-lunar injection orbit, ISRO performed a Lunar-Orbit Insertion (LOI) on 5 August, successfully placing the Chandrayaan-3 spacecraft into an orbit around the Moon. The LOI operation was carried out from the



**Portion of the Chandrayaan-3's landing site taken after**

ISRO Telemetry, Tracking & Command Network (ISTRAC) in Bengaluru. On 17 August, the Vikram lander separated from the propulsion module to begin the last phase of the mission.

Since reaching the moon's South Pole, Chandrayaan-3 deployed the Pragyan rover to explore the cratered surface, harnessed integrated cameras to send back videos of its environment, and even started working on the research objectives planned. The first video of the rover, posted on 25 August 2023, showed it leaving the Vikram

lander on a ramp and driving onto the Moon. ISRO posted the video in a thread on X that also included footage from the lander approaching its landing site and kicking up dust as it touched down on the surface. ISRO wrote afterwards that the rover's two scientific instruments had been turned on and that it had moved eight meters. On 26 August, ISRO posted a new video, shot from the lander, of the rover's drive away, moving almost out of the lander's sight. On 27 August, it published two pictures after



the rover encountered a large crater positioned 3 metres ahead of its location. However, the rover safely headed on a new path afterwards.

ISRO also released a first-of-its-kind data from the observations made by ChaSTE (Chandra's Surface Thermophysical Experiment), one of the four instruments present on the lander module. ChaSTE was meant to study the heat conductivity of the Moon's surface and measure the differences in temperatures at different points on and below the surface, with the overall objective of creating a thermal profile of the Moon.



The first set of data released by ISRO showed a very sharp difference in temperatures just above and below the surface of the Moon. A graphical plot put out by ISRO showed that while temperatures on the surface were over 50C (122F), they dropped to nearly -10C (14F) just a few millimetres below the surface. The measurements suggested that the topsoil of the lunar surface did not conduct heat very well, and insulated the sub-surface from heat.

On 29 August, ISRO said that the Laser-Induced Breakdown Spectroscopy (LIBS) instrument onboard the Pragyan rover has “unambiguously” confirmed the presence of sulphur in the lunar surface near south pole. The presence of sulphur on the Moon has been known before; however, it was detected for the first time at the South Pole.

Prime Minister Narendra Modi announced that the touchdown point of the Vikram lander would henceforth be known as Shiv Shakti point. He further declared 23 August, the day the Vikram lander landed on the moon, as National Space Day. 🚀

Article by Sayan Majumdar  
All photos: ISRO

## ISRO's PSLV-C57 and Aditya L1

On 2 September 2023, ISRO confirmed the launch of Aditya L1 by PSLV-C57 as successful with the satellite placed precisely into its intended orbit. With this, India's first solar observatory has begun its journey to the destination of Sun-Earth L1 point. Aditya L1 is the first space-based Indian mission to study the Sun. Through various orbit raising manoeuvres and the cruise phase over about the next four months, the spacecraft shall be placed in a halo orbit around the Lagrange point 1 (L1) of the Sun-Earth system, which is about 1.5 million km from the Earth. A satellite placed in the halo orbit around the L1 point has the major advantage of continuously viewing the Sun without any occultation/eclipses. This will provide a greater advantage of observing the solar activities and its effect on space weather in real time.

The spacecraft carries seven payloads to observe the photosphere, chromosphere and the outermost layers of the Sun (the corona) using electromagnetic and particle and magnetic field detectors. Using the special vantage point L1, four payloads directly view the Sun and the remaining three payloads carry out in-situ studies of particles and fields at the Lagrange point L1, thus providing important scientific studies of the propagatory effect of solar dynamics in the interplanetary medium.

The Aditya L1 Mission is expected to provide the most crucial information to understand the problem of coronal heating, coronal mass ejection, pre-flare and flare activities and their characteristics, dynamics of space weather, propagation of particles and fields etc.

Text: Sayan Majumdar

Photos: ISRO







# Exercises and visits

## Explosive ordnance disposal Exercise SALVEX

The Seventh edition of Indian Navy/US Navy Salvage and Explosive Ordnance Disposal (EOD) exercise, SALVEX was conducted from 26 June to 6 July 2023 at Kochi. IN and USN have been participating in joint Salvage and EOD exercises since 2005. The exercise saw participation from both the navies which included the ships INS Nireekshak and USNS Salvor in addition to Specialist Diving and EOD teams. Spanning over 10 days, the Diving teams of both the countries shared experiences on Maritime Salvage and trained together in various facets of EOD Operations on land as well at sea. SALVEX also saw conduct of joint training exercises towards enhancing interoperability, cohesiveness and gaining from best practices mutually in Maritime Salvage and EOD operations.



## Japan India JIMEX 23

The seventh edition of the bilateral Japan-India Maritime Exercise 2023 (JIMEX 23) hosted by the Indian Navy, was conducted at/off Visakhapatnam from 5 to 10 July 2023. This edition marked the 11th anniversary of JIMEX, since its inception in 2012. Japan Maritime Self Defence Force (JMSDF) units under the command of RAdm Nishiyama Takahiro, Commander Escort Flotilla One, and Indian Naval ships under the command of RAdm Gurcharan Singh, Flag Officer Commanding Eastern Fleet participated in the exercise.



JIMEX 23 witnessed participation of INS Delhi, India's first indigenously built guided missile destroyer, INS Kamorta, an indigenously designed and built anti-submarine warfare corvette, fleet tanker INS Shakti, a submarine, maritime patrol aircraft P8I and Dornier, ship-borne helicopters and fighter aircraft. JMSDF was represented by the guided missile destroyer JS Samidare and its integral helicopters.

## Ex Op Southern Readiness

INS Sunayna was at Seychelles from 10 to 12 July 2023 to participate in Op Southern Readiness 2023 conducted by Combined Maritime Forces (CMF). The visit was aimed at strengthening multilateral ties and enhancing cooperation through CMF exercise which is a multinational initiative aimed at enhancing maritime security, countering piracy to ensure safety and freedom of navigation in the region.





## IAF at Bastille Day, France

A flying contingent of four Rafale fighters, two C-17 Globemasters and 72 IAF personnel departed for France on 7 July 2023. The fly past and marching by the IAF air warriors on Bastille Day follows a long association that the two nations share, especially in the field of the air power. The professional ties between the two Air Forces have also been strengthened during flying exercises like Ex Desert Knight, Garuda and Orion. The IAF's Rafale aircraft, flying wings to wings with the FASE, is reflective of this strategic friendship spanning decades that continues to mature, both, on ground, as well as in air.



## India–Mongolia Nomadic Elephant 2023

Indian Army contingent comprising of 43 personnel left for Mongolia on 16 July 2023. The contingent participated in the 15th edition of bilateral joint military exercise Nomadic Elephant-23 and the exercise was conducted at Ulaanbaatar, Mongolia from 17 to 31 July 2023. Exercise Nomadic Elephant is an annual training event with Mongolia which is conducted alternatively in Mongolia and India, the last edition was held at Special Forces Training School, Bakloh in October 2019.





## Indian Navy ships at Jakarta, Indonesia

Two frontline Indian Naval ships INS Sahyadri and INS Kolkata, mission deployed in South Eastern IOR, arrived in Jakarta on 17 July 2023. The ships were accorded a warm welcome by the Indonesian Navy. During the port call, personnel from Indian and Indonesian navies engaged in a wide range of professional interactions, joint yoga sessions, sports fixtures and cross-deck visits, aimed at strengthening mutual cooperation and understanding between the two navies.



## Visit to Oman

Adm R Hari Kumar, Chief of the Naval Staff, was on a three day official visit to the Sultanate of Oman from 31 July to 2 August 2023. The visit aimed to consolidate existing bilateral defence relations and high level discussions with military leadership of the Sultanate of Oman. Coinciding with the visit, Indian Navy's indigenously designed and constructed Guided Missile Destroyer INS Visakhapatnam arrived at Port Sultan Qaboos, Muscat on 30 July 2023 for a three day port call, during which various naval cooperation events were scheduled with the Royal Navy of Oman.



## INS Khanjar at Trincomalee, SL

Indian Naval Ship Khanjar, mission deployed in the Southern IOR, arrived at Trincomalee, Sri Lanka for an operational turn around on 29 July 2023. The ship was accorded a customary welcome by the Sri Lanka Navy. INS Khanjar is the fourth ship of the indigenously designed and built Khukri class missile corvettes. Built by GRSE, Kolkata, the ship is armed with an array of modern weapons and sensors. The ship is a part of the Indian Navy's Eastern Fleet and is commanded by Cdr NVSP Kumar.



## Indian Navy ships at Port Moresby, Papua New Guinea

Indian Naval Ships Sahyadri and Kolkata, mission deployed in the Eastern IOR, arrived at Port Moresby on 2 August 2023, for enhancing maritime partnership and cooperation with Papua New Guinea.





## Visit of Indian ships to Port Rashid, Dubai

Indian Navy's frontline platforms INS Visakhapatnam and INS Trikand under the Command of RAdm Vineet Mc Carty, Flag Officer Commanding Western Fleet, visited port Rashid, Dubai from 8 to 11 August 2023. INS Visakhapatnam and INS Trikand are commanded by Captain Ashok Rao and Captain Pramod G Thomas respectively. During the visit, the ships undertook professional interactions with UAE Naval Force on various elements of maritime operations and share best practices aimed at enhancing cooperation and strengthening ties between the two navies.



## Exercise Malabar 2023 concludes

The 27th edition of Exercise MALABAR, concluded on the East Coast of Australia off Sydney on 21 August 2023. The exercise saw participation of ships, submarines and aircraft from the Indian Navy (IN), Royal Australian Navy (RAN), Japan Maritime Self Defence Force (JMSDF) and the US Navy (USN). Exercise MALABAR 23 was conducted in two

phases, which included a harbour phase from 11–15 August 2023 and a sea phase from 16–21 August 2023.

The Indian Navy was represented by indigenously built destroyer INS Kolkata, frigate INS Sahyadri and P8I maritime patrol aircraft. Other participating units included RAN ships HMAS Choules and HMAS Brisbane, USS Raphael Peralta, JS Shiranui, along with submarines, fighter aircraft, maritime patrol aircraft and shipborne helicopters. While the ships sailed out for the sea phase from Sydney harbour, the air assets operated from RAAF Amberley Brisbane.



## Indian Army exercises

Armoured and Mechanised troops of Airawat Division carried out Integrated Training Manoeuvres with attack helicopters on 16 August 2023. Additionally, Pine Warriors "demonstrated indomitable spirit, extreme endurance and professionalism in heliborne insertion to strike deep in enemy territory".



## INS Vagirat Fremantle, Australia

INS Vagir, an Indian Navy (IN) submarine, is on an extended-range deployment. The deployment commenced in June 2023 and Vagir reached Fremantle, Australia on 20 August 2023. The submarine, which is the Indian Navy's fifth Kalvari class submarine, was commissioned into the Indian Navy in January 2023 and is based in Mumbai. During her stay in Australia, INS Vagir participated in various exercises with Royal Australian Navy (RAN) units on the West Coast of Australia.



## INS Sunayna at Durban, South Africa

INS Sunayna entered port of Durban, South Africa on 21 August 2023. The ship undertook passage exercise with South African Navy Ship SAS King Sekhukhune I off Durban. Post exchange of pleasantries at sea, the ship entered Durban harbour. The ship was received by Cdr Kenneth Singh officiating Flag Officer Commanding Naval Base Durban and HCI Pretoria Officials.





## 5th edition of AUSINDEX–23 at Sydney

5th edition of biennial AUSINDEX maritime exercise between Indian Navy and Royal Australian Navy (RAN) was conducted from 22–25 August 23 at Sydney, Australia. INS Sahyadri and INS Kolkata participated in the exercise along with HMAS Choules and HMAS Brisbane from RAN. Besides ships and their integral helicopters, the exercise also witnessed participation of fighter aircraft and maritime patrol aircraft.



## Indian Army at Ex Bright Star, Egypt

Indian Army contingent comprising of 137 personnel also departed for Exercise Bright Star along with the IAF. This is a multinational tri-services joint military exercise that was led by US CENTCOM and Egyptian Army. It was initially conceptualised as a bilateral biennial training exercise between the US and Egypt during the Camp David Accord of 1977. The first edition of the Exercise was conducted in the year 1980 in Egypt. From 1995 onwards the Exercise was expanded for participation by other nations. The previous Exercise Bright Star was conducted in the year 2021 wherein forces of 21 countries had participated. This year 34 countries participated. The Indian Army was represented by a contingent from 23 Jat Battalion.



## IAF in Ex Bright Star at Cairo, Egypt

An Indian Air Force (IAF) contingent departed on 27 August 2023, for participating in Exercise Bright Star a biennial multilateral tri-service exercise which was held at Cairo (West) Air Base, Egypt from 27 August to 16 September 2023. This is for the first time that IAF is participating in Ex Bright Star which will also saw participation of contingents from the United States of America, Saudi Arabia, Greece and Qatar. The Indian Air Force contingent consisted of five MiG–29, two IL–78, two C–130 and two C–17 aircraft. Personnel from the IAF's Garud Special Forces, as well as those from the Numbers 28, 77, 78 and 81 Squadrons participated in the exercise.



**Air Marshal (Retd) Anil Chopra writes on**

# Make In India Fighter Contenders and Options

The Indian Air Force (IAF) has a sanctioned strength of 42 fighter squadrons. However, the service is down to 31 squadrons currently. The IAF had anticipated the phaseout of the MiG 21, 23 and 27 squadrons well in time and had moved the case for 126 fighter aircraft as early as 2001. The Medium Multi-Role Combat Aircraft (MMRCA) purchase tender for 126 aircraft was floated in 2008 to fill the gap between the still to be inducted Light Combat Aircraft (LCA) and the in service Sukhoi Su-30MKI air superiority fighter.

The contest was between six fighter aircraft, Boeing F/A-18E/F Super Hornet, Dassault Rafale, Eurofighter Typhoon, Lockheed Martin F-16, Mikoyan MiG-35 and Saab JAS 39 Gripen. After an intensive technical evaluation, by April 2011, the bidders were reduced to two fighters—Eurofighter Typhoon and Dassault Rafale. On 31 January 2012, it was announced that Dassault Rafale had won the competition due to its lower life-cycle cost (LCC). However, the deal stalled due to disagreements over production in India. As negotiations stalled, a government to government (G2G) contract was signed on 23 September 2016 for 36 Rafale aircraft to be bought in flyaway condition. The €7.8 billion deal included certain India specific modifications and ground infrastructure and technical support requirements. All 36 aircraft arrived in India as per plan in 2022.

The delays in indigenous LCA resulted in IAF squadrons continuing to reduce. Despite IAF committing to 40 LCA Mk.1 and 83 LCA Mk.1A and having given tacit approval for LCA Mk.II, the inductions remained slow. IAF also fully backs the indigenous Advanced Medium Combat Aircraft (AMCA). Meanwhile, the LCA Mk.II will be using the GEF414 engine. The same may also go in the initial AMCA. India and the United States are in conversation about manufacturing the F414 in India.

## Multi-Role Fighter Aircraft RFI

The IAF needed to acquire 114 MRFA (Multi-Role Fighter Aircraft) and

the Request for Information (RFI) was issued in April 2018. The Indian Navy's deck-based fighter requirement was to be viewed in conjunction. Eight aircraft are in the competition. These are the Boeing F/A-18E/F Super Hornet, Boeing F-15EX Eagle II, Dassault Rafale, Eurofighter Typhoon, Lockheed Martin F-21 (A F-16V variant with India-specific customisation), Mikoyan MiG-35, Saab JAS-39 Gripen E/F and Sukhoi Su-35. At least six of these were in the MMRCA competition, but most aircraft have seen significant upgrades since they were evaluated last around 2010-11. The Request for Proposal (RFP) has still to be issued. There are complexities related to the level of Transfer of Technology (ToT) and Make in India quantum and phases and the proposal to link aeroengine transfer of technology to this deal.

IAF Chiefs have been insisting that any aircraft that India purchases should be able to match those of adversaries. The People's Liberation Army Air Force (PLAAF) is pulling ahead in both numbers and quality. They have inducted nearly 150 fifth-generation J-20 aircraft.

## Boeing F/A-18IN

This twin-engine multirole fighter first flew in 1978 as Hornet and is operated by US Marines and US Navy, Royal Australian and Spanish Air Forces among others. The Hornet and Super Hornet have successfully taken part in the Gulf and Middle East wars. The Super Hornet has a new larger airframe and has seen extensive avionics upgrades. The aircraft is powered by two General Electric F414-400 turbofans. The variant likely to be offered will be customised for India and called F/A-18IN, and have a modern AESA radar. Boeing and Tata's joint venture, the Tata Boeing Aerospace Limited (TBAL) facility at Hyderabad, supports India as a global exporter of aerospace. The 14,000 square meter facility makes aero-structures of Boeing's AH-64 Apache helicopter for customers worldwide. Over 150 Apache fuselage have been delivered. Boeing also announced a new production line for vertical fin structures for the Boeing 737



family. This is the first time the Super Hornet is being offered for production in a foreign country.

## Boeing F-15EX Eagle II

The Boeing F-15EX Eagle II is an advanced two-seat variant of the F-15E Strike Eagle and made its maiden flight in February 2021. Improvements included the Advanced Missile and Bomb Ejector Rack (AMBER) system to carry up to 16 air to air missiles, Active Electronically Scanned Array (AESA) radar, infrared search and track, advanced avionics, electronic warfare (EW) equipment, conformal tanks and revised structure with a service life of 20,000 hours. The USAF went ahead with these to maintain fleet size as F-22 production ended. The USAF has ordered around 80 aircraft. The Israeli Air Force ordered 25 F-15IA fighters and plans to upgrade 25 F-15Is to the F-15IA standard. The aircraft has a max take off weight of 36.7 tons, similar in class to Sukhoi Su-30MKI at 38.8 tons.





## Dassault Rafale

After a gruelling selection process, the omnirole Rafale came out a winner. It has been operationally tested in Iraq, Afghanistan, Libya and Mali. The fleet is fully operational in IAF. India has infrastructure for two airbases. Also, India has paid for one-time India-specific enhancements. The F4 is the latest variant with radar and sensor upgrades that facilitate the detection of airborne stealth targets at long range and improved communications equipment for more effective network-centric warfare. It is not clear what variant will be on offer. In view of IAF's depleting numbers, albeit expensive, one school of thought has been to order additional Rafales.



## Eurofighter Typhoon

The Eurofighter Typhoon is a twin-engine, canard-delta wing multirole fighter manufactured by a consortium of Airbus, BAE Systems and Leonardo formed in 1986. The aircraft entered operational service in 2003 and around 600 have been built to date and flown by 10 air forces. The fighter is powered by two Eurojet EJ200 engines. It is an agile fighter that has seen operations in Libya. Eurofighter was one of the two aircraft shortlisted after a technical evaluation during the MMCA competition along with Rafale but lost out on commercial bid. Though a consortium, India would



have to have a lead partner to enter into a contract. The upgrades of the aircraft include MBDA Meteor, Storm Shadow and Brimstone integration. There are upgrades to the AESA radar and electronic suite.

## Lockheed Martin F-21

This single engine air superiority, multirole fighter aircraft first flew in 1974 and has since been operated by 26 countries. It has been repeatedly upgraded, including changes to the airframe. The aircraft today has latest technologies and modularity makes it easily further upgradable. The F-21 would be an India-specific Block 70 variant. The aircraft will feature Northrop Grumman's advanced APG-

83 AESA radar and enhanced battlespace awareness avionics. On offer are also many weapons including the latest versions of the AIM-120 Advanced Medium Range Air to Air Missile (AMRAAM).

The structural life of the aircraft has been extended to see it flying till 2040. Operational capabilities are enhanced through an advanced datalink, targeting pod and weapons; precision Global Positioning System (GPS) navigation and the Automatic Ground Collision Avoidance System (Auto GCAS). At one stage, the offer was to shift the entire F-16 manufacturing line to India and make India the global supply chain hub. With 2250 F-16s still flying in 26 countries, it would mean a very significant move. Lockheed Martin has a joint venture company with Tata Advanced Systems Limited (TASL) which has proven expertise through the manufacture of airframe components for the C-130J airlifter and the S-92 helicopter. Lockheed Martin and Tata would produce the F-21 "in India, for India".



## Mikoyan MiG-35

The Mikoyan MiG-35 is a Russian multi-role fighter which is essentially a further development of the MiG-29M2 and was first presented internationally during Aero India 2007. The single-seat version is designated MiG-35, while the two seat version is called MiG-35D. The fighter has improved avionics and weapon systems, including a new AESA radar, and precision-guided targeting capability. With IAF having already upgraded the MiG-29s, India has already partially imbibed the technologies.



## Saab Gripen JAS 39 E/F NG

JAS 39 Gripen first flew in December 1988. The 250 Gripen aircraft built are flying in Sweden, Czech Republic, Hungary, Brazil, South Africa and Thailand. The aircraft has been sourced roughly 67 percent from Swedish or European suppliers and 33 percent from the US. One plus point is that all operators have access to Gripen's source code and technical documentation, allowing for upgrades and new equipment to be independently integrated. The next Generation (NG) version on offer to India can be with a more powerful power plant, new avionics and AESA radar. An EW version of the Gripen F two-seater is under development. The Swedish Armed Forces plan to maintain 100 C/D-model aircraft until 2042. The first Gripen E was rolled out on 18 May 2016. Saab proposed a significant transfer of technology to make India 'an independent manufacturer' of fighter jets. A proposal has the backing of the Swedish government.



## Sukhoi Su-35

The Sukhoi Su-35 is yet another upgrade of the Su-27 air defence fighter family. It is a single seat, twin engine, super maneuverable, multirole aircraft. The two seater version resembles the Su-30MK family. The Su-35 has a redesigned cockpit and weapons control system and features thrust vectoring engines and no canards. The type made its first flight in February 2008. It is currently operated by the Russian Air Force and People's Liberation Army Air Force (PLAAF).



## LCA Tejas and AMCA status

IAF currently has around 35 LCA Mk.1. Eighty-three LCA Mk.1A deliveries would begin in 2024 and be completed in 2029. The LCA Mk2's first flight is planned for around 2024. The aircraft will require significant testing. The operational deliveries may begin around 2029. IAF's fifth generation aircraft the AMCA may make its first flight around 2026-27. At the earliest, it can be inducted only around 2032. AMCA would require some foreign technological support, some of which can be factored into the new fighter selection package.



## Multiple Fleets – Multiple Countries

While the trend worldwide is to have limited fleet types, IAF continues to be mired by a multiplicity of fighter fleets with Jaguar, Mirage 2000, Su-30, MiG-21/29, LCA and Rafale. Adding more types would mean a continued logistics nightmare. Larger fleets can amortise costs and can maintain decent spare backups. Nearly 65 percent of the IAF continues to be of Russian origin. This dependency on a single country has to reduce. This has become clearer after the Ukraine conflict. Ideally in 20 years, India must target a percentage mix of 40 Indian, 30 Western and 30 Russian.

## Options India

The necessity of 114 additional fighters is definitive. The starting point is issuing the RFP. Once the RFP responses are received, the chances are that many if not most will meet the technical specifications. The extent of evaluation would have to be decided to save time. The commercial consideration and level of technology transfer on offer would decide the ultimate winner. Chances are that the single engine aircraft may be cheaper.

There is a continued decision conflict about light versus heavy fighters. Light aircraft are relatively simple with only essential features and lower cost. Intentional simplicity also allows buying larger numbers to outnumber the enemy in the air under combat conditions. Larger fighters provide the opportunity for more technology, longer range radars and heavier weapons. However, they are relatively expensive. IAF has to maintain a balance. The LCA would bring in lighter fighter numbers.

Any deal for the new fighter would have to have in-built in the contract maximum technology transfer and support for India's LCA, AMCA, AESA radar and aircraft engine programmes. Swedish Saab Gripen JAS-39 is the more recent aircraft with fairly modern technologies. Being an overall smaller political player for India it will be easier to get a good deal from Saab. They are willing to share the source code.

F-18 is a twin engine aircraft and its airframe has recently been redesigned. Boeing has significant presence in the country. F-16 is a single-engine aircraft and has the largest fleet in the world, many of which will be flying well past 2035. India can get huge businesses worldwide for maintenance and overhaul. With the MiG-29 upgrade, some of the technologies have already been imbibed from the MiG-35. Earlier the Eurofighter had lost out to Rafale on the commercial bid. New commercial bids would have to be seen. Rafale also has the advantage of a naval variant being selected—thus the advantage of numbers.

All these aircraft have been extensively evaluated during MMRCA selection; as such only the newer subsystems require a look. Despite much refined DPP-2020, amended in 2022, the only contracts that seem to have gone through have all been G2G deals. All deals with the Soviet Union and Russia in the past were G2G. Also, Americans (P-8I, C-17, C-130, Apache, Chinook and others) and French (Rafale) deals were G2G, too. G2G deals save time and price discovery is inbuilt. A G2G approach would be the best for the selected fighter for both cost and time savings. Considering the urgency involved, an early decision is operationally most critical. ➡

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**Lt Gen Kamal Davar's analysis on**

# **What IAF needs to transform into to develop as an aerospace power**



**F**or the Indian Air Force to truly live up to its motto of “Touching the Skies with Glory”, some critical transformational imperatives are needed. While the IAF is sincerely trying to move from air power to being an aerospace power, these imperatives have to be implemented with vision and alacrity. Faced with China’s rapidly growing military assertiveness and its unbridled ambitions, supplanted by a traditionally hostile Pakistan, the challenge to the IAF by both nations, individually and collusively, in the aerospace domain are indeed formidable. Aerospace is unquestionably the domain of the future.

To successfully confront a two-front threat, the IAF needs a frugal 42 fighter squadron strength, if not more. Successive Air Chiefs have publicly lamented that they are down to a strength of 31–32 squadrons, which is woefully inadequate to meet the emerging challenges from the Chinese PLAAF (Chinese People’s Liberation Army Air Force) and the Pakistan Air Force (PAF). India’s strategic area of interest spans the entire region from the Malacca Strait to Strait of Hormuz, where China is gradually expanding its naval footprint.

The Chinese, in recent years are threatening our territorial integrity in Arunachal Pradesh, in areas adjoining Bhutan and Sikkim, in the central sector and in the eastern Ladakh region. They are also endeavouring to link the Xinjiang region in western China with Gwadar port in Pakistan, near the Strait of Hormuz via the overly ambitious China–Pakistan Economic Corridor.

Meanwhile, Pakistan retains the ability to indulge in terrorist activities or provoke incidents, especially along the Line of Control in J&K.

Importantly, Pakistan has also enunciated a “first-use” nuclear option against India, that cannot be taken lightly. Meanwhile, the vast Indo-Pacific region is emerging as a major arena for military and economic contestation between the United States and China, where India will have a vital role to play, and apart from its maritime muscle, India’s air power will come into reckoning in furtherance of its strategic interests.

The global geopolitical trajectory in recent years has shown an intense competition between the US and China. The US desires a “unipolar world but a bipolar Asia”, whereas China is striving for a “bipolar world but a unipolar Asia”. Invariably, India is a principal player in this rivalry. India therefore has to ensure that its overall military preparedness at the desired levels is ensured across the entire spectrum of warfare, including in its air power. Also, it is well-known that aerospace systems comprising manned aircraft, micro-satellites, diverse forms of spacecraft, unmanned aerial vehicles and ballistic and cruise missiles are evolving at a rapid pace.



Technology applying stealth, Artificial Intelligence, hypersonic aerial systems, direct energy weapons, improving genres of platforms assuming very long range and lethal, accurate, non-detectable dimensions which any modern military would like to induct in its arsenals. China's advances in its aerospace capabilities is mind-boggling.

All governments are aware that the primacy, flexibility in and the speed of unleashing one's air power, whenever faced with a conflict or emergency situation, cannot be substituted. Barring nuclear exchanges, the effective employment of air power has become not only the dominant form of military power projection but in the restoration of an adverse situation for any country.

The IAF's retaliation at Balakot immediately after Pakistan's terror strike in Pulwama in February 2019 did send an appropriate message to Pakistan, besides scoffing at their propaganda of nuclear retaliation. The IAF, a battle-hardened force, is gradually transforming itself from being a continental air power to one with a global reach.

variety of reconnaissance and armed drones while also assisting Pakistan in this field. Nevertheless, the US Air Force still remains miles ahead, both in overall capabilities and numbers of its modern aircraft like the F-22 Raptor/F-35A/ B-21 Raider (under induction). However, the race between these two nations is bound to get sharper by the day.

For India, faced with a formidable challenge from China, the yawning gap between the PLAAF and IAF needs to be bridged swiftly. The indigenisation in defence production is sine qua non to accord requisite numbers to the IAF, yet additional budgetary support for the acquisition of ultra-modern platforms from abroad is also essential. Prime Minister Narendra Modi's recent visits to the United States and France are a step in this direction and hopefully the nations we are purchasing equipment from will readily agree to the transfer of technologies like manufacture of engines and critical avionics.

The IAF, besides getting requisite numbers of 4.5/5th generation aircraft, have to make up their minds for selection,

then leave their clinically professional recommendations to the government to follow up.



The PLAAF has been working feverishly to augment its air power and aerospace capabilities, besides mentoring the PAF too. Currently enabling its fifth-generation fighter, the stealth capable Chengdu J-20, it is also developing the H-20 stealth bomber and the more modern J-31, besides a Chinese hybrid space plane and a variety of platforms. China, often dubbed as the "Walmart of UAVs", is producing a fair

ensuring cost-effectiveness, of the most suitable aircraft- to choose from either the F-35A/Rafale/F-15/Gripen/F-22/ Russia's Su-35 or Su-57. Our own Light Combat Aircraft, Tejas, may be a stopgap arrangement but is being also steadily improved which augurs well. The IAF's planners should be absolutely clear on their specific requirements for the impending Advanced Medium Combat Aircraft (AMCA) project, and

As is well known, Comprehensive National Power and its multiple military constituents takes inordinately long to fructify. Thus, it will only be prudent for the nation to accord the necessary budgetary support and prioritisation in defence acquisitions to the IAF for enhancing its overall air power capabilities. ➡



*The author of this article, Lt Gen Kamal Davar in the photo above. All photos: Vayu*



# Air Marshal (Retd) Anil Chopra writes on Multiple Origin Fleets and Complexities for IAF; Time to Rationalise



## Current fighter fleet of IAF

The Sepecat Jaguar, the Anglo-French deep strike ground attack aircraft was ordered in 1978, and 120 were built by HAL under license. India made major avionics updates including the inertial attack system (DARIN), autopilot, cockpit avionics, weapons and radar. IAF still flies nearly 140 aircraft in 6 Squadrons and plans to operate till 2030. IAF operates 36 French Dassault Rafale. It had earlier bought Dassault Mirage-2000 in 1984 and the same has been upgraded to Mirage-2000-5 Mk II standards. Mirages will fly in IAF beyond 2030. HAL carries out Mirage aircraft and engine overhauls. Most components and spares still come from abroad. 63 of the 80 MiG-29s procured from the Soviet Union have been upgraded recently. Three upgraded MiG-21 Bison are still with IAF and will phase out by 2025. India has nearly 260 Sukhoi Su-30MKI, most of which have been licensed-produced in India. The aircraft will soon be upgraded as 'Super Sukhoi' with AESA radar and will be the backbone of the IAF's fighter fleet for at least the next two decades.

At the time of independence, Indian Air Force (IAF) inherited some of the aviation assets left by the British including Hawker Tempest and Spitfires. India also procured more British aircraft like the Hawker Hunter, the Gnat, Devon and Vickers Viscount. The USA was reluctant but offered some helicopters. The French offered fighter aircraft in the 1950s such as Dassault Ouragan (Toofani) and Mystere. By the late 1950s, India had inducted Soviet medium transport aircraft IL-14 and Mi-4 helicopters, and in the 1960s An-12 and a topline MiG-21 fighter. India also procured many Soviet air defence systems and weapons. With this began a relationship of "Bear Hug" that even today nearly 65% of the IAF aircraft fleet is of Soviet/Russian origin. Hindustan Aeronautics Ltd (HAL) also initially began manufacturing foreign aircraft under license production, including the French Allouette, British Gnat and Russian MiG series, Jaguars, among many others. Sourcing from different countries had its own complexities of mixed spare inventories and overhaul management. This sometimes resulted

in lower aircraft serviceability and higher maintenance cost. Also in many cases, the Life Cycle costs went up.





IAF Jaguars

## Transport aircraft

89 British Hawker Siddley HS-748 medium turboprop aircraft were license produced in India by HAL. A few of these aircraft are still used for communication duties. HAL built the German Dornier-228 under license in India. IAF operates Russian Ilyushin IL-76MD (freighter), IL-78MKI (Flight Air Refueller) and A-50 with Israeli Phalcon radar as AEW&C. IAF's over 100 An-32 had come from a plant that was in Ukraine. Meanwhile, Indo-US relations have come a long since the cold vibes of the 1950s which had pushed India into the Soviet camp. Starting in 2004, the Indo-US Cope India series of joint exercises began, and IAF also participates in the Top Gun Red Flag Exercises in the US. The more serious relationship began with the USA offering high end aircraft. India procured the Boeing P-8I for the Indian Navy and Lockheed C-130J-30 "Super Hercules" and Boeing C-17 Globemaster III, strategic lift aircraft for IAF. India has recently signed a contract with Airbus



Indian Air Force C-130J

for 56 C-295, 40 of which will be built in India.

## Helicopters

Over 300 Aerospatiale Alouette III, Light Utility Helicopters (LUH) were manufactured under license by HAL. Variants 'Chetak', 'Cheetah' and 'Cheetal' are still flying in India, including for high altitude operations on the Siachen glacier. Mid-sized Russian utility and assault helicopters Mi-8s joined IAF in the early 1980s. Later more advanced versions of Mi-17s and Mi-17V-5s followed. Nearly 240 are in service. The IAF procured Boeing Apache AH-64 Longbow attack helicopters and CH-47 Chinook heavy-lift helicopters. The USA has thus gotten into India's transport and helicopter ecosystem. They are now offering the F-16, F-18, and F15 for the MRFA completion.



LCH Prachand

## Trainer aircraft

HAL Kiran (HJT-16) intermediate stage jet trainer was influenced by the British Jet Provost design. Kirans have the Rolls Royce Viper engine and later versions Bristol Siddeley Orpheus engine. India acquired nearly 75 Swiss Pilatus PC-7 Mk II trainers. BAE Systems Hawk Mk.132, a British single-engine advanced jet trainer is used for training and low-cost combat. Being built by HAL under license, the numbers will soon be around 140. A Russian engine is supposed to power the indigenous Intermediate Jet Trainer (IJT).



HJT-40



Rudra and ALHs





IAF Hawk

## Unmanned Aerial Vehicles

Israel has been a very significant aerospace partner of India since the two established formal diplomatic relations in 1992 and defence ties in 1996. India acquired Heron and Searcher Unmanned Aerial Vehicles (UAV) and Harpy and Harop Combat UAVs (UCAV) from Israel. In addition, the Phalcon advanced airborne early warning radars for India's IL-76 based AEW&C, Night Vision Goggles, Green Pine early warning and fire control radars and many other items like Laser guidance kits, Head Up Displays etc. The Multi-Mode Radar on IAF's maritime Jaguars and India's LCA Tejas is also from Israel. Adani-Elbit joint venture makes Hermes UAVs in India. Rafael supplies the IAF with Spyder Low-Level Quick Reaction Missile systems (LLQRM) armed with Python and Derby missiles, and India and Israel work closely on medium range surface to air missiles (MRSAM) and LRSAMs.

India is also likely to acquire 30 MQ-9 UAVs for the three armed forces from General Atomics Aeronautical Systems of the USA, two of which have been on lease with the Indian Navy for two years and have flown nearly 10,000 hours. Meanwhile, India has ambitious plans for indigenous UAVs and drones.



DRDO's Tapas

## Aircraft engines

India has been dependent on foreign origin aircraft engines. India has been making Russian, British and French engines under license for many years. Even the ALH engine Shakti is through a joint venture with France. The US origin General Electric engines power LCA variants and are likely to be used for AMCA for some time to come.

## HAL, PSUs and private industry

HAL has made thousands of fixed and rotary wing aircraft in the last 75 years. Other than HF-24 Marut, ALH helicopter variants, a few trainers and more recently LCA, all aircraft have been of foreign origin, licensed and produced in India. HAL built aircraft using foreign production technology drawings. In most of these cases, India has been dependent on foreign suppliers even for relatively low end technologies. Often license production was at the mercy of foreign supplied systems or parts. At times small parts become obsolete because no one manufactures them due to poor economics of scale. HAL did succeed in creating local vendors for these parts. Even today, many major components of LCA, the engine, radar, ejection seat, many avionics, and weapons are imported.



LCA Tejas

India has successfully used the joint venture route in some cases, but there has been no significant transfer of technology (ToT) in most cases. China has used intellectual theft and reverse engineering to build top end defence systems but has now invested large sums in research and development and become independent.

Indian private aviation industry is also dependent on many DRDO labs and other defence PSUs who in turn are also dependent on foreign firms. Complexities for private players are similar. The Drone Federation of India has listed the many critical components of drones made in India that are still imported. While it is encouraging to see some major private players entering defence production, the industry still needs hand holding and support with India friendly policies and it is presumed that the new Defence Acquisition Procedure will make a difference.



IAF Rafale

## Logistics and maintenance complexities of multi-country fleets

From the above, it is clear that India is dependent on many countries. Managing aircraft fleets from many countries has its complexities. Each country follows different methods of inventory management and in many cases, India has to follow a similar system. Each country has different import and export regulations and follows different customs procedures. There are different time lines for repairs and spare supplies. Each country has different agencies to deal with and many have further placed orders to subvendors.

Many unpredictable trigger events bring in logistic chain disruptions. The breakup of the Soviet Union in the early 1990s caused a level of turmoil for supplies. Though Russia took over the contracts and supplies, India still had to

deal with other countries like Ukraine for many items. Similarly, with the recent Russia-Ukraine conflict, there has been disruption of some supplies. Russia's own internal arms replacement requirements due to the war would bring in their own supply priorities.

A few Western countries like the USA do have strategic or political reasons for military supplies but most European countries primarily have commercial interests. The Soviets, to politically win over India, earlier supplied aircraft in barter for ships loads of bananas, shoes or hosiery. After the breakup in 1991, the payments began in hard dollars, but the mindset of many in the Russian aircraft industry has still to recover from the Soviet hangover. The signing of even small contracts for spares takes much longer time with Russia. Some Russian production houses are financially weak because of considerably reduced orders.

The initial per unit cost of Russian combat aircraft has always been lower, but the Life Cycle Costs (LCC) have invariably been high because of faster replacement rates and shorter overhaul cycles. Because of the long repair cycle involving complex export/



import procedures, the Russian fleet serviceability has often been seen at between 50-60 percent. While Western countries have adopted modern online means of spare monitoring and supply, Russians mostly follow the old system of indenting. Serviceability and mission accomplishment rates of some Western fleets have been fairly high. Any force with around 650 combat aircraft having 60% serviceability would mean 320 aircraft in the hangar. The government mandated serviceability is stipulated at 75%. Taking the cost of a typical fighter even at around Rs 400 Cr, nearly 260 aircraft on the ground would mean assets worth Rs 1,04,000 Cr being non-operational. This is a very high figure.

## Balancing the arms basket

Undoubtedly the Soviet Union and Russia were a great help to India for arms supplies during critical initial years and the relationship remained rock-solid. However, after the 1990s, Western countries pushed ahead in some technologies. Also as India started



*Indian Air Force Su-30MKI*

becoming a significant economic and military power, the West began to woo it and was more ready to give advanced weapons. This gave India greater options to choose from. In the long term, it is not in India's interest to have most of its eggs (arms) in a single basket.

India has to thin its Russian aircraft basket. India finally backed out of the joint Fifth Generation Fighter Aircraft (FGFA) programme with Russia, ostensibly for technical reasons. It also did not pursue the twin engine Multirole Transport Aircraft (MTA) and the Ka-226 light utility helicopter. IAF which at the peak had nearly 85% Russian aircraft has already come down to around 65%. Yet just the Su-30 MKI constitutes nearly 40% of IAF's fighter fleet.

## Operational management of multiple fleets

IAF has airborne platforms from Russia, the USA, the UK, France, Israel, Ukraine, and Switzerland. India has seven types of fighters in Su-30MKI, Rafale, MiG-29, MiG-21 Bison, Mirage 2000, Jaguar and LCA Tejas. Clearly, IAF had no choice but to master the art of operationally managing mixed fleets. India has also managed to integrate a large number of fully programmable Western and Indian avionics even in Russian aircraft such as Su-30, MiG-27 and MiG-21 Bison, etc. Russian aircraft do have some commonality of systems with each other, but spare part nomenclatures being different did make it difficult for IAF to manage inventories for many years. For many



*Model of Tejas Mark II*

initial years, the combat employment approach of IAF was Russia-centric, but after the induction of the Jaguar and Mirage-2000 the same changed, and also the Tactics and Air Combat Development Establishment (TACDE) supported the evolution of the Indian combat employment approach.

## Action time

IAF's depleting air assets are already inadequate for an air campaign in a twofront scenario. Technology intensive air power requires faster replacement of assets due to quicker obsolescence. IAF is down to 30 combat Squadrons vis-à-vis the authorised 42. Low serviceability adds to the already dismal scenario. A critical component of improved serviceability is the improved logistics chain. Many fleets mean many aircraft inventories. Every 5% improvement in serviceability would mean adding 32 aircraft (1.5 squadrons). By merely improving the average serviceability from 60% to 75% IAF could be at around 4.5 squadrons. Serviceability is also linked to supply chains.

The Pakistan Air Force (PAF) has decided to restrict its fighter aircraft fleet to just 3-4 types in the long run. These would primarily be the F-16, J-10C and JF-17. China is also working towards that end. In the long run, India must start rationalising its fleet. I feel India should primarily have the AMCA, LCA, Su-30MKI, and one more foreign fighter type, bringing down the fleets to just four. The MiG-21 Bison will phase out and the LCA Mk.2 will replace the Mirage 2000, Jaguar and MiG-29. India will have to buy a foreign MRCA. IAF already has two squadrons of Rafale. It has already paid for India specific enhancements, two air bases have the infrastructure to take on more aircraft, and reports are that the Indian Navy has shortlisted Rafale-M for carrier operations.

Rationalising and reducing the number of fleets should be a priority. Till we induct more indigenous aircraft, all future procurements must keep this factor in mind. Geopolitically it is best to spread eggs in different baskets. In the long run, India must target what I call a 30-30-40 aircraft mix. This means 30% Russian, 30% Western, and 40% Indian. It may take us over two decades to reach there but should be the target. ➡

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**All photos: Vayu Aerospace Review**



# CAS review of LCA programme



The Chief of Air Staff (CAS) Air Chief Marshal VR Chaudhari reviewed the status of the Light Combat Aircraft (LCA) programme at Air Headquarters on 23 August 2023. Also in attendance were senior functionaries from the Ministry of Defence, DRDO, HAL and ADA. Opening the proceedings, the CAS brought out that the LCA has been the flag bearer of the Indian Air Force's (IAF) efforts towards indigenisation of its aircraft fleet. He said that given the nature of this project of national importance, it is required that all stakeholders adopt a collaborative approach towards its success. The programme has been the harbinger of Atmanirbhar Bharat and Make in India initiatives of the nation. More importantly, it is a flag bearer of India's self-reliance in the aerospace sector.

During the review, it was brought out that all contracted fighter variants of the LCA Mk.1 had been delivered to the IAF. Representatives of HAL



assured the CAS of the timely delivery of the contracted twin-seaters in the coming months, as well. Further to the LCA Mk.1, 83 LCA Mk.1A aircraft have also been contracted by the IAF in 2021. The Chairman & Managing Director

of HAL assured those present that the deliveries of this advanced variant of the LCA would commence by Feb 2024.

While complimenting HAL, the CAS indicated that based on these assurances, the LCA Mk.1A could be inducted in

a newly raised squadron in one of the IAF's operational bases, early next year. Notwithstanding the project delays that were brought out during the course of the review, the CAS lauded the efforts of all stakeholders and emphasised on the need to incorporate the lessons learnt from the LCA programme into future indigenous design and developmental projects. With timely deliveries of the more capable variant, the LCA Mk.1A is likely to see increased deployments at forward bases, besides participation in international exercises in the days to come.



The test launch was monitored by the Test Director and scientists of Aeronautical Development Agency (ADA), Defence Research and Development Organisation (DRDO), Hindustan Aeronautics Limited (HAL) along with officials from Centre for Military Airworthiness and Certification (CEMILAC) and Directorate General of Aeronautical Quality Assurance (DG-AQA). The aircraft was also monitored by a chase Tejas twin seater aircraft.

Astra, a state-of-the-art BVR air-to-air missile to engage and destroy highly maneuvering supersonic aerial targets, is designed and developed by Defence Research and Development Laboratory (DRDL), Research Centre Imarat (RCI) and other laboratories of DRDO. The indigenous Astra BVR firing from home grown Tejas fighter is a major step towards 'Aatmanirbhar Bharat'.

Raksha Mantri Rajnath Singh complimented ADA, DRDO, CEMILAC, DG-AQA and the industry for the successful firing of the missile from Tejas-LCA. He said the launch would significantly enhance the combat prowess of Tejas and reduce the dependency on imported weapons. Secretary, Department of Defence (R&D) and Chairman DRDO has also congratulated the teams involved in the successful launch. ➡

## LCA Tejas tests Astra BVRAAM

Tejas, Light Combat Aircraft (LCA) LSP-7 successfully fired the Astra indigenous Beyond Visual Range (BVR) air-to-air missile off the coast of Goa on 23 August 2023. The missile release was successfully carried out from the aircraft at an altitude of about 20,000 ft. All the objectives of the test were met and it was a perfect text book launch.



*Light Combat Aircraft (LCA) LSP-7 successfully firing the Astra (poor quality image)*





# Disclosing the Frailties

## Exploring the Flaws in India's Combat Aircraft Acquisition Strategies



IAF Su-30MKI (Photo: Philipp Vallianos)

While India under the new leadership is guided by the idea of “Make in India”, it still cannot ignore the fact that the country has been one of the top importers of arms since 1990s. The country is forced to import various critical technologies and platforms due to several issues like slow progress in indigenous programmes, inefficiency of government institutes and lack of political determination. But at the same time it needs to be highlighted that currently, where our nation stands in terms of technological development, the imports can be a huge asset to boost our growth and provide us with unmatched capabilities in the region. This, however is only possible when while importing a state of heart platform, the whole ecosystem is brought with it as done by Turkey in past, and not only just the platform is acquired.

### How India can extract the maximum by importing various platforms

The Indian defence market is quite appealing to the West, and so the Western nations try their level best to capture the

largest share of Indian defence market. It is further evident that India itself aspires to move away from huge dependence on a single supplier for its defence market, as at one point in the 2000s, Russia constituted 70–75% of Indian defence supplies which has now come down to 50–55% in recent years. It is further expected to fall below this number due to (current) sanctions imposed on Russia and the whole new idea of indigenisation. Meanwhile, the US has been the topmost gainer through the reduction of Russian equipment in Indian defence market by achieving defence sales of 24 billion dollars in a span of roughly 20 years.

The emerging circumstances in Indian defence market can enable India to import modern platforms which in turn will not only maintain standards of technological superiority for Indian armed forces but will also assist in development of critical indigenous programmes like AMCA and Tejas Mk.2. While India maintains its relations with nations like US, Russia, France and Germany, it is important to come out of the delusion that these strategic partnerships will directly result in access of critical technology for India. Leading nations in

defence are very protective of their technological leadership position as a country's military industrial complex not only provide it with huge economic benefits but also gives them a strategic upper hand and unmatched capabilities.

The sole way left with India is to increase its defence capabilities rapidly through international cooperation would be able to extract utmost advantage while procuring a foreign platform. This can be done through joint ventures involving co-design and co-development, opening up Maintenance Repair and Overhaul (MRO) facilities for all operators of that platform in the region, getting a license for global production, providing training and education to the operator, collaborating in R&D and ensuring assistance in future programmes of the country.

At the same time, it is important to highlight that due to evolving geopolitical scenario, India has become one of the most preferred destination for setting up of defence manufacturing establishments from all over the globe. The country provides one of the most ideal conditions for manufacturing like an affordable workforce to minimise the expenses of companies, a democratic nation that respects intellectual property rights and contracts to secure their investment, and most importantly, the security that India provides to Western technology by respecting contracts and preventing incidents like that of reverse engineering and proliferation of technology.

## A look at Turkish and Pakistani F-16 procurement

The comparison between procurement models of Turkish and Pakistani F-16s is one of the best cases to highlight the importance of gaining control over every aspect of platform while procuring it and to understand that even imports in defence industry which are often looked as setbacks to indigenous programmes, with proper planning can provide significant boost local ecosystem of country.

### The Turkish case

The F-16s are the frontline aircraft of the Turkish Air Force with around 250 units in service, but what's important is the way Turkey procured these aircraft. Turkey launched the Peace Onyx programme which was held in phases. In Peace Onyx I, a total of 160 F-16 Block 30/40 were bought, while under Peace Onyx-II 80 F-16 block 50 aircraft were delivered and the series is even continued till now with Peace Onyx-IV having comparatively smaller orders. However, the important part was visionary planning on part of the government of Turkey and their aerospace industry led to the creation of two highly significant aerospace manufacturing entities in heart of country just from imports. The first is TUSAS Turkish Aircraft Industry (TAI) co-owned by Turkish and American stakeholders and the other is the TUSAS engine industry (TEI) manufactures and assembles General Electric engine for TAI F-16s production.

Under the Peace Onyx-I, Turkey used to manufacture 70% airframe of F-16s that included significant portions of aircraft like the fuselage and wings. The Peace Onyx deal finally emerged as a success not only by gaining the appropriate amount of manufacturing rights, it also helped the TAI to expand itself extensively in the future, but apart from it, the programme became a kind of source of constant income for TAI as later it was awarded the contract to build 46 block 40 F-16 C/D's for Egyptian air force under Peace Vector-IV programme.

### The Pakistani case

The Pakistan procurement of F-16s was the only such procurement ever in Pakistani history that gave Pakistan regional superiority, in fact for a short span of time when Pakistan procured these aircraft in the 1980s, even India didn't have any concrete defence against such advanced technology until MiG-29s and Mirage-2000s later joined the Indian side.

Pakistan's procurement of F-16s however did not go very well. In the 1990s, due to American suspecting Pakistan of developing nuclear weapons, the sales of military equipment and further assistance to Pakistan were prohibited under the Pressler amendment by the US. The aftermath of these sanctions was very clear, as Pakistan had not acquired any kind of technological knowhow to manufacture the aircraft while procuring them, a major chunk of F-16 fleet soon started getting grounded. The same case was repeated multiple times whenever the country was sanctioned in the past, in fact, Pakistan was said to sustain its fleet only with the assistance of TAI and China which provided them essential components to keep the airframes fly worthy.

The studies of both nations show that even the way a platform is procured matters to the same extent as the platform itself. Turkey while procuring a modern platform like F-16 had a well drafted plan that not only bolstered the capabilities of the Turkish Air Force, but also gave a paradigm shift to the country's aerospace sector for growing and earning enormous profits by producing the aircraft even for USAF and Egyptian air force in future. Further it shouldn't be neglected that in the recent years even Turkey was partially sanctioned by US under CAATSA that gave some serious repercussions to Turkey like strained diplomatic relations with US and expulsion from F-35 programme, but still there were hardly any effects on Turkish availability of F-16 fleet.



PAF F-16 (Photo: Syed Zohaib Zaidi/airliners.net)

Pakistan on the other hand just procured the platform without any proper planning, it is indeed correct that the scale of orders plays a vital role in deciding how much a country would be able to gain in the future by acquiring the platform. In the case of Pakistan, the scale of orders was way smaller than Turkey. Furthermore, the poor negotiations done by Pakistani side did not provide PAF even the ability to sustain its fleet for few months without US assistance.



## The roadmap for India

India has historically made large and fast procurements of combat aircraft. The long-awaited tender like that of the medium weight multirole combat aircraft (MMRCA) suggest that India can still make such drastic procurements once again. While the induction of Su-30MKI is a clear cut example of how India can buy enormous units of similar kinds of aircraft over a span of time, our acquisitions have usually been fragmented and smaller in lots which provides a lot of benefits to the foreign vendor in terms of cost or low level of transfer of technology.



Photo: Vayu

The Indian government has always done a balancing act between defence modernisation and budgetary constraints which has restricted India to gain something significant while importing a technologically superior platform. Another problem was that majority of our procurement was sourced from Russia and the Russians have generally been a supplier of low cost finished weapon systems to other nations, so they don't find any necessity to build an offshore production base that in turn has led India to miss out on notable benefits like proper transfer of technology and codevelopment even after massive procurement in several domains from Russia. The Indian policymakers also became aware of this and due to the same reason when India participated in FGFA programme with Russia, it was made very clear from the beginning that India would not proceed in the programme until Russia guaranteed 100% ToT and assistance in indigenous programmes.

The IAF requires almost 400 aircraft within the next decade since a large number of aircraft are on the brink of completing their technical life and are waiting to be phased out of service. This includes MiG-21s, MiG-29s, Jaguars and Mirage-2000s. The burden of IAF was somewhat eased by inking the deal for 83 Tejas Mk.1A which along with previously ordered 40 Tejas Mk.1 gave a comparatively faster solution to the IAF. The long awaited MMRCA tender is another ray of hope for IAF apart from indigenous alternatives to save its depleting numbers of squadrons, as in the MMRCA tender apart from a few initial units, almost 100 aircraft are planned

to be manufactured in India. This gigantic number provides ideal conditions for establishing the required production infrastructure, starting from the assembly of the aircraft to the final phase of production. Such a sequence not only facilitates the absorption of technology and the development of skills but also enables the indigenisation of diverse components. It also empowers the Indian side to negotiate more favourable prices and leverage these advantages to our benefit.

The Indian government and Indian armed forces needs to ensure that maximum is reaped while importing any foreign platform in the future. This requires not only hard negotiations but also a change in the way India conducts its procurements,

especially for combat aircraft. A mistake that India has made with Russian platforms should not be repeated. However, at the same time, the importance of indigenous programmes cannot be compromised at any cost even if imported platform momentarily provide technological superiority. ➡



Article by: Pratisht Chaudhry  
(Twitter: @Pratisht3)

# IAF Rafale's in “revolutionary” flight

## Strategic partner India joins French Bastille day celebrations

All over the world countries celebrate annually their national memorials and or markings of important historic events. Internationally well known samples of such large festivities and parades include “Independence Day” in the USA in July, Chinese “National Day” in October and, in the same month, “Unity Day” in Germany. France is no exception when celebrating its revolution and founding of the republic during “Bastille Day” on 14 July. Highlight of this French event is the large military parade at and over the “Champs Elysee”, the most important and well known road through the centre of Paris, capital of the country. On the ground and in the air the defence forces and governmental services of France present themselves to the gathered audience in a large defile in front of the President of the French Republic.

Each year the defile focusses at specific themes to underline the importance as well as showing honour, gratitude and respect to the involved units and crews. Next to the national themes another regularly included element of Bastille Day are the international friendships, cooperations and partnerships with other nations. Samples of forces who joined the aerial parade over the past few years include military aircraft of Singapore, Belgium, Germany and Greece. This year French President Emmanuel Macron invited Prime Minister Narendra Modi of India who accepted to join the French celebrations on 14 July, as a special guest of honour. Amongst others, the joint French–Indian contribution to Bastille Day 2023 was to commemorate 25 year anniversary of their strategic partnership.

The months prior to the festivities, India revealed information how they would contribute to the French event. A total of 240 personnel of army, navy and air force elements were scheduled for the marching parade over the Champs Elysees. Actually, on 14 July these Indian troops, accompanied by their fanfare, were leading the opening of the marching parade through the Paris city centre in front of the Indian PM, the French President and numerous VIP guests.

Additionally the Indian Air Force was giving act the presence by forwarding 4 Rafale fighter jets together with 72 flight and







maintenance crew. 3 of the IAF Rafale's were scheduled for the "25 year strategic partnership" formation of the air defile, while 1 aircraft acted as a reserve backup. Logistic support for the IAF contingent was provided by several C-17's and an Il-78 for aerial refuelling during the transit to and from France. The fighters, being 2 dual seaters and a pair of single seaters, came from 101 squadron "Falcons", part of the 16th Wing based at Jalpauiri-Hashimara Air Force Station (ICAO: VEHX), India. On 7 July the Rafale detachment arrived at its French host air base, BA-105 Evreux, west from Paris. The days ahead of Bastille Day the IAF Rafale's flew a few familiarisation and photo flights over the Paris and Evreux regions.





PM Modi arrived by “Air India One”, the presidential B-777, in France on 13 July. During his 2 day stay in France the Indian PM and host President Macron followed a formal programme of various meetings, ceremonies and state banquets to underline the strong bond between both nations. In the morning of 14 July, Rafale’s RB004, RB006 and BS028 took off from Evreux to join their formation with a French

L’Armee de L’Air Rafale from squadron 30 based at Mont-de-Marsan, while BS023 acted as the reserve aircraft with pilot in cockpit to react immediately when needed to join. Meanwhile the sky over Evreux was filling up with orbiting aircraft formations to await their call-off to take position in the track of formations to fly over Paris. The air defile started around 10.30 local time with the Alpha Jets of “Patrouille de







France”, as usual opening the parade, immediately followed by the Indian Rafale formation. It took around 11 minutes for all formations to pass Paris, after which they split up and flew straight back to their home bases. The Indian Rafales returned back to Evreux to park next to the reserve aircraft. Two days after the air parade over Paris, the 4 Rafale’s left Evreux and headed back home for an approximate 10 hour nonstop flight, similar to what they did in the beginning,

to Jalpaguiri AFS. During the first leg of the journey the IAF fighters were accompanied by a French MRTT tanker aircraft for aerial refuelling, which duties were taken over after a rendezvous with an Indian IL-78 tanker over the Mediterranean for the remainder of the trip. ➡

**Text and photos by Peter ten Berg**



# Airbus delivers first C295 to India



the Vadodara FAL, which is expected to be operational by November 2024.

The first 'Make in India' C295 will roll out of the Vadodara FAL in September 2026 in what will be a milestone for the Indian aerospace industry; the final aircraft expected to be delivered to the IAF by August 2031.

With 283 orders from 41 operators, the C295 is the leader in its segment and "stands out for its versatility". It can carry up to 71 troops or 50 paratroopers, airdrop cargo, be used for medical evacuation and take off and land in short and unpaved runways. ➡

Airbus Defence and Space, on 13 September 2023, officially handed over in fly-away condition the first of 56 C295 aircraft to the Indian Air Force (IAF) to begin replacing its ageing Avro HS-748 fleet. The C295, in transport configuration and with an indigenous electronic warfare suite, left Airbus' production site in Seville, Spain, for Delhi, India, a few days later, piloted by a joint IAF and Airbus crew.

"It was only two years ago that we signed this contract with India, the largest order in the history of the C295," stated Jean-Brice Dumont, Airbus' Head of Military Air Systems, in a delivery ceremony held in Seville in the presence of India's Ambassador to Spain Dinesh K. Patnaik and IAF Air Chief Marshal Vivek Ram Chaudhari. "Today, we are enhancing the capabilities of the Indian Air Force and modernising its transport fleet by delivering the first aircraft on schedule. This is the beginning of an exciting and longterm journey with the Indian Air Force."

The first 16 C295s of the 56 aircraft on order will be assembled at the San Pablo Sur site in Seville, Spain, with the second aircraft due to be delivered in May 2024 and the next 14 rolled out at a rate of one per month until August 2025.

To boost self-reliance in the defence manufacturing sector in India, the remaining 40 C295s of the

IAF order will be manufactured and assembled, in partnership with Tata Advanced Systems Limited (TASL), at a Final Assembly Line (FAL) in Vadodara in western India.

The production of components of these aircraft has already started in the Main Constituent Assembly (MCA) facility in Hyderabad, southern India. These parts will be shipped to



*From left to right: Jean-Brice Dumont, HO Military Air Systems at Airbus Defence and Space; IAF Air Chief Marshal Vivek Ram Chaudhari; Dinesh K. Patnaik, India's Ambassador to Spain; Francisco Sánchez Segura, Executive Vice President Airbus in Spain.*



# Nyoma ALG transforms into high-altitude fighter base



*LCA Tejas at Leh during trials (Photo: Vayu)*

In an effort towards bolstering its military prowess, the Ministry of Defence has decided to elevate the Nyoma Advanced Landing Ground (ALG) in eastern Ladakh into a fully functional operational base, capable of facilitating fighter aircraft take-offs.

This endeavor, slated to be completed within a span of less than 20 months, involves the construction of a concrete runway spanning 2.7 km, accompanied by essential ancillary infrastructure. Sources within the defence and security establishment have revealed that Defence Minister Rajnath Singh is anticipated to conduct an inspection of the ongoing work in the coming month.

Situated at a staggering altitude of 13,700 ft, Nyoma holds the distinction of being the world's highest airfield. This unique feature mandates adaptations to fighter engines, enabling them to perform optimally at such elevations. Currently designated as an ALG, Nyoma's existing runway comprises mud, restricting its utility to specialised transport aircraft and helicopters. However, with the imminent completion of the new runway, the operational capabilities will extend to accommodate heavier transport aircraft. This development is poised to significantly enhance India's military strategic depth.

## About Nyoma ALG

The Nyoma ALG played a pivotal role in the face-off with China, as the deployment of C130Js facilitated swift mobilisation of personnel, heavy armament and equipment along the Line of Actual Control (LAC) during the heightened tensions in 2020.



*10 years ago in August 2013, an IAF C-130J did a maiden landing at Daulat Beg Oldi, the world's highest airstrip (16614 feet). (Photos: IAF)*

India's proactive move arrives at a juncture when China has already concluded extensive upgrades to its bases along the LAC, reinforcing them with elongated runways and fortified shelters. China has also established new heliports, strategically positioned in proximity to crucial regions such as the Galwan Valley and the Pangong Tso area.

In light of these developments, India's objective is to establish a comprehensive defensive capability and deployment strategy to counter China's "Anti Access Area Denial (A2AD)" approach. This strategy hinges on curtailing the adversary's battlefield mobility through an array of surface-to-air missile (SAM) installations, long-range radar systems, and a formidable amalgamation of ground forces.

While fighter operations from Leh, Nyoma, Thoise, and Srinagar are poised to expedite aerial response during emergencies, it is the hinterland bases, particularly in Punjab, that are projected to bear the brunt of conflict. This bifurcation bestows India with a tactical advantage in the domain of fighter jet operations.

The driving impetus behind the Nyoma ALG's expansion stems from the exigency of establishing an alternate operating base for fighters in Ladakh, supplementing the existing ones in Leh and Thoise. Weather conditions, often hampering operational capabilities, underscored the need for diversification. The Indian Air Force conducted a meticulous evaluation to ascertain the suitability of the three ALGs in Ladakh – Daulat Beg Oldie (DBO), Nyoma, and Fukche – for fighter operations.

DBO faced two insurmountable challenges: its formidable elevation of 16,600 ft and its strategic visibility within Chinese surveillance parameters. Fukche presented limitations regarding runway expansion and infrastructure creation, ultimately tipping the scales in favor of Nyoma. The weather resilience exhibited by Nyoma throughout the year acted as another pivotal factor.



*The Nyoma ALG played a pivotal role in the face-off with China. (Photo: IAF)*

However, the path to expansion encountered hurdles due to environmental clearances, primarily owing to the presence of the Changthang Wildlife Sanctuary, which harbours the Kiang or Tibetan Wild Ass and rare black-necked cranes. In response, the IAF restructured the expansion plans to secure environmental clearances, which were granted with certain conditions.

The change of Nyoma ALG into a high-altitude fighter base signifies India's unwavering commitment to fortifying its national defence apparatus. This endeavour not only accentuates India's strategic readiness but also underscores its proactive stance in the face of evolving regional dynamics. ➡

**Huma Siddiqui**

Courtesy: Financial Express Digital



*IAF Il-76 at high altitudes (Photo: Wg Cdr RS Chauhan)*



# MBDA celebrates India's Air Force Day 2023



IAF Rafale with MBDA's SCALP ASM and MICA AAM at Aero India 2023 (Photos: Sankalan Chattopadhyay, Twitter @vinoddx9)

**M**BDA is proud to celebrate Air Force Day 2023 in India, and to be a key industrial partner for the IAF providing the air force with its chosen equipment to protect India's skies. The Indian Air Force throughout its history has been a strong user of MBDA's missile systems on a number of different aircraft types. Today the IAF's latest aircraft Rafale fields a highly potent suite of weapons from MBDA.

Unquestionably the most famous is the Meteor, the ramjet powered and network enabled beyond visual range air-to-air missile that is widely recognised as a game changer for air combat. Meteor's throttleable ramjet engine provides sustained high-supersonic power, making it the only missile able to chase down manoeuvring enemies at even the longest of ranges.

No less game-changing for the IAF is the SCALP stealthy air-launched cruise missile that also forms part of the Rafale weapons package. This potent weapon gives the IAF a flexible tool to conduct deep strike missions at long ranges against even the most protected of hostile targets. The combat proven effectiveness of SCALP in such scenarios is unrivalled.

Another MBDA weapon, MICA provides both the Rafale and the newly upgraded IAF Mirage 2000 aircraft with a uniquely flexible approach to air combat. MICA is the only missile in the world featuring two interoperable seekers (active radar and imaging infrared) makes MICA highly countermeasure resistant and therefore highly effective.

With a strong reputation as a reliable partner that has supported the Indian Air Force for over 50 years, European missile firm MBDA understands the importance of operational capability

and sovereignty to the IAF. For these reasons, the company has so strongly committed to Make in India to deliver both industrial sovereignty and the best of military equipment to India.

Indian firms now supply key components for key new missiles that are enhancing the combat power of the IAF. For example by Indian industry today to extensive manufacturing of 15 major subassemblies of MICA missile covering various complex technologies such as mechanical, electrical, electromechanical and pyrotechnic items. MBDA continues to deepen its relationship with Indian industry, as seen by the recent formation of a joint venture with long-standing partner Larsen & Toubro to deliver a series of important missile programmes under the Make in India category.

The IAF is also getting a major boost with the addition of the ASRAAM as its Next Generation Close Combat Missile. MBDA and its longstanding Indian partner BDL are establishing a new facility in Hyderabad to assemble and test this potent air combat missile. With its large rocket motor and clean aerodynamic design, ASRAAM has unrivalled speed and resultant aerodynamic manoeuvrability and range. ASRAAM gives it a high kinematic capability that delivers superior end-game performance for within visual range air combat. MBDA's ASRAAM missiles are significantly enhancing the battle capability India's Jaguar bombers, giving them unrivalled self-protection ability and enhanced ability to penetrate hostile airspace. This highly capable weapon is also set to be fielded by India's Tejas LCA Mk.1A and could also boost the combat capability of other IAF aircraft.



ASRAAM CCM on an IAF Jaguar (Photo: Vayu)

Key to many of MBDA's offerings are their ability to be fitted to multiple platforms. By utilising the same weapon across different platforms, not only do extra aircraft benefit from these capabilities, but there are also major cost savings and operational benefits to be found in maintaining common equipment stockpiles, not to mention the training and logistics benefits. For example, utilisation of the Mistral missile on India's helicopter platforms provides a bridge to their use in a ground based VSHORAD role, where the missile is fully compliant with India's requirements and outperforms the capabilities of its rivals. ➡



Article by Ludovic Dumont, Country Head MBDA & MBDA India General Delegate

# TIGERSHARKS OVER HELLAS

## The Indian Air Force at Exercise INIOCHOS 2023

### INTRODUCTION

In late April and early May 2023, Andravida AFB in the northwestern Peloponnese, witnessed an event that had not happened anymore since the time of the Indo–Hellenic kingdom between 180 BC and 10 AD: Indian and Hellenic Armed Forces trained together for a common goal.

The Indian Air Force responded to the invitation of the Hellenic Air Force and attended for the first time the international exercise INIOCHOS 2023. This was a great step forward for Indo–Hellenic diplomatic and military relations, but also for establishing new personal ties. Presented here is a detailed report on exercise INIOCHOS 2023.







Indo-Hellenic relations were dispersed and unfortunately remained in this situation even after the establishment of the modern states of India and Hellas. The first serious step towards rapprochement took place in the 1980s with the “Six Nations Peace Initiative”, an initiative of the leaders of six countries of the world (Argentina, Hellas, India, Mexico, Sweden and Tanzania) with the aim of limiting armaments and promoting peace processes between warring states. Unfortunately, the influence of the great powers prevented this laudable initiative from developing further. Significant progress in Indo-Hellenic relations has only been achieved in recent years through visits from both sides by government officials and the signing of numerous agreements to develop bilateral relations.



## INDO-HELLENIC RELATIONS

Indo-Hellenic relations began to develop from ancient times. Initially they were mainly economic in nature, but after the conquest of the Persian Empire by Alexander the Great during 334BC–324BC and the subsequent shared borders between the Indian and Hellenistic Kingdoms, now in the present time Indian states of Himachal Pradesh and Punjab and the union territory of Jammu and Kashmir, multiple political, military and also close social relations

developed between Indians and Greeks, see for example the Indo-Greek Kingdom, Greco-Bactrian Kingdom, etc. After the 10th century AD and the invasion of the Kushans and with the simultaneous spread of Arabic tribes in the Near East, the relations between Indians and Greeks were ultimately broken and the common Indo-Hellenic civilization was assimilated in the new established kingdoms. In the centuries that followed and mainly due to the invasion of Turkish tribes in the Near East and Mediterranean region, the

## INDIAN FOREIGN DEFENCE POLICY

The participation of the Indian Air Force in INIOCHOS 2023 is part of a more general externalization of the Indian Defence Policy in recent years. One of the pillars of this change in policy is the year-on-year increasing participation of the Indian Armed Forces in international exercises. In the aviation sector, exercise INIOCHOS was the Indian Air Force's third participation



IAF and HAF pilots discussing tactics after a flight together in a HAF F-16D Block 52+

Economic Zone (EEZ) of Hellas, Egypt and Cyprus shares many similarities with the P.R. of China's expansionist policies in the Indian Ocean. On the other hand, the increasingly close cooperation between Pakistan and Turkey is a growing concern for Hellas, particularly in the context of Turkey's attempt to acquire nuclear weapons with Pakistan's help and the very close relationship between the Pakistani and the Turkish Air Force, for example by sending Pakistani pilots to fill the gaps left by the failed 2016 "coup" in Turkey. The advantage for Pakistan from this is the possibility of realistic "training" with Hellenic Air Force Mirage 2000 and Rafale during the daily violations of the Hellenic airspace and the ensuing skirmishes, with the aim of developing counter tactics against the Indian Air Force Rafale. This is one of the reasons why India has started to develop and deepen two axes: India-Iran-Armenia at the basic level and India-Hellas-France at the strategic level. The advantages for both sides are manifold and significant. For India, it is an opportunity to break the cordon in the west and north, where it is in, a demonstration of long-range power projection and a chance to train with two of the best Air Forces in the world. For Hellas, it is the opportunity to put pressure on the Pakistan-Turkey axis and assimilate the Indian Air Force's experience with the Pakistan Air Force and its offshoots within the Turkish Air Force.

in an international air exercise in Europe this year, after Cobra Warrior 2023 in the United Kingdom and Orion 2023/VOLFA 2023 in France. In recent years, India has begun to reassert old historical ties and to develop new ones with countries with similar interests and threats in order to find its rightful role in the new world order and as a counterweight to the intensifying axis between the People's Republic of China and Pakistan. The dispute regarding areas of the Himalayas by the P.R. of China and Pakistan's support of separatist movements in the Kashmir region, bear many and serious similarities to Turkey's policy of challenging the Hellenic sovereignty over the islands of the Aegean Sea and Western Thrace. Furthermore, Turkey's refusal to recognize the Exclusive







## INIOCHOS 2023

The honour of Indian Air Force's first participation in an INIOCHOS exercise went to the famed "Tigersharks" with their Sukhoi Su-30MKI multirole fighters. The "Tigersharks" is the first Su-30MKI squadron to be equipped with the BrahMos supersonic cruise missile. This deadly combination is a real game-changer from day one, and will significantly improve security over the Indian Ocean and ensure that legal Indian claims, for example in relation to the Exclusive Economic Zone (EEZ) are respected.

The Indian contingent arrived at Andraivada AFB on 22 April with an overnight stopover at Cairo-West AB in Egypt and a prior aerial refuelling over the Arabian Sea by Il-78MKI of the Indian Air Force. It consisted of 99 members and 4 Su-30MKI. For logistical support, the mission was accompanied by two C-17A strategic airlifters. The contingent left Andraivada AFB on 6 May for the return journey along the exact same route.

During INIOCHOS, the Indian contingent took part in missions of all kinds. However, particular emphasis was placed on Long-Range Strike Package Escort missions/High-Value Target Protection during the first week of the exercise and Maritime Strike missions during the second week. The Su-30MKI is well suited for such missions, thanks to the long range of the Tikhomirov N011M "Bars" radar, the long range of the aircraft itself and the wide range of A/A and A/G weapons



it can carry. Considering that most western types of fighters do not have such an equipment (one of the few exceptions is the Rafale), the integrated OLS-30 IRST (Infra-Red Search and Track) was a surprising element in joint missions for most participants. With its help, the Sukhoi could spot enemy fighters very early and without having to actively use its radar, thus evading detection. The Hellenic Air Force was deeply impressed by the capabilities of the Su-30MKI and found it very suitable for Maritime Strike missions, as well as for Maritime Reconnaissance missions. The Hellenic fighter pilots all agreed that the Indian Air Force was a very tough and professional opponent and that in real combat missions they would fly with them with great confidence!

The many years of great experience of the Indian Air Force also played a catalytic role in the successful outcome of the missions. An impressive feature of the Indian contingent was the way the missions were carried out. From the planning of the missions through their implementation to the subsequent debriefing, the other INIOCHOS participants were impressed by the extreme professionalism that all members of the Indian contingent displayed without exception. They devoted themselves fully to each mission and always tried to find multiple plans to execute each mission, rank them according to their chances of success, and completed each mission with a success that was close to or even 100% in most cases.



During the exercise there was also the opportunity for bilateral missions/flights between the Hellenic Air Force and the Indian Air Force. The French Air Force often participated in this as part of the aforementioned strategic alliance between France, Hellas and India. Several crew exchanges also took place with Indian pilots flying with Hellenic F-16D Fighting Falcons and Hellenic pilots flying with Indian Su-30MKI. The same happened during the exercises Orion 2023/VOLFA 2023 in Mont-de-Marsan, France, with crew exchanges between the Hellenic Air Force Mirage 2000-5 Mk.2 and the Indian Air Force Rafale. These exchanges are not only symbolic and for public relation reasons, but also have serious practical reasons and advantages: They help to further deepen the new special relationship between the Hellenic Air Force and the Indian Air Force and allow the exchange

of first-hand experiences, opinions and practices. In addition, and this is very important, new personal friendships are made that last over the time with everything that goes with it.

At Andravida, it was clearly heard that the Hellenic side was very satisfied with the joint training with the Indian Air Force Rafale during exercises Orion 2023/VOLFA 2023 and that the Indian side was very happy with the opportunity given to their pilots to fly with two-seat F-16D Block 52 of the Hellenic Air Force and to fly against F-16 of the Hellenic Air Force in joint missions during INIOCHOS 2023. It is certain that this will be an important fact in the development of plans to deal with the Pakistani F-16 Block 52, one of the newest and most modern fighters in the Pakistan Air Force.

It is clear to say that the Indian contingent was the most pleasant

surprise of INIOCHOS 2023. All other participants and in particular the members of the Hellenic Air Force had only the best words about the Indian personnel. They were always very polite and smiling, from the senior officer to the youngest member of the contingent, they were always ready to answer questions and willing to help wherever they could. They have always used more than 100 % of their skills for the tasks assigned to them. And all this without ever losing their professionalism in their work and their commitment to the achievement of their missions. They were true ambassadors of Indian culture and ethos and made many new friends in Hellas. A characteristic phrase often heard in Andravida was this: "The Indians were true warriors in the sky and true lords on the ground".



# EXCLUSIVE INTERVIEW!

Vayu Aerospace and Defence Review had the great honour and privilege to conduct an interview with Group Captain R. Ahlawat and Group Captain V. Bhushan, leaders of the IAF contingent in Andravida AFB during exercise INIOCHOS 2023, with conclusion of the first week of the exercise.



IAF Squadron personnel together with Colonel V. Singh (Indian Defence Attache accredited to Hellas)



From left to right: Group Captain V. Bushan, Colonel V. Singh, Group Captain R. Ahlawat, Lieutenant General Themistoklis Bourolias (Chief of the Hellenic Air Force General Staff), General Konstantinos Floros (Chief of the Hellenic National Defence General Staff)





**VAYU:** *It is a big honour to welcome you to Hellas, at INIOCHOS 2023. I hope you are enjoying your stay.*

**A:** Yes, it is an amazing hospitality and beautiful people. Please let me express our gratitude to the Hellenic Air Force for their exceptionally hospitality. We were welcomed with great heartiness and interest. We meet only good professionals, this includes all participating countries and we are going well with the exceptional, professional standards of all countries involved in the exercise.

**VAYU:** *This is the first participation of the Indian Air Force in an international exercise in Hellas. How far in advance the decision to participate has been made?*

**A:** The larger aim of these exercises is to develop a bond between nations and militaries. In that sense especially, we are glad that we are here in this

historic country. The two Air Forces can prove to be a medium to further enhance the relations between our countries. Considering the logistics and clearances required for such visits, these decisions have a certain unavoidable lead time, as was also the case with exercise INIOCHOS.

**VAYU:** *According to what criteria the decision was made which squadron of the Indian Air Force would participate?*

**A:** Despite all Indian Air Force Su-30MKI squadrons being Multirole-Squadrons, each Squadron is also specialised in other particular roles. The “Tigersharks” are specialised in Long-Range Maritime Strike missions, and so, most probably this was the main reason for choosing us to participate in INIOCHOS 2023.

**VAYU:** *Is INIOCHOS 2023 the first international exercise in which the Squadron participates?*

**A:** For the “Tigersharks”, yes, it is the first international exercise, but many officers have participated in other international exercises in India and abroad like Red Flag in the USA, Garuda in France and India, so many pilots have experiences in training with foreign Air Forces. Therefore, the aircrews who are participating, I would say not everybody but the majority of them has many experiences to international exercises either in India or abroad.

**VAYU:** *How many days did the transfer trip to Andravida AFB take and what route was covered? Was any air refuelling used?*

**A:** Two days. We started our journey in India and flew via Egypt to Hellas. Yes, we did use air refuelling over the UAE and then landed in Cairo-West AB. After staying there for overnight, we continued the next day to Andravida AFB. From Egypt to Hellas, no air refuelling was necessary.



Returning from another successful mission





IAF pilots – Among the best in the world!

Squadron specialised in Long-Range Maritime Strike missions. I think this will be a part where we can display our capabilities to our friends and partners. Otherwise, I think any kind of role should be comfortable for us to show our capabilities. In addition to this, operating and working in a multinational multirole environment should be a good lesson of how to operate together with multiple types of aeroplanes, flying together in an escort or strike role and working together. It will also be a great lesson for all participating Air Forces. We are sure that as we will learn something new from them, they also will learn something new from us.

**VAYU:** *What are your impressions of the exercise INIOCHOS after a week of intensive training? Did anything particularly impress you?*

**A:** Everyone is very professional here, every country is leading a mission, everyone is cooperating, and we all learn during these procedures. We see a really good teamwork by all participating countries. The cool part in this exercise and what we do back in India in similar way too, is the fact that the exercise is being controlled by the Hellenic Air Force Air Tactics Centre (KEAT), and the overall controlling of the missions is done by the Hellenic Air Force Tactical Weapons School (SOT) instructors, so they run the

**VAYU:** *Which parts of the exercise are of particular interest to the Indian Air Force? Which parts will you focus on?*

**A:** We will participate in all kind of missions which they assign to us. Escort missions, Strike missions, Maritime Strike missions, we are competent to participate in any missions they will give us. The Su-30MKI is a truly multirole aircraft; it can perform any role, starting from Air-to-Air Escort through Escort of Strike Packages to Maritime Strike. It can do any kind of mission. The Sukhoi can fulfil any task assigned. Equally, the Squadron can fulfil all roles. Our main task during the exercise is Long-range Escort. Back in India, it is all roles, and mainly Maritime Strike.

**VAYU:** *In which parts of the exercise do you think that you can make a special contribution? What do you think the other participants can learn from you?*

**A:** We can contribute extra in all related roles they are going to give us. The Squadron is a Multirole-



Ground crew – Nothing is possible without them



missions and they are helpful to all the countries who participate in planning the missions, executing the missions and debriefing the missions, because of sharing the experience they have. They give valuable advices and help with the planning/executing/briefing of the missions. I would say they have a very high amount of experience due to training with other NATO and US Forces and that is why they all have the highest professional standards. Everybody is able to cope with very little expose to faults, the performance of all the nations participating is according to very high standards. It is primarily because of very clean and crisp briefings and very competent planning. Real professionals are at work here.

**VAYU:** *What are your impressions of the other participants?*

**A:** The level of the participants is very high. Each country takes turns

leading a mission, bringing their experiences and input, everyone is cooperating and they are all working together as a team. The briefings are very crisp and the planning is extremely good.

**VAYU:** *What kind of missions did you complete after the first week?*

**A:** During the first week, we were assigned Escort missions first and I can tell you that the missions are progressing steadily, regarding planning, execution and in difficulty.

**VAYU:** *Did you or will you participate in night missions and low-level missions?*

**A:** We have participated in night missions this week and we are going to participate in night missions next week, too. Low-level blocks are not given to us yet, but I think next week. Reason is that for the role given to

us during the first week we have to fly higher. The role given to us is not Strike missions but mainly Escort missions where we should be higher. Next week we will be given Strike/ Maritime Strike role, which gives us the opportunity to low-level flying over the sea and land. Flight at low-level is no issue for the Squadron. The Squadron is fully capable of undertaking low-level flying over sea and if the mission requires it over land. From us there is no embargo on that. Therefore, the only thing are airspace restrictions around the country because of civil traffic and other restrictions, applying to all participants. Otherwise, there is a wonderful planning, the entire essence of what we want to achieve will be achieved.

**VAYU:** *How many sorties do you fly on average per day?*

**A:** We are ready everyday with all four planes. We are participating in two missions each day. Until now, there is a 100 % mission success achieved by us.

**VAYU:** *Did you fly any special missions together with the Hellenic and French Rafale? Hellas is now flying the Rafale, India is already flying the Rafale, did you work more closely with them during the exercise?*

**A:** Yes, we cooperated in Escort missions with them, more specific Long-range Escort missions protecting the strike packages.







will also learn from us and that we will contribute with our experience and professionalism to the overall success of INIOCHOS 2023.

**VAYU:** *Thank you very much. It was a great honour to meet you. Enjoy your stay and have always a safe flight.*

**A:** Thank you also for giving to the Indian Air Force the opportunity to present themselves to the world. We will definitely make the most of our stay in Hellas and we wish you success in future. ➡

**VAYU:** *This year the Indian Air Force is participating in many exercises abroad, I think six or seven so far, more than ever before. Is this part of a broader shift in Indian foreign policy? Will you be more active outside of your country in the future?*

**A:** I think the broader intent is to cooperate with friendly countries towards further developing relations at the diplomatic and strategic levels. Developing an understanding of each other at the grassroots level will no doubt help in this regard. Such exercises can therefore be viewed as a means towards a greater end. Of course, the exposure that they provide us is priceless and the bonds that form will undoubtedly be lifelong.

**VAYU:** *Do you think, the Indian Air Force will organise in the future an exercise like INIOCHOS in India with international participants or are Indian Air Force exercises mostly bilateral exercises?*

**A:** I certainly hope so because if nothing else, it will give us all an opportunity to reciprocate the warmth we have received.

**VAYU:** *And finally, one last question. Do you think the Indian Air Force will participate in INIOCHOS again in next year? Was it worthwhile for the Indian Air Force to participate this year?*



From left to right: Group Captain R. Ahlawat, Group Captain V. Bushan and the author of this article/interview, Marcus Vallianos.

**A:** We definitely hope so! If the invitation from the Hellenic side comes, we would like to participate again. It is a good learning for all. It is a very very professionally conducted exercise. The other participants are very good professionals in their business and we definitely would like to be part of it in the next years. We enjoy it very much. We have learned a lot during the first week and are sure that it will continue this way also during the second week of the exercise. At the same time, we are convinced that the other participants

**Article/Interview by Marcus Vallianos  
Photos by Philipp Vallianos**

*The authors would like to sincerely thank the following people (in alphabetical order). Without their active support, this article would not have been possible: Group Captain R. Ahlawat, Group Captain V. Bushan, Lieutenant Colonel Chr. Kalogeropoulos, Colonel S. Magotsios, Wing Commander Pr. Mor, Colonel V. Singh and all unnamed Indian and Hellenic Air Force personnel who contributed. Thank you so much!*

# VAYU on-the-spot report

## Visit to the Tupolev 142 Museum, Vizag



*Albatross standing strong under the sun*

on “Albatross” as well, the Indian designation for both Tu-142 and its squadron: INAS 312. A pilot station replica is also placed in the same room. Among the various info-boards spread across all the rooms; one also described the achievements of INAS 312 “Albatross”, starting from winning Best Operational Squadron Trophy and Flight Safety Trophy in January 1955 to participating in a grand flypast over Mumbai and Vizag on the occasion of Navy Day in December 2001. The armoury room had a range of sonobuoys and munitions which was active with the fleet, such as PLAB-250-120 and APR-2E, anti-submarine bomb and missile respectively. The 14,795 hp NK-12MP engine also had its place in the room. The holography room, which was supposed to describe the aircraft’s characteristics via various audio-visual means, was apparently glitching and hence, it had not much to offer. Advancing ahead, one will find more on the squadron, like the story behind its crest, title, and motto: “Victory is

**I**t was a sunny afternoon under which we had the chance to visit the Tupolev Tu-142 museum at Vizag. Situated at RK Beach Road and just opposite the INS Kursura Submarine Museum, the Tu-142 Museum is indeed a charm at first sight, with a beautiful entry building and also an elegant lawn comprising a few tourist attractions like a replica of Tu-142 tail, and “I love Vizag” point, great for photo shoots for both locals and tourists. The museum was opened on 7 December 2017, 51 days after the foundation stone was established. The Eastern Naval Command had collaborated with the Vishakhapatnam Urban Development Authority (VUDA) for the setting up of the museum based on the Tupolev Tu-142MK-E Maritime Patrol Aircraft (MPA), the flagship of the Indian Naval Air Arm for nearly 3 decades (1988–2017). The entry ticket costs 70 rupees for adults and 20 rupees for children less than 3 years of age. On weekdays, it remains open from 2 pm to 8:30 pm, so one can enjoy the beautiful sightings under the sun, during the sunset and even in the night lights, which worth it.

### Exhibits

Once entering the main complex after the ticket check, one can find a series of rooms dedicated to each classification. The first one consists of a small tribute with engravings on both side walls, one for Vizag as a whole, the other for Tu-142 itself, with reference to landmark events during its service, one being the in-flight refueling from an Il-78 tanker. A small model showing an overview of the museum layout is also placed. Then we enter the room dedicated to Tupolev’s background, along with its founder, Andrei Tupolev. We can find background



*Bomb Bay*



our passion”. In the same vicinity, the walls are decorated with medals like Nao Sena Medal and Vishisht Seva Medals. Furthermore, the officers of the squadron who were recipients of certain awards were also honored with their portraits on one of the walls.

## The Tupolev itself

Finally, we head to the main attraction of the venue, the Tupolev Tu-142 “Albatross” herself. The airframe, tail number IN312, took its last operational sortie on 27 March 2017 before it was officially decommissioned at INS Rajali two days later. Two entry points are made for the visitors to enter the aircraft, after which they can notice that the interior is authentic, but also has essential markings for tourist information, like which cabin they are entering. Mannequins are also placed at crew stations for people to have an idea of how the personnel were organised while the aircraft would be in flight. The bomb bay consists of some munitions’ replicas. It is advisable to watch your head while navigating through the floors, which lead all the way up to the cockpit and navigator’s position. The navigator’s seat is empty remains empty, and sitting on it can give a mesmerizing experience even when the aircraft is stationary. One can only imagine the visuals the actual navigator would have enjoyed when the aircraft was cruising through the clouds in the air. While having a walk around the aircraft, one can notice how well-maintained the airframe is, along with the museum.



*Propellers, each measuring 18 feet in length*

We can say that this museum is surely the best tribute this aircraft can get from the nation and people are equally impressed by this mammoth Soviet machine. Facing the tropical climate of the coastal city of Vizag, the Albatross in its post-retirement stage proudly stands strong even today, flaunting its rich service record with the Indian Navy. ➡

Article and photos by Rishav



*Crew Stations: Cockpit, TACCO and Senior Navigator*



*Navigator Station*



*Bomb bay station*



*NK-12MP Station*



*Awards and Honours Zone*

# VAYU on-the-spot report

## Visit to the INS Kursura Museum

The INS Kursura served as a Kalvari class diesel electric submarine lending its glorious service to the Indian Navy for more than four decades. India's fourth submarine, it was commissioned on 18 December 1969 and served till its decommissioning on the 27 February 2001. The submarine was then converted to a museum where it now sits, singing praises of its days of glory gone by, at the side of a calm ocean off the coast of Visakhapatnam.

As one lands at the airport, they are welcomed by the calm environment and breezy winds forming a mist on your car's window as you drive past the views of the Eastern Ghats. The museum is located at the jovial and lively location of RK Beach at Vizag. One can see people wondering about, lovebirds roaming on the beach, with ice cream vendors and food trucks satiating the hunger of the tourists playing on the beach.

The Submarine sits on a piece of concrete, flaunting its mammoth size of 300 ft in length, a beam of 25 ft and a draught of 20 ft. At a displacement of 2,475 tonnes, it is a humble machine in comparison to today's submersibles often comparable in size to a small island but one that, for its time, was more than capable in size and submersible ability.

With Vizag hosting a triad of Naval Museums, a ticket at INS Kursura can



bear the cost of 70 Rupees for an adult or 140 Rupees for a combined ticket to all three museums. The visitor, however, would have to pay an extra charge of 50 Rupees in order to capture the memories of their visit on a camera.

As one walks past the ticket counter, the submarine can be seen touching its length with the sky above and comes ready with a convenient entrance at

the starboard side of the hull. The front of the ship displays its torpedo tubes with dummies installed for the viewer's delight. As one enters the ship through the starboard side, they are immediately greeted with the experience of what it might feel like to serve in a submarine floating below the waters. The ship gives ample context for the same, with barely any headroom to stand straight in, mechanical instruments and valves cramped into every nook and cranny and thin corridors, claustrophobia hits the visitors mind as the first emotion upon entrance.

The gallery at start displays torpedo tubes as well as an information board describing the exit procedure through the torpedo tubes in case of an emergency. Beside the tubes, lies on display an atmospheric diving suit which resembles equipment written about by many a fictional writers. As one climbs down to another thin corridor, they are greeted by the living quarters and rooms of the captain, other officers and sailors as well as a display of the dining room, the lavatory as well as a small mess possessing awards and gallantry earned by the ship during its days at sea.

Continuing further, the middle of the ship comprises its navigational room and the main control centre hosting







sonar equipment, the captains steering as well as the ship's main entrance through the thin shaft up top. Post the operational area of the ship lies the engine room, which happens to be the only area of the ship where in one could stand without their heads constantly bowed down and a straight back. The engine room hosts three Kolomna 2D42M diesel engines along with the batteries the engines charge in order to submerge into the vast depths of the ocean. One can almost hear the constant whirring and vibrations produced by the engine while in this room.

Moving forward, the 300 ft of the ship's length comes to an end with an exit placed to enter back into civilisation. Upon exiting, one can catch a final glimpse of the submarine and its propellers placed at the stern, bidding you adieu, as you walk towards the main exit and onto the bustling city roads of Visakhapatnam. ➡



*Article and photos by Puranjay Chawla*



# VAYU on-the-spot report

## Visit to IAF's Heritage Centre, Chandigarh



*Heritage Centre from outside*

### The experience of a visitor

As one tears up the miles, moving past the luscious viridescent farmlands of Punjab while sipping on their hot tea, in the slightly wobbly train, they soon reach the elemental planned city of Independent India which now hosts the first Indian Air Force Heritage Centre of the nation.

As one steps onto the slightly crowded platform, they are greeted with fresh air, a privilege for metro city folks in contemporary times. Moving out of the station at a leisurely pace and hopping onto a primordial, yet tidily kept rickshaw, the city welcomes you with its salubrious environment, wide open roads and neat traffic in contrast to the war-like traffic conditions we might have to deal with otherwise.

After a 15-minute long rickety ride, aviation enthusiasts would be euphoric to witness the sight of a Folland Gnat, mounted atop a pole as if trying to shout from the height, telling the entire city of its glorious past as the 'Sabre slayer.' The Indian Air Force Heritage Centre sits adjacent to the model of the Gnat, serving as a welcome board and indicator of the Museum from afar. The heritage centre was first conceived as an idea when it was felt that a modern

museum, with the attractions of today, should be instituted as a gateway for the people of India to understand and gain information on the glorious past, present and future of the IAF.

When the ribbon of the centre was customarily cut by the Defence Minister on 8 May 2023, it charmed defence and aerospace enthusiasts from all over the country to flock to the western city.

Upon entering the museum, the visitor finds a neatly kept building, painted in maroon and white with a MiG-21, which served in the Kargil war parked outside. Upon entering the structure, the visitor will be spellbound to see what is perhaps the best collection of aircraft models, the history of the Indian Air Force and, uniquely, simulators to get a taste of the enthralling experience of flying a multi-million dollar machine.

The gallery is divided into an indoor and outdoor exhibit, each hosting a number of models, retired engines and full aircraft for the visitor's amazement. The cost of a ticket stands at a modest 50 rupees for general attendance which can be purchased on the spot, and at 345 rupees inclusive of the experience of a simulator which has to be pre-booked online. The museum can be visited on

all days of the week apart from Monday. The visitors can also treat themselves to souvenirs from the museum shop as well as priceless memories to be cherished.

### The indoor gallery and models

As the visitor moves past the model of an LCA Tejas, they are greeted by the entrance of the interior gallery. The gallery boasts of the history of the Indian Air Force, its strides towards modernisation and hints towards its plans for the future. Key exhibits in the indoor gallery include models of all current serving aircraft of the IAF, including its helicopter and transport fleet as well as a model of the still under-work Tejas Mk.II project. The exhibits also include models of armament the IAF uses, with state of the art missiles such as the BrahMos NG on display. Pictures and recreational models of glorious operations conducted by the force ranging from the recent Balakot airstrikes to operations during the numerous wars from Kargil to the Bangladesh Liberation war and the 1965 Indo-Pak war also find their place in the gallery. The indoor gallery also boasts of exhibits displaying the gallantry award winners of the IAF, their personal belongings and deserving medals. The gallery proudly owns the title of 'AtmaNirbhar Bharat' with exhibits earning a special tag for the machines of war developed, designed and manufactured in India.

### Outdoor Gallery

The very first outdoor exhibit one can find at the heritage centre is a MiG-21M (T/No.C1592) on the podium. The aircraft once served the 108 "Hawkeyes" squadron which played



*Night visit*





***Su-30MKI simulator***

a significant role in the Kargil War, conducting multiple strike missions against the hostile fortifications in the hills. Entering the main building, one can first find the HAL Prachand Light Combat Helicopter (LCH) model. The entry alley has war paintings on both walls and aircraft models hanging off the ceiling. Exiting the alley, in the corridor one can find more miniature models of the aircraft as well. Models

## Recreations

The indoor gallery had numerous miniature recreations of some daring and terrific operations carried out by the Indian Air Force so far, starting from the Sargodha air raid of the 1965 war where Indian Gnats, Canberras and Mysteres conducted a decisive late-night air strike against Pakistan Air Forces' Sargodha airbase, which housed a fleet of F-86 Sabre. Similar recreations were made for other operations conducted throughout multiple conflicts, including the 2019 Balakot air strike in which Mirage 2000s bombed a JeM training camp located in the Khyber Pakhtunkhwa province of Pakistan. All the recreations featured lighting and sound effects for glorified representation which served as a visual treat for the visitors.

## Simulators

Being the centre of attraction at the venue, the simulators should not be missed by any aspiring visitor and



***Jaguar simulator***

of LCA Tejas Mk1, recently ordered C-295 medium transport aircraft and Tata ALS-50 are easily catchable. Apart from the already well-dawned corridor, a wall beside the entrance is very distinct since it boasts the models of all the aircraft which served the Indian Air Force since its inception. Moving onto the courtyard which has multiple real aircraft on display including the Deepak trainer aircraft and MiG-23MF, which was retired from service in 2009. Apart from the flying machines, other elements which are integral to aviation, including a variety of bombs and most importantly, jet engines, like the RD-33, used by MiG-29B "Baaz" were also on display.

they should book their slots in advance with the immersive ticket. There are two simulator setups right now, one for Jaguar and the other for Su-30MKI. One can find the integration of various hardware, like throttle, flight stick and rudder pedals to offer the experience of the elements which are used in real flying. The museum also boasts of the cockpit of a real MiG-21M which can give the visitor an experience of what it feels like to sit inside a fighter cockpit bogged down by all the systems and switches in every direction. Overall, the cockpit experience should not be missed at any cost by the visitors as it is an experience unrivalled by any public institution within the nation. ➡



***MiG-21 cockpit and HUD***



***Model of a Tejas Mk.II***



***Strides towards modernisation and network-centric warfare***



***Women officers of the IAF***



***Model of a DRDO SAAW***



***Article by: Rishav and Puranjay Chawla  
Photos by: Puranjay Chawla and Rishav***





*RD-33 engine (MiG-29/29UPG)*



*Mikoyan Gurevich MiG-23MF on display*



*LCA Tejas Mk1 and Tata ALS-50 loitering munition*



*Tribute for Marshal of the Air Force Arjan Singh*



*The Souvenir Shop*



*Model of a Folland Gnat outside the Museum*



*Kanpur I vintage prototype aircraft*



# VAYU on-the-spot report

## Visit to the Sea Harrier Museum, Vizag

It was in December 2020 when it was decided that the prestigious memorial and cultural centre of Rajiv Smruthi Bhavan would receive a facelift for its conversion into a dedicated museum based on Sea Harrier combat aircraft. The structure was once devastated by Cyclone Hudhud in 2014. However, its fresh look can surely arouse any visitor or passerby of Beach Road. The Sea Harrier Museum is located within walking distance of the INS Kursura Submarine Museum and Tu-142 Aircraft Museum at RK Beach Road. The building also sports multiple markings associated with the Jump Jet, like the INAS 300 'White Tigers', the squadron it served in throughout its 33-year service cycle. For entry, the ticket price for adults cost Rs.70 while for children, it is Rs.20. Upon entering, one can navigate through the gallery enriched with multiple exhibits.

### Models on display

The Sea harrier Museum boasts of a rich history of not just the aircraft, but the Indian Naval Aviation arm in its entirety. The information boards on display cover the lifespan of the two illustrious fighter squadrons of the Navy INAS 300 (White Tigers), INAS 303 (Black Panthers) and INAS 310 (Cobras). The Museum has been divided into 3 distinct floors, each hosting a



*Model of a Hawker Sea Hawk*

separate affair of information on display.

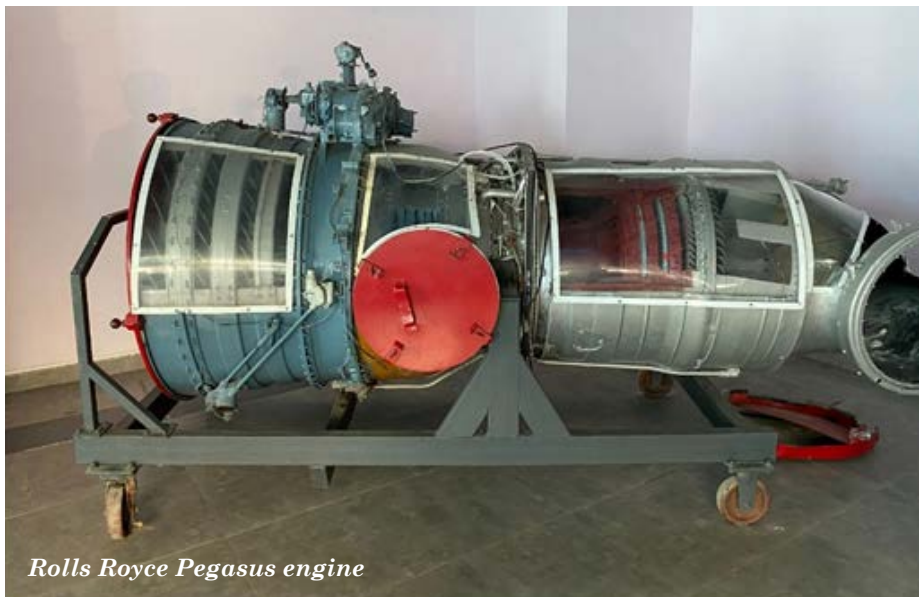
The ground floor display starts with the description of Naval Aviation, its history all through the world and the birth of Indian Naval Aviation as we know it today. It possesses various information boards starting the history of the fighter squadrons in service with the Navy as well as the models of all aircraft carriers which have served our nation, be it INS Virat, Vikramaditya

or the new age IAC-1 or INS Vikrant. Interestingly, a model of the concept on INS Vishal, along with its EMALS launching system instead of a ski-jump was also on display.

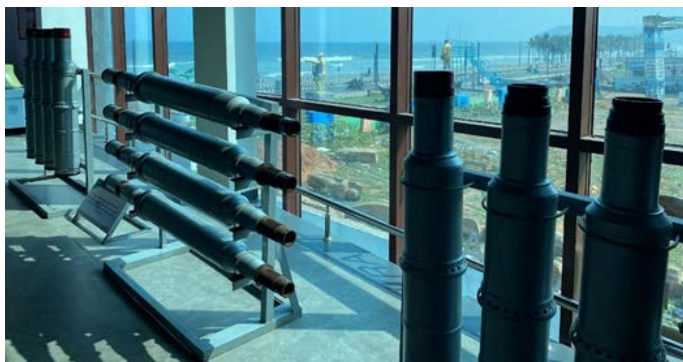
Moving upwards through a ramp to the first floor introduces the viewer, now with ample context on naval aviation, to the Sea Harrier. The mighty V/STOL aircraft belonged to the family of planes which developed the idea of vertical take off and landing. On display on this floor are information boards describing the development process of the aircraft, the need for such an intricate engineering solution as well as how the Indian Navy came to operate the Sea Harrier's.

Moving onwards, the next section of the Museum is solely dedicated to the component of the aircraft which made the magic possible, its thrust vectoring engine. The mighty Rolls Royce Pegasus brought the idea of a completely thrust vectoring engine into fruition using not one, but multiple thrust vectoring nozzles as an exhaust for the engine. Using multiple nozzles allowed the aircraft to be steered in any which way desired, including the availability of vertical take off and landing.

The last and final floor of the museum flaunts a decommissioned Sea Harrier slung through metal wires adorning the roof as a crown jewel and a beautiful



*Rolls Royce Pegasus engine*



**Disassembled refuelling probe**



**The Blue Fox radar**



**Fuel pods**

chandelier. Alongside the model of the aircraft, on display are the armament it carried alongside, its Ferranti Blue Fox radar and ejection seats.

## Info boards

Apart from models and pictures, the museum is also filled with multiple information boards. Many original components of the aircraft, including the Ferranti Blue Box radar were on display, which was replaced by Elta EL/M-2032 during a mid-life upgrade. One was on the entire History of Harriers as an “invincible jet”, then on maintenance of the aircraft to keep it fit for active service. Speaking of active service, the MiG-29K also had its own info board, describing the modern generation capabilities it brought along with itself in 2010 when it was inducted into Indian naval service. While exploring the info boards, we managed to find an interesting tale from the year 1989

when an Indian Navy Sea Harrier had intercepted at least one US Navy F-18.

The INS Viraat with its INAS 300 “White Tigers” squadron, flaunting the Sea Harrier, was on a patrol in the Northern Arabian Sea, not too far from Pakistan’s coast. The radar was buzzed by an unidentified aircraft flying at high speed. It was then one Sea Harrier was quickly scrambled to identify and control the aircraft. Shekhar Sinha (who retired as Vice Admiral in 2014) took off as “Tiger Leader” and climbed towards the bogey. While flying low, he had no radar contact with the bogey himself but was directed by the control station. Flying after 80 miles, he observed an aircraft flying high, which was unaware of the Harrier’s presence. Sinha pulled up and climbed at full speed until it managed to get on its tail. The F-18 Hornet was not supersonic at the time and Sinha established radio contact with the American pilot. As Harrier was bingo fuel and other Harriers were also in pursuit, Sinha went cold and other Harriers took up from there to escort the F-18 until it landed on its home carrier: USS Enterprise, which was also apparently operating in the vicinity.

There are many pictures associated not just with the Sea Harrier, but also with the other elements of naval aviation. One such is the aircraft carrier, which is a force multiplier for any

naval aviation arm. Indian Navy has experienced operating carriers since the early 60s, starting with British Majestic class Vikrant and going on up to its recent indigenous INS Vikrant. Multiple models and pictures are also showcased around the place, as described earlier.

## Simulator!

While the content-rich halls had already impressed us enough, we caught sight of another point of interest. Hiding in its own room was the simulator itself! What was more surprising is that it was not a low-cost setup, where hardware was purchased and screens were installed, playing video games. But in fact, it was the actual simulator that was once employed for the training of pilots and ground engineers. The airframe replica was already there along with the platform, the works were still undergoing to install screens and boards which will complete the setup. This is confirmed by one of the officials



**Sea Harrier**



**Bomb carriers**



**Ejection seat of the Harrier (MB MK 10 H)**



serving as an advisor for the Sea Harrier Museum. Once successfully deployed and starts operation, Vizag will have the privilege to host the first such museum in India that will flaunt a simulator of this complexity.

All these elements, whether we talk about the exhibits or even the aesthetics of the museum, should be on the “must-visit” list of aviation and naval enthusiasts around the country. ➡

**Article by Rishav and Puranjay Chawla**

**Photos by Puranjay Chawla and Rishav**



*Night Lights glaring the Museum*



*Sea Harrier Museum Logo*



*Harrier: The Invincible Jet, a tribute to Harrier and its services to the Indian Navy*



*Lakshya Target Drone*



*Bonjour! Sea Harriers in formation with French Air Force Mirage 2000*



*Jump Jet making the jump*



*Sea Harrier Model*



*Different Branches, Same Commitment: Aviators from Indian Air Force and Indian Navy*

# VAYU on-the-spot report

## Visit to the BrahMos Museum, New Delhi

Within the premises of the BrahMos Head Office in Cariappa Marg at New Delhi, there lies a very beautifully adorned museum dedicated to BrahMos Aerospace, cruise missiles, Indo-Russian friendship and India's renowned scientist and former President, Dr. APJ

Abdul Kalam. It boasts a track of major milestones and events associated with the missile and the company. ➡

Photos/text by Rishav and Pratisht Chaudhry



*One of the many exhibits*



*Land-based Transporter Erector Launcher (TEL)*



*Replica of sea and land based BrahMos outside the head office*



*Tracking the missile's succes*



*Dramatic photo of Su-30MKI with BrahMos and replica of Submarine Based Weapon Complex*





*Su-30MKI replica with 1x BrahMos-A (centreline) and 2x BrahMos NG (underwing)*



*Replica of a land-based BrahMos regiment configuration*



*Airborne Launcher of BrahMos ALCM*

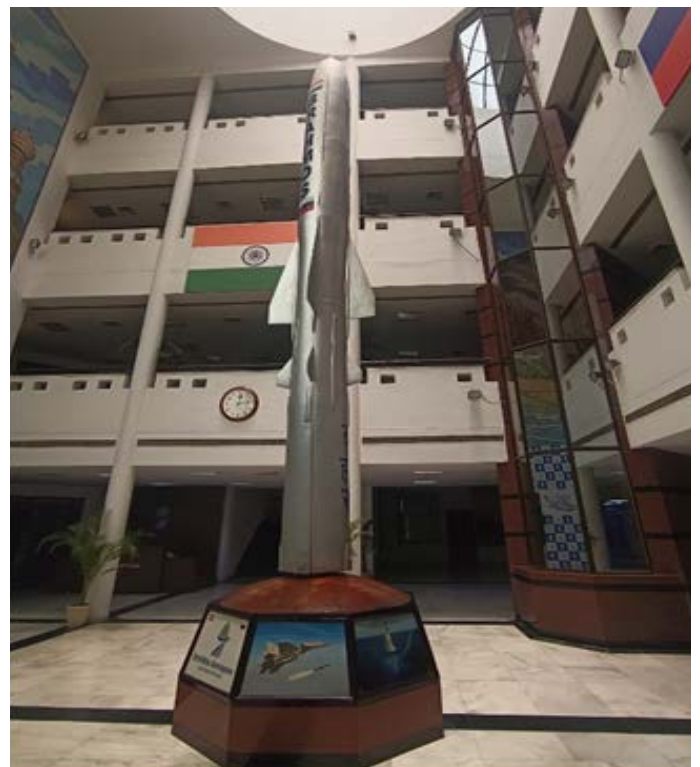


*BrahMos ship-based configuration*



*Awards and Recognitions*

*BrahMos submarine based configuration*



*Standing Strong! In the centre of the headquarters.*

# 25 Years of BrahMos



As the 21st century has already made it through the halfway of 2023, BrahMos Aerospace is also delighted to mark its 25th year of existence. It was 12 February 1998 when the company was founded to give new wings to the Indo-Russian friendship, collaborating between India's Defence Research & Development Organisation (DRDO) and NPO Mashinostroyeniya (NPOM). The vision of the Indo-Russian Joint Venture (JV) was to develop and produce state-of-the-art cruise missiles to cater to the requirement of a standoff strike solution. In its 8 month schedule, starting from 12 June 2022 to 12 February 2023, BrahMos Aerospace organised several events to interact with key allied sectors. The events included:

**Industry Partners Meet** – To acknowledge and highlight the invaluable contributions made by the JV's key Industry Partners as part of the Missile Manufacturing Industry Ecosystem within the country.

**User Interaction Meet** – To acknowledge the contribution and professionalism of the Indian Armed Forces operating the world's best supersonic cruise missile system.

A National level Competition on cutting-edge technology and its application in Missiles & Aerospace field was held with an aim to orient and nurture young talent in the field of Missile Technology.

The Industry meet was attended by several key personalities of the Indian Armed Forces, which included Chief of Defence Staff (CDS) General Anil Chauhan who graced the occasion along with Chief of Air Staff (CAS) Air Chief Marshal VR Chaudhari, Chief of Army Staff (COAS) General Manoj Pande and Vice Chief of Naval Staff (VCNS) Vice Adm Sanjay Jasjit Singh.

"It was the visionary scientist Dr. Kalam who played a pivotal role in giving shape to the BrahMos JV at a time when the lethality, formidability

and indomitability of precision-guided weapons in modern warfare was becoming evident," Mr. Rane stated while adding that Padma Shri and Padma Bhushan Dr. AS Pillai, the founding CEO & MD of BrahMos, led from the front to accomplish what was unthinkable for many leading nations at that point of time.

"Our supersonic journey of 25 incredible years has resulted in many 'firsts' for India. Over 100 test firings of BrahMos have been conducted from India's ground, ship and air platforms, both development trials and user/acceptance trials, with an unbeatable success rate," the BrahMos Chief stated. "Our strong commitment to be an equal shareholder with our Armed Forces in maintaining the BrahMos Weapon System(s) remains our paramount motto," he added.

Dr. Sanjeev K Joshi, Deputy CEO of BrahMos, concluded the mega event by thanking the Chief Guest, the Guests of





Honour, officers from the Indian Armed Forces, scientists and engineers from DRDO and NPOM and other esteemed guests. “Thanks to the Indian Armed Forces for appreciating our after-sales Product Support. We assure best quality product support not only in peacetime, but also in wartime,” Dr. Joshi concluded.

## About BrahMos cruise missile

The need for cruise missile systems in India was highlighted after the Gulf War of 1990s, as a result, Dr. APJ Abdul Kalam who was then the Scientific Advisor of India and Russian Defence Minister N.V. Mikhailov signed an inter-governmental deal to establish BrahMos Aerospace in 1998. The BrahMos joint venture was aimed to design, develop, manufacture and market only supersonic cruise missile systems. The aim of BrahMos was further propelled by the personal aspirations of Dr Kalam who wanted to give the Country such a platform where it could proudly recognise the fact that India was the first nation in the world to develop such technology.

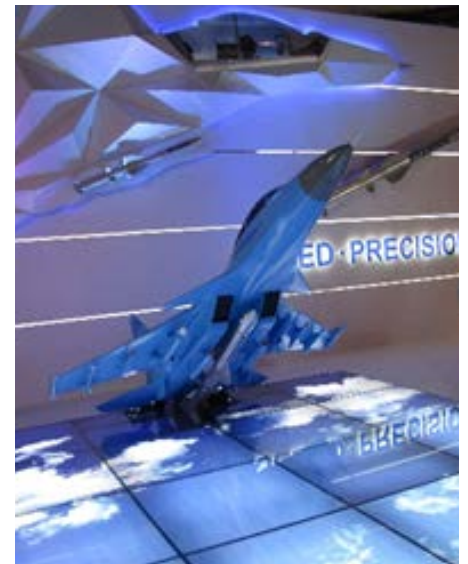
BrahMos series of cruise missiles is the primary product to be introduced by the JV. The design of the approximately 3-ton land and ship-based variant of the missile is derived from P-800 “Oniks” missile currently in service with Russian forces. The Indian variant integrates within itself a significant proportion of indigenous components (nearly 70%) designed to match the enhancement

required by Indian strike forces, which includes increased precision, effective strike range and robust navigational ability to carry out error-free pounding on the target.

The first test was conducted on 12 June 2001, and since then, it has gone through a series of upgrades and modifications as required by different wings of the Indian armed forces at different points in time. The current BrahMos missile is a ramjet-powered supersonic cruise missile with the capability to reach speeds as high as 1 km/second. The mighty speed

of BrahMos combined with its huge warhead carrying capacity provides it with much-needed momentum to even pierce through the largest of ships. The missile is further difficult to intercept due to its high speed, robust electronic counter-countermeasure system and terrain hugging/sea skimming ability. The hypersonic variants of the missiles are planned in the future with a scramjet propulsion system under the project of BrahMos Mk.2. The BrahMos Mk.2 is expected to be the fastest hypersonic missile in the world and would provide unmatched capabilities in the region.





## 25 years of excellence and achievements

Over the course of two plus decades, BrahMos Aerospace has achieved numerous remarkable milestones and accomplished several “firsts” within the country. As the company embarks on its next phase, it has commenced work on a cutting-edge manufacturing centre for BrahMos missiles in Lucknow, Uttar Pradesh, as part of the UP Defence Industrial Corridor (UPDIC) Project.

On 3 June 2022, the Prime Minister Mr. Narendra Modi initiated the ground breaking ceremony for all major industrial projects under UPDIC, which includes the establishment of a dedicated BrahMos facility. This facility will be responsible for the design, development and production of the highly advanced BrahMos Next-Generation (NG) weapon system.

BrahMos Aerospace has been allocated approximately 80 hectares

of land in Uttar Pradesh for the construction of this new manufacturing centre, with an initial investment of Rs. 300 Cr. The company aims to complete all manufacturing-related tasks for the facility by mid-2024. Once fully operational, the dedicated centre will have the capacity to produce 80–100 BrahMos systems annually.

Progress is also being made on the development of the BrahMos-NG missile, which is expected to enter serial production within the next three to five years. The establishment of the BrahMos-NG manufacturing centre will strengthen the Missile Industry Consortium in India and contribute to the growth of the defence ecosystem in high-end missile technology. It will also position India as a leading defence technology hub globally.

The supersonic cruise missile has already been successfully integrated into all three branches of the Indian Armed Forces, including the Indian

Navy in 2005, the Indian Army in 2007 and the Indian Air Force in 2020.

In a significant breakthrough for India’s military exports, the world-class BrahMos missile became the first full-scale weapon to be exported to a responsible and friendly nation. On 28 January 2022, BrahMos Aerospace signed a historic contract with the Republic of the Philippines to supply shore-based anti-ship BrahMos systems to the Philippine Navy. This achievement highlights BrahMos Aerospace’s role as a proud ambassador of ‘Make-in-India’ and ‘Design-in-India’, as it now embarks on the mission to ‘Make-for-the-World’ a notable first for the joint venture and a proud moment for India.

This multi-million-dollar export deal for BrahMos missiles sets the stage for India’s aspiration to become a top-tier military manufacturer and exporter in the world in the coming years. ➡



Article by: Pratish Chaudhry (R) and Rishav  
Photos: The Vayu Team



# Bastille Day 2023, France

107 years later....

..... “Wiped out from Hollywood, Indian soldiers to march in Paris during Bastille Day Parade”



*History repeats! Punjab Regiment troops of Indian Army embarks on journey to France to take part in Bastille Day Parade on 14 July 2023. Photo 1: Indian soldiers rehearsal for the parade in Delhi before embarking. Photo 2: French lady pins flower on the chest of a middle age agile Sikh soldier after defeating Germans in France during WW-I (1916).*

Indians, particularly those interested in military history, were miffed when the 2017 Hollywood Film, ‘Dunkirk’ was released worldwide and became an instant blockbuster. Based on the Battle of France, fought during World War II and evacuation of Allied soldiers from Dunkirk, a coastal city in Northern France, Indians were disappointed on western media to continuously wipe out from the history the role Indian soldiers (of erstwhile British Indian Army) had played both during the First World War and then the WW II.

Dunkirk was not the first or the last Hollywood movie on military history which has completely ignored role British Indian soldiers had played in the European wars.

Notwithstanding the myopic view of western media, an iconic black and white picture of a French lady pinning flower on an Indian soldier became viral on social media at the same time during the release of ‘Dunkirk’. This picture belonged to the First World War when Indian soldiers, of British Indian Army, had saved France from falling in the hands of Germany (1916). After winning the war, the Indian cavalry soldiers were marching on the streets of France as a mark of victory (parade) when the French lady out of exuberance and gratitude pinned a flower on the chest of one of the middle aged soldiers.

“I don’t think any chest is being pinned. In our Regiment (Sikh Regiment) the caption of the photo is a lady touching (and welcoming) a Sikh soldier in Marseille,” stated Brig Sandeep Thapar (Retired) who had served Indian Army as Deputy DG in StratCom (ADGPI) and belonged to the Sikh Regiment. This picture along with other WW I pictures are kept in the Regimental Centre records of Sikh Regiment.

Since the soldiers were wearing turbans, everybody believed them to belong to Sikh or Punjab Regiment. But as per the military historian Mandeep Singh Bajwa, “The soldier whose chest was pinned by French lady was none other than

Risaldar–Major Ganga Dutt of Haryana who belonged to the Indian Cavalry Corps.” Other soldiers were too of the same corps marching on the streets of France (Marseilles) after withdrawing from the battlefield. “Till the Independence of the country, all the Indian soldiers wore the turban. That’s the reason Risaldar–Major Ganga Dutt is confused to be a Sikh soldier”, Bajwa adds.

Wheel of history has completed a full circle after more than a century, precisely 107 years later, when the soldiers of the Punjab Regiment (of course now part of Indian Army) embarked on a journey to France to take part in the infamous Bastille Day parade in the French Capital Paris on 14 July 2023.

This year, the Prime Minister of India, Narendra Modi was invited by French President, Emmanuel Macron as the Guest of Honour at the Bastille Day Parade or Fête Nationale Française (the French National Day). It is known as the Bastille Day as this day is the anniversary of Storming of the Bastille in 1789 during the French Revolution.

“The Bastille Day parade will witness a 269 member tri-services contingent of the Indian Armed Forces (army, air force and navy) marching alongside their French counterparts. The contingent has left for France”, stated Colonel Sudhir Chamoli, Spokesperson of the Indian Army, in Delhi. The Indian contingent is visiting France at a time when Paris and other cities have been reeling under week long riots and arson.

“The association of the Indian and the French Armies dates back to World War I. Over 1.3 million Indian soldiers participated in the war and almost 74,000 of them fought in the muddy trenches to never return again, while another 67,000 were wounded”, said the Indian Army in an official statement. “Indian troops valiantly fought on French soil also. Their courage, valour and supreme sacrifice not only thwarted

the enemy but also significantly contributed towards winning the war”, it added.

“The Army contingent in Paris is represented by the Punjab Regiment which is one of the oldest Regiments of the Indian Army. The troops of the Regiment have participated in both the World Wars as well as the post-independence operations”, stated the Spokesperson. The Indian Army contingent of 77 marching personnel and 38 members of the Band was led by Captain Aman Jagtap. Indian Navy contingent was led by Commander Vrat Baghel and the Indian Air Force contingent by Squadron Leader Sindhu Reddy.

In World War-I, troops of the Punjab Regiment were awarded 18 Battle and Theatre Honours.

The gallant soldiers fought in Mesopotamia, Gallipoli, Palestine, Egypt, China, Hong Kong, Damascus and France. In France, they took part in an offensive near Neuve Chapelle in September 1915 earning the Battle Honours ‘Loos’ and ‘France and Flanders’.

Later, World War II witnessed a whopping 2.5 million Indian soldiers making significant contributions in various theatres of the war from Asia to Africa and Europe. This also included the battlefields of France. The Indian troops established their valour in these wars which was well recognised in the form of several gallantry awards being bestowed on the Indian soldiers. In World War-II, soldiers of the Punjab Regiment had earned 16 Battle Honours and 14 Theatre Honours.

This year, both India and France are celebrating 25 years of ‘Strategic Partnership’. The armies of both the countries have been participating in joint exercises and sharing their experiences. Over the years, India and France have become reliable defence partners with Indian Air Force (IAF) operating 36 French Rafale fighter jets, procured in a G2G (Government to Government) deal inked in 2016. The deal was himself announced by PM Modi during his first visit to Paris in 2015 as Prime Minister. IAF also operate French Mirage 2000 fighter jets which had carried out an airstrike on the training camp of terrorist organisation Jaish-e-Mohammed (JeM) in Balakot area of Pakistan in Feb’ 19 in the aftermath of Pulwama terror attack.

“Many Indians like Linker, Shivdev Singh, HC Dewan and Jumbo Majumdar have fought over the skies of France during the world Wars,” stated IAF Spokesperson Wing Commander Ashish Moghe. “A flying contingent of 4 IAF Rafale fighter jets, 2 C-17 Globemasters and 72 air-warriors will participate in fly past and marching in Paris on Bastille Day this year,” Wg Cdr Moghe added.

France has also helped the Indian Navy in making six Scorpene class submarines at Mazgaon Dockyard (in Mumbai). Five of these Scorpene submarines viz Kalvari, Khanderi, Karanj, Vela and Vagir have already been commissioned in the Indian Navy while the sixth and the last Vagsheer is undergoing sea-trials these days.

“The Navy team in Bastille Day parade will comprise of four officers and 64 sailors. The contingent will be led by Cdr Vrat Baghel who is a specialist in gunnery and missile warfare and has sailed on the French ship BCR Var during Exercise Varuna



In Marseilles and through the French village they passed, there was much excitement among the population. young, old, men and women flocked to meet them

(between Indian and French navies),” stated Indian Navy Spokesperson Commander Vivek Madhwal. “To commemorate the event (Bastille Day) the Indian Navy will also be represented by INS Chennai, indigenous guided missile destroyer, which will be deployed to France from 12-16 July,” added Cdr Madhwal.

All eyes are again set on PM Modi as the Indian Navy is vying for 26 carrier based fighter jets for its indigenous aircraft carrier, INS Vikrant. Again, French Rafale (M), the marine version of IAF Rafale, is contending for this deal with US fighter jet F/A-18 Super Hornet. Also in line is the manufacture of engines of indigenous stealth AMCA (Advanced Medium Combat Aircraft) under PM Modi’s flagship programme, ‘Make in India’. It is believed that French aviation giant Safran is willing to manufacture aircraft engines (both fixed and rotary) in India—though no official word has come from either side.

“The Rajputana Rifles Regiment Band is also accompanying the tri-service contingent to France”, stated Colonel Chamoli. The Regiment is the senior most rifle regiment of the Indian Army. Most of its battalions have a long and glorious history. They have taken part in some of the bloodiest battles in many theatres of the world. They have demonstrated exemplary contribution in both World Wars. During World War-II, the battalions of the Rajput Regiment fought in every theatre where the Indian Army was involved. They are the recipients of six Victoria Cross prior to independence. The band of the Regiment was raised in 1920 at Nasirabad (Rajasthan) during the British era. ➡



**Article by Neeraj Rajput (Defense Journalist and War Author)**

Twitter @neeraj\_rajput

The black/white photos have been shared by Brig Sandeep Thapar, Ex Deputy DG, StratCom, Indian Army.



# Rosoboronexport summarises results of its activity at Army 2023 Forum



**D**uring the business programme of the Ninth Army 2023 International Military and Technical Forum, Rosoboronexport (Rostec State Corporation) held more than 80 meetings and negotiations with delegations from more than 40 countries.

The total area of Rosoboronexport's exhibit at Army 2023 exceeded 2,300 square meters, enabling the company to increase the number of products presented. The company showcased more than 250 pieces of military equipment developed and produced by Russian defence companies for all services of the armed forces at 6 locations of the forum. Rosoboronexport told its partners about the advantages of Russian weapons and military equipment, which have undergone upgrades taking into account feedback from the zone of the special military operation in accordance with the missions performed.

"In 2023, Rosoboronexport organised a tight business agenda on the sidelines of the Army Forum. We held

presentations of 350+ Russian military, dual use and civilian products for delegations from more than 30 countries. We signed several export contracts worth about \$600 million, discussed with our partners the development of bilateral military-technical cooperation and saw their great interest in industrial partnership projects. We reached agreements on joint production of Kalashnikov assault rifles, armoured vehicles, guided missiles, as well as the installation of Russian remote weapon stations of various calibers on partners' combat platforms on their premises," stated Rosoboronexport Director General Alexander Mikheev.

In 2023, Rosoboronexport unveiled a reconnaissance-fire system at its outdoor display area. It included reconnaissance unmanned aerial vehicles, an artillery unit's reconnaissance and control system based on the Planshet-A mobile automated artillery fire control and the 1B75E sound and thermal ranging systems, as well as artillery weapons: the Msta-S self-propelled howitzer and the 2S31 Vena self-propelled artillery gun. A layered counter-UAV system comprising air defence and electronic warfare assets was also on display.

The company's partners showed keen interest in the MiG-35, Su-57E, Su-35, Su-34 and Su-30SME combat aircraft, Ka-52E helicopter, modernised Mi-28NE, Mi-171Sh, Ka-226T and Mi-35P helicopters, as well as Orion-E, Orlan-10E and Orlan-30 UAVs and counter-UAV assets.

Russian air defence equipment, considered the best one on the world market, attracted particular attention of foreign delegations at Army 2023. Upon requests from partners, Rosoboronexport presented the S-400 Triumf, S-350E Vityaz air defence missile systems (ADMS), Viking SAM system, various versions of the Buk and Tor SAM systems produced by the Almaz-Antey Corporation, as well as products from High Precision Systems, a subsidiary of Rostec – Pantsir-S1 and Pantsir-S1M self-propelled anti-aircraft gun/missile



(SPAAGM) systems and their naval version – the Pantsir-ME AAGM system, which has recently successfully passed official tests and is being installed on Russian ships, as well as the Verba and Igla-S MANPAD systems.

In the segment of Ground Forces equipment, Rosoboronexport briefed foreign customers in detail about

was published using virtual reality technologies and with the possibility of an integrated switching from a general overview of exhibit items to getting more detailed information about them.

“The Army Forum plays a huge role in facilitating Russia’s military-technical cooperation with foreign countries through the demonstration of new Russian weapons and military equipment to partners. The ratio between new Russian products on the world market and those produced today is expected to reach 90–10 in 2030”, stated Alexander Mikheev in his report to Russian Defence Minister, General of the Army Sergei Shoigu at the Army 2023 Forum. “Among the leaders of growth in the near and medium term, Rosoboronexport sees the Su-57E fifth-generation fighter, IL-76MD-90A(E) military transport aircraft, Ka-52E scout/attack helicopter, S-350E Vityaz ADMS, Pantsir-S1M SPAAGM system, Project 22356 frigate, TOS-2 heavy flamethrower system and others.”

In addition to demonstrating Russian products to customers at the forum, Rosoboronexport visited the exhibition areas of foreign partners participating in Army 2023. Alexander Mikheev appreciated the exhibits presented by China, Iran and India. ➡



Russia’s T-90 and T-72 MBTs, tube, rocket and missile artillery systems, including the Msta-S SP howitzer, Tornado-S and Tornado-G multiple rocket launcher (MRL) systems, Tigr, Spartak and Typhoon-K MRAP vehicles, Kornet-E and Kornet-EM ATGM systems, small arms, close combat weapons and inflatable mock-ups of military equipment. The partners highly appreciated the performance of the Nakidka camouflage system unveiled for the first time, which successfully hides armoured vehicles from optical and thermal observation in combat conditions.

Rosoboronexport also carried out active marketing work on its digital platforms. In particular, 40 video announcements and presentations of the products showcased at the forum were prepared for posting on the company’s official website, on Rosoboronexport RuTube and YouTube channels, as well as in social networks. An interactive tour of the exhibition







*All photos are from Rosoboronexport displays*



# Rubin Design Bureau at Army 2023

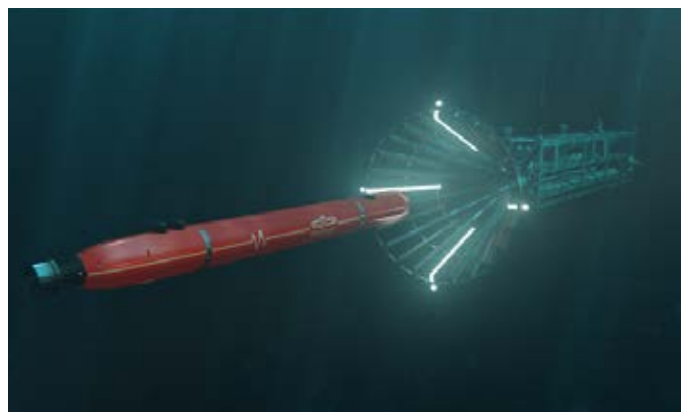
## Rubin demonstrates Robotic System for Seismic Prospecting

At the Army-2023 show, Rubin Design Bureau presented a concept design: a group of autonomous unmanned underwater vehicles (AUVs) for offshore geophysical surveys. Concept design development is at the R&D stage. This system shall ensure seismic prospecting activities during any season and at any sea state including severe ice conditions.

The designed system includes a group of small vehicle-receivers and one large vehicle-emitter of seismic signals. Group of AUV-Receiver (200 or more small underwater drones) is transported in the depot module at the support vessel. When arrived at the target point, the depot module submerges and the Receivers leave the module and operate according to the stored programme. The bottom beacons and single small AUVs in the group that are provided with leader function ensure positioning. The entire group of AUVs is controlled from the support vessel.

This system would allow extending the range of geophysical surveys and developing new technologies of offshore seismic prospecting. Seismic arrays of various format and at various depth extend the range of detected signals.

Large robotic Emitter generates acoustic impulse penetrating the seabed. This impulse propagates through the Earth's crustal structure and the recorders in AUV-Receiver detect the response. This is how location of hydrocarbons and structure of their bedding is found. Two hundred small robots would cover the area up to 600 thousand sq.m. with endurance of the vehicles being up to 12 hours. The control system capacity allows operating up to one thousand of AUV-Receiver to meet customer's requirements for extensive exploration.



The vehicles are designed to perform both local seismic surveys (i.e. analysis of general features of the block) and detailed 3D-surveys to facilitate selection of the best locations for well drilling. This Rubin's development would enable year-round seismic surveys in the Arctic Regions with 9 to 10-month ice cover season.

Besides, the system focuses on safe hydrocarbon production: being in the mode of energy saving the AUVs can stay at the sea bottom near the produced wellhead and monitor its status for several months.

The system can also perform other tasks: acquisition of data on marine environment, mapping, inspection of subsea infrastructure, acoustic profiling. AUVs record seismic vibrations and thus allow determining both current and predicted status of offshore drilling platforms.





*Rubin Design Bureau officials at their press briefing during Army 2023*

## Rubin's AUV Argus: The versatile monitoring system

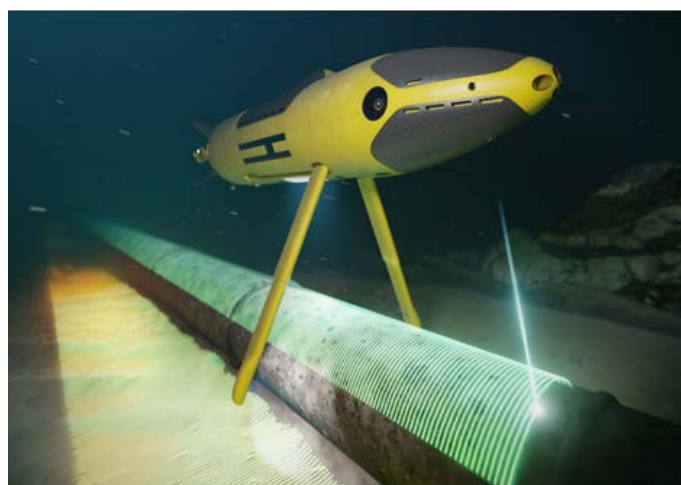
Rubin Design Bureau also unveiled its new conceptual design at the defence show Army 2023: an autonomous underwater vehicle (AUV) Argus. Argus is designed for the wide range of errands supporting an offshore field exploration and development. It can explore subsea natural resources, collect data on the bottom structure and state of water environment. By using information supplied by Argus offshore project team can quickly and accurately locate an area suitable for laying a pipeline. After laying of the pipeline is completed, Argus monitors health of the seabed equipment: detects oil/gas leak, locates the insulation damage and identifies free span of the subsea pipeline or a pipe shift from original position. Argus guards underwater infrastructure detecting an alien object near the pipeline, identifying it as a hazardous one and reporting that to a mother ship.

Argus can also be used during salvage operations: the vehicle will search lost objects, including silted and covered with ground ones. AUV can operate within a group of similar-type vehicles coordinating their actions. The group engages up to five vehicles, significantly decreasing duration and cost of mission (e.g., surveying operation or mapping a large seabed area).

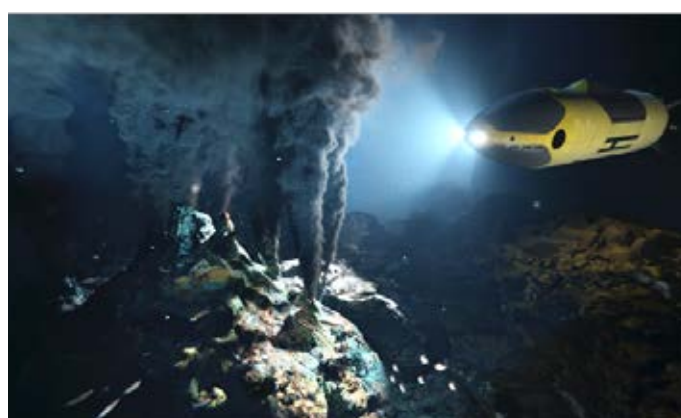
The vehicle weighs 3.2 tons, its length is 5.6 m and hull dia is 1 m. A lithium-ion battery powers the AUV. Detachable sections support multi-tasking of the vehicle. When submerged, Argus maintains coded communication with surface mother ship, other deployed AUVs and seabed communication nodes. When surfaced, it uses VHF communication, satellite communication, Wi-Fi system.

Diving depth of Argus is up to 6000 m. Following a customer's request, Argus may also be designed for the diving depth of 1 000 m or 3 000 m. At cruising speed (up to 3 knots) Argus works autonomously up to 24 hours. If required, it makes full underwater speed up to 8 knots. A customised launch and recovery system (LARS) allows Argus's operations up to sea state 4. The vehicle can deploy different sensors, including seismic detectors and sampling devices to the specified area.

Rubin intends to develop an underwater docking station seeing AUV Argus used jointly with a seabed berthing facility. The docking station will provide for AUV communication with the control centre ashore or located at an offshore platform. It will also charge AUV's batteries. In such a system, Argus will take on the role of a "resident" underwater vehicle capable to stay submerged for half a year and, in future, even longer. Argus can be deployed for other purposes, following a customer's wish, a demanded payload will be granted.



"Rubin Design Bureau is among world leaders in the design of nuclear and conventional submarines and the largest marine engineering company offering design services in Russia. More than 1060 submarines in 122 years of our work have been built to Rubin designs, including more than 950 submarines commissioned by the Russian Navy. Totally 116 submarines designed by Rubin have been exported to 16 countries. Rubin also develops marine robotic systems and designs the facilities for offshore oil and gas field development. The company is a subsidiary of the state-owned United Shipbuilding Corporation", stated Rubin executives. ➡



### Indonesia commitment to acquire Boeing F-15EX



Indonesia and Boeing have shared their commitment to finalise the sale of 24 F-15EX aircraft to Indonesia, subject to US government approval, during a visit of Indonesia's Minister of Defence Prabowo Subianto to the United States.

### Poland for 96 AH-64E's



Poland has requested to buy ninety-six (96) AH-64E Apache Attack Helicopters; two hundred ten (210) T700-GE 701D engines (192 installed, 18 spares); ninety-seven (97) AN/ASQ-170 Modernized Target Acquisition and Designation Sight/AN/AAR-11 Modernized Pilot Night Vision Sensors (M-TADS/PNVS) (96 installed, 1 spare); thirty-seven (37) AN/APG-78 Fire Control Radars (FCR) Mast Mounted Assembly (MMA) (36 installed, 1 spare); thirty-seven (37) Longbow Fire Control Radar (FCR) Radar Electronic Units (REU), (36 installed, 1 spare), etc.

### Sikorsky to build 35 CH-53K's

The US Navy has awarded Sikorsky, a Lockheed Martin company, a \$2.7 billion contract to build and deliver 35



additional CH-53K helicopters; the largest procurement to date for this multi-mission aircraft. The agreement includes 12 US Marine Corps Lot 7 aircraft, 15 US Marine Corps Lot 8 aircraft, and eight aircraft for Israel. Sikorsky will begin delivering these aircraft in 2026.

### GE Aerospace deliveries for F-35



GE Aerospace recently delivered the 1,200th shipset system for the F-35 for each of the seven avionics and power systems across their global manufacturing and support network.

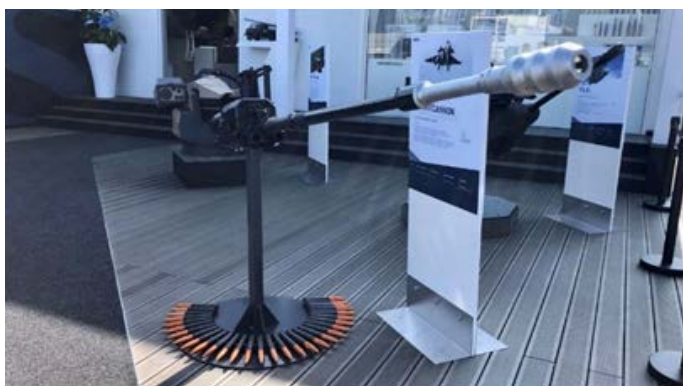
### China Airlines orders GENx for 787s

China Airlines announced an order for 17 GENx-1B engines and spares to power its growing fleet of Boeing 787 Dreamliner commercial jets. The order also includes a comprehensive services agreement. China Airlines, a leading Taiwan-based carrier, has been a GE Aerospace customer since 1999 when it first purchased 13 GE CF6-80C2-powered Boeing 747-400 aircraft.





### Nexter produces the 300th Rafale gun



This year, Nexter, a company of KNDS, will deliver the 300th gun for the Rafale fighter jet. The M791 cannon, manufactured at Nexter's Bourges site, is the latest in a long line of 30mm DEFA guns dating back to the postwar period. Thanks to numerous innovations, its rate of fire is the highest in the world: 2,500 rounds/minute. It fires 42 shells in one second, equivalent to 1.5kg of explosive.

### 6th C-390 for Brazilian Air Force



Embraer has delivered the sixth C-390 multi-mission aircraft to the Brazilian Air Force (FAB). This is the first aircraft delivered in the Full Operational Capability (FOC) configuration. The FOC certificate confirms that the project meets all the requirements defined by the FAB and that the aircraft can carry out all missions for which it was designed. The other aircraft already delivered to the FAB will be updated to operate with their full capabilities.

### Thales to equip new frigates



COMMIT and Thales have signed a contract for the production and delivery of the AWWSS fire control cluster and sensor suite for the four new ASW frigates that Damen Naval will build for the Belgian and Netherlands navies. This contract follows on the development contract signed in 2018. Thales will deliver the AWWSS fire control cluster that "continuously generates the best solution for each approaching threat in every environment".

### BAE and Elta teaming on ACV



BAE Systems has successfully tested manned-unmanned teaming (MUM-T) on the Amphibious Combat Vehicle (ACV) C4UAS as a technology demonstration using IAI/ELTA Systems Ltd's Rex MK II Unmanned Infantry Combat Support System. The teaming technology enhances mission effectiveness through greater situational awareness and decision making capabilities.

### Germany for 969 AIM-120C-8's



Germany has requested to buy up to nine hundred sixty-nine (969) AIM-120C-8 Advanced Medium Range Air-to-Air Missiles (AMRAAM); and up to twelve (12) AMRAAM C8 Guidance Sections. Also included are AIM-120 Captive Air Training Missiles (CATM); telemetry kit and control section spares and containers, etc.

### Canada orders 4 Airbus A330 MRTTs



Canada has awarded Airbus Defence and Space with a contract for four newly-built Airbus A330 Multi Role Tanker Transport aircraft (MRTT) and for the conversion of five used A330-200s in a quest to strengthen Canada's continental defence capabilities. The current contract has an order value of approximately CAD \$3 billion or 2.1€ billion (excluding taxes).

### Wizz Air orders 75 A321neo's

Wizz Air, the fastest growing European ultra low cost airline, has signed a firm contract for an additional 75 A321neo Family aircraft, taking its total order for the largest member of the Airbus single aisle to 434, and for Wizz's A320 Family overall to 565 aircraft.



### Gulfstream G550 in 1 millionth flight



Gulfstream Aerospace Corp has announced that the G550 fleet recently completed its 1 millionth landing, proving the long-lasting durability of the aircraft and its continued performance excellence. To date, the G550 fleet has logged 2.6 million flight hours.

### Second tranche of 18 Rafale's for Indonesia



As part of the contract signed by Indonesia in February 2022 for the acquisition of 42 Rafale, the second tranche of 18 Rafale has come into force. This follows the entry into force in September 2022 of the first tranche of 6 Rafale, bringing the total number of aircraft on order to 24. "This new step consolidates the beginning of a long-term partnership with the Indonesian authorities, whom I would like to thank once again for their confidence. It testifies to the strategic link that unites Indonesia and France, and will be reflected in the growing presence of Dassault Aviation in the country", stated Eric Trappier, Chairman and CEO of Dassault Aviation.



## Croatia's first Rafale spotted



**T**he first Croatian Rafale fighter jet was seen at the French Saint Dizier Air Base on 14 September 2023. Croatia signed the contract for the purchase of this French built fighter in 2021 and in total the Croatian Air Force signed a contract for delivery of two Rafale B dual seat fighters and ten Rafale C single seat fighters. The French jets will replace the last operational Soviet-era MiG-21bis fighter jets. These aircraft were developed in the 1950s and were the most advanced fighters of its period. Most of the MiGs originated from the Yugoslavian Air Force and were taken by the Croatian Air Force when the country became independent during the Yugoslavian War.

The Rafales will be 14 years old when they will enter service in Croatia. The aircraft are second hand models which flew in the French Air Force for several years. The aircraft have still +/-3,800 flight hours per aircraft remaining. Deliveries are expected to start in late 2023, with the first actual arrival of eight aircraft in Croatia during 2024 and the remaining four in early 2025. The first pilots started their training in early 2023 at the Saint Dizier Air Base in Northern France. In total the first batch of pilot will consist of 12 pilots for this type. Also around 80 personnel will be trained in France to be able to handle these modern fighter jets. This training will take 15 to 18 month for the ground crew.

**Text:** Joris van Boven and Alex van Noye  
**Photo:** Alex van Noye

## NG's B-21 Raider continues progression

The US Air Force announced that the B-21 Raider had commenced engine runs as part of its ground test programme at Northrop Grumman's Palmdale, California, facility. Engine testing is an essential milestone for the programme as the world's first sixth generation aircraft continues on the path to flight test. The B-21's first flight will remain a data driven event that is monitored by Northrop Grumman and the United States Air Force. Developed with the next generation of stealth technology, advanced networking capabilities and open systems architecture, the B-21 Raider will serve as the backbone of America's bomber fleet. ➡



# News from Safran

## Safran and MTU team up for next-gen military helicopter

Safran Helicopter Engines and MTU Aero Engines have signed a Memorandum of Understanding (MoU) to create a 50/50 joint venture as an agile and lean structure intended to develop a new engine for the European Next Generation Rotorcraft Technologies (ENGRT) project.

Both partners are convinced that European armed forces need a new 100% European engine with advanced design maturity and affordable operating and maintenance costs, to power a military helicopter to enter service by 2040. Developing this next-generation engine demands efficient project management and quick and flexible decision making. MTU Aero Engines and Safran Helicopter Engines have therefore “forged a strong alliance that will form the core of an extended European partnership involving industrial partners from several other European nations”.



## Greek Army selects Safran's Patroller

The Greek Army has chosen Safran Electronics & Defense to upgrade the Greek army's drone fleet, with four new Patroller tactical drones to be added to the country's current Sperwer drones. NATO Support and Procurement Agency (NSPA) was tasked by its Greek customer to enter into negotiations with Safran. The Patroller is fitted with multiple sensors for intelligence missions on behalf of armies and homeland security forces. Featuring a number of innovative technologies, Patroller benefits from the expertise acquired by Safran Electronics & Defense on the Sperwer tactical drone system, while incorporating feedback from nine years of continuous deployment in Afghanistan.



## Safran and Volocopter in agreement

Volocopter, the pioneer of Urban Air Mobility (UAM), and Safran Electrical & Power, one of the world's leaders in aircraft electrical systems, announced that they have signed an agreement signifying their intention to collaborate on developing a next generation power train for electric vertical takeoff and landing (eVTOL) aircraft.

## Safran to supply SkyNaute navigation system

As part of the Tiger attack helicopter modernisation programme, Airbus Helicopters has chosen key navigation and flight control equipment from Safran Electronics & Defense for the aircraft to be deployed by French and Spanish armed forces. These advanced systems and equipment will help Tiger crews carry out all missions, under any conditions and even in the most demanding theaters of operation.



## Safran's Euroflir 410d Optronic System selected

Safran Electronics & Defense's Euroflir 410D optronic (electro-optical) system has been selected by the French defense procurement agency DGA (Direction Générale de l'Armement) for the Beechcraft Super King Air 350 "VADOR" (Vecteurs Aéroportés de Désignation, d'Observation et de Reconnaissance) designation, observation and reconnaissance aircraft to be deployed by the French air force. ➡





# News from Saab

## Saab receives order for Sabertooth

Saab has received an order for the autonomous underwater vehicle Sabertooth from the marine geophysical company PXGEO. The order value is SEK 620 million and deliveries will take place 2023–2025. The order includes more than 20 Sabertooth vehicles, which makes this the largest Sabertooth order to date. These will form part of PXGEO's MantaRay solution for offshore seismic data acquisition and will be used for deployment and recovery of equipment during ocean bottom surveys.



## Saab welcomes 1st T-7A Red Hawk flight by USAF pilot

The first flight by a United States Air Force's (USAF) pilot of a T-7A advanced jet trainer built during the Engineering and Manufacturing Development (EMD) phase took place on 28 June from St. Louis, USA. The 63-minute flight by the



USAF test pilot Maj. Bryce Turner, 416th Flight Test Squadron and Boeing T-7 chief test pilot Steve Schmidt, was observed by senior representatives of the USAF, Boeing, and Saab, as well as an audience who watched online via the internet.

Saab is responsible for the development and production of the fully installed aft section for T-7A. The seven afts produced at Saab in Linköping, Sweden are part of the EMD test aircraft. Saab has opened a state-of-the-art manufacturing facility West Lafayette, Indiana for the production series aircraft, which will be used for pilot training by the US Air Force.

## Order for Carl-Gustaf M4 from Australia

Saab has received an order from the Australian Department of Defence for the supply of additional Carl-Gustaf M4 weapons. The order value is SEK 400 million with deliveries during 2024–2025. The Carl-Gustaf M4 weapons will be delivered with Saab's new Fire Control Device, FCD 558.



## Order for Sight and Fire Control Capability

Saab has received an order for sight and fire control capability from BAE Systems Hägglunds. The order value is approximately SEK 900 million and deliveries are scheduled 2023–2029. Saab will provide the capability for the BAE Systems' CV90 combat vehicles ordered by the Slovak Republic in late 2022 and will carry out the work in Sweden and the Slovak Republic.



## Carl-Gustaf ammunition for Sweden

Saab has received an order from the Swedish Defence Materiel Administration (FMV) for deliveries of ammunition for the recoilless Carl-Gustaf rifle. The order value is approximately SEK 3 billion and deliveries will take place during 2026–2030. The order is placed within a framework agreement between Saab and FMV which allows purchases of Saab's Ground Combat weapons Carl-Gustaf, AT4 and NLAW, including ammunition and equipment.



## Order for Gripen development and operational support

Saab has received an order from the Swedish Defence Materiel Administration (FMV) for the maintenance and provision of resources for development and operational support of Gripen. The total value of the order is SEK 345 million. The order from FMV mainly comprises operations relating to rigs, simulators, and test aircraft for verification and validation of the Gripen fighter aircraft system, versions C/D and E, as well as operational support for Gripen C/D.



## Operational training of Brazilian pilots to fly Gripen

The last four pilots have completed the Delta Conversion Training at the Swedish Air Force, which included theoretical and practical classes, as well as simulator flights. The last class of operational pilots responsible for the deployment of the F-39 Gripen in the 1st Air Defence Group (1st GDA) of the Brazilian Air Force (FAB), concluded the Delta Conversion Training on June 13th at the Gripen Centre, located at the F 7 Wing in Sätenäs, in the western region of Sweden.

The course, conducted by the Swedish Air Force's Phoenix Squadron, is divided into two stages. The Conversion Training, with a duration of 11 weeks and 50 flights per pilot, covers the basic operation of the fighter jet in both solo and formation missions during day and night periods. The Combat Readiness Training includes 25 flights over approximately nine weeks, exploring the air-to-air combat capabilities of the fighter, including the use of missiles, cannons, and the human-machine interface, one of the main features of Gripen.



## Saab Air Power at RIAT 2023

At this year's Royal International Air Tattoo (RIAT) 2023 Saab brought two of the "world's most advanced military aircraft" to make their debuts at RAF Fairford, England. The Saab Gripen E multi-role combat aircraft and the Saab Global Eye multi-domain airborne early warning & control (AEW&C) solution will be on display to showcase Saab's status as a global defence technology powerhouse. ➡





# News from Israel

## Rafael unveils Sky Sonic: Hypersonic Missile Interceptor

Rafael Advanced Defense Systems Ltd announced that it has developed an advanced interceptor, named “Sky Sonic,” as a groundbreaking defensive response to the growing threat of hypersonic missiles. The Sky Sonic interceptor represents a major technological leap in hypersonic missile defence. Designed with “exceptional maneuverability and high-speed capabilities, it effectively neutralises hypersonic missiles, which travel at ten times the speed of sound, with unmatched precision and stealth”.



## Elbit unveils new EW capability

Elbit Systems unveiled a new and unique Electronic Warfare (EW) capability as part of its Unified EW suite. The new capability is provided via the digital Radar Warning Receivers (RWR), one part of Elbit’s Airborne self-protection EW suite, and enables drone detection and identification as well as locating Personal Location Beacon (PLB) of ground forces and pilots.



## Elbit unveils Nano SPEAR

Elbit Systems has unveiled the Nano SPEAR, an advanced, digital and miniature system designed as a countermeasure against radar-guided air-to-air and surface-to-air missiles that threaten aircrews and their platforms. The Nano SPEAR is part of the Self Protection Electronic Attack and Reconnaissance (SPEAR) product family, which includes the Micro SPEAR for very small installations; Light SPEAR for installation on medium-large sized helicopters and UAVs; and the Advanced SPEAR ECM Pod currently on contract for providing active self-protection for the C-390 transport aircraft.



## Rafael introduces “Sky Spear” LR-AAM

Rafael has unveiled SKY SPEAR its 6th generation long range, air-to-air missile. Rafael has a long legacy in the development of world leading aerial systems and technologies. The newest member of the air-to-air missile family for Rafael is a long-range solution that provides users with “unparalleled operational capabilities” in the complex arena of aerial combat.



## Rafael, Diehl, Hensoldt in agreement

Rafael Advanced Defense Systems Ltd., Diehl Defence GmbH & Co. KG, and Hensoldt Sensors GmbH have announced a teaming agreement focused on the modular SPICE 250 ER (Extended Range) system. Rafael’s SPICE 250 ER system, derived from the SPICE Family of highly automated Human-in-the-loop air-to-surface systems, serves as the foundation for this collaboration. The SPICE 250 ER employs a turbojet engine, enabling it to operate at extended stand-off ranges. Therefore, managing to cope with for example today’s long-range air defence threats.



## IAI's AESA SAR/GMTI reconnaissance system

Israel Aerospace Industries (IAI) announced the release of the ELM-2060PES, a new generation AESA SAR/GMTI pod for fighter aircraft, recently developed by its defence systems subsidiary, ELTA Systems Ltd. The ELM-2060PES builds on the legacy of the ELM-2060P system, in service for decades with air forces worldwide. The ELM-2060PES Pod is a self-contained Active Electronically Scanned Array (AESA) Airborne Radar System, providing state of art Synthetic Aperture Radar (SAR) and Ground Moving Target Indication (GMTI) capabilities; a Bi-directional Line-of-Sight (LOS) wide band Datalink, interconnected with a Ground Datalink and Exploitation Station (GES).



## IAI to supply the Rotem LM's

Following the recent announcement that NATO member Estonia has purchased long-range loitering munitions from Israel Aerospace Industries (IAI), the company has signed separate contracts with three additional NATO countries worth several millions of dollars to supply Rotem loitering munitions. Rotem is a unique combat-proven Vertical Takeoff and Landing (VTOL) tactical loitering munition, intended for use by customers' special forces and can also serve for test and evaluation purposes. Rotem is part of IAI's family of loitering munitions which includes Harpy, Harop and Mini-Harpy, and has been proven in different combat situations since 2019.



## IAI MMR radars pass Czech Army tests

IAI vice president and Elta CEO Yoav Tourgeman: "IAI's MMR radars can be found in all of Israel's defensive systems, and have proven their operational effectiveness providing Air Situational Picture for many years and assisting air and missile defence. The systems supplied to the Czech Republic, and those still to be delivered in the coming months, are intended to fulfil the same function, to safeguard the Czech people, providing them with the most advanced defence against airborne threats. We are proud to be involved in this important cooperation which we have put in place with local companies, sharing knowledge and technologies" Israeli radars are compatible with NATO systems and will replace the previously-used but now obsolete radar technology of Russian origin.



## IWI assault rifles for IDF infantry brigades

IWI-Israel Weapon Industries will supply additional thousands of Micro-TAVOR (X95) assault rifles for IDF infantry brigades under a new contract. The contract was signed with the Israel Ministry of Defence's Department of Production and Procurement-Ground Weapons Division.





## Aeronautics launches Orbiter 5

Aeronautics Ltd has introduced a new paradigm in UAS system performance with the launch of the Orbiter 5 UAS. This new innovative platform enables MALE mission capabilities in a tactical UAS, delivering a high-performance, multi-mission/multi-payload capabilities, and all in a cost-effective solution. The Orbiter 5 provides an extended endurance time of more than 25 hours with multi-mission capabilities, enabled by its capacity to carry payload weight of more than 25kg, including two payloads simultaneously, and implementing advanced AI capabilities.

## UVision contract for the Hero LM's

Rheinmetall AG of Düsseldorf has secured an important order from Hungary for Hero Loitering Munitions. The munitions are worth a figure in the low three-digit million-euro range. Delivery will begin in 2024 and is scheduled to end in 2025. Hero Loitering Munitions are a family of operationally proven, widely used effectors which Rheinmetall fabricates and markets in Europe under a cooperation agreement with UVision Air Ltd. of Israel. In October 2021 Rheinmetall and UVision embarked on a strategic partnership aimed at addressing sharply increased demand for remotely controlled precision munitions.



## Elbit to supply artillery shells to IMod

Elbit Systems announced that it was awarded a contract worth approximately \$60 million to supply thousands of 155mm artillery shells to the Israeli Defence Forces' Artillery Corps. The contract will be performed over a period of one year.



## Successful Completion of Sea Trials

The Israeli Navy and Elbit Systems have successfully completed a series of sea trials for the DESEVER MK-4 Counter Measure Dispensing System (CMDS) onboard Israeli Navy vessels. The trials tested the capability of the new maritime Electronic Warfare (EW) system to effectively respond to complex missile attack scenarios, including launching decoy rounds from several launchers against multiple concurrent threats.



## Poland for Spike-LR

The Polish Ministry of Defence, through its Armament Authority, announced that it is purchasing hundreds of Spike LR Missiles through Rafael's local industrial partner, MESKO, in a deal worth around 100 million dollars. As Rafael's local Polish industrial partner, MESKO has already manufactured SPIKE Missiles for the Polish MOD, and this will be the third such deal involving the Spike Missile Family.



## Rafael support services contract with Asian Navy

Rafael announced that it had won a new contract with an Asian nation to provide comprehensive maintenance support services for operational systems employed by its navy. The multi-year agreement is estimated at 100 million Shekels (30 million dollars) and will include maintenance services for the navy's Typhoon and MINI-Typhoon remotely-controlled naval weapon stations, Naval Spike ER and NLOS missile systems, EO surveillance systems, as well as EW Integrated Decoy Systems (IDS).



## Australia selects Rafael Spike LR2 ATGM

Rafael Australia has finalised a substantial acquisition contract with the Australian Government to provide the Australian Defence Force (ADF) with the next generation of Guided Weapons and Explosive Ordnance (GWEO) systems; Rafael's Spike LR2 Anti-Tank Guided Missile. ➡



# Dassault Aviation: First half of 2023 results



The Board of Directors, which met under the chairmanship of Mr. Éric Trappier, has approved the 2023 half year financial statement. The Statutory Auditors performed a limited review of these consolidated financial statements and have expressed an unqualified opinion.

The global context remains marked by the war in Ukraine and the associated instability.

In the business jet market, the post-Covid upturn in growth witnessed in 2022 began to ease off in the last quarter of 2022, a slowdown that continued in the 1st half of this year. The Rafale's success is still generating new prospects for Export. Post-closing, the announcement on 13 July by the Indian Government of the selection of the Navy Rafale to equip the Indian Navy with a latest generation fighter illustrates this success. Following an international competition launched by the Indian authorities, this decision comes after a successful trial campaign held in India, during which the Navy Rafale demonstrated that it fully met the Indian Navy's operational requirements and was perfectly suited

to the specificities of its aircraft carrier. The Indian Navy's 26 Rafale will eventually join the 36 Rafale already in service, making India the first country to make the same military choice as France by operating both versions of the aircraft (Navy and Air Force). This selection confirms the excellence of the Rafale, the exceptional quality of the link between Dassault Aviation and the Indian Forces, and the importance of the strategic relationship between India and France.

In France, the Military Programming Law ("LPM") voted on 13 July includes the 42 aircraft of the 5th batch of the Rafale (out of which 20 are to be delivered between 2027 and 2030, which will make the fleet of the French Air and Space Force reach 137 Rafale), the Rafale F5 standard which includes the development of a drone derived from the works of the nEUROn demonstrator, the pursuit of FCAS/NGF, the decision for the launch of a successor to the ATL2 in 2024, and the activation of the options for 5 Falcon 2000 AVSIMAR and for a 3rd Falcon 8X Archange.

Like most other players in the sector, we face supply chain issues.

The situation has deteriorated further since 2022. We are striving to limit the negative impact of this by keeping a closer eye on our suppliers' production. This situation has an impact on the development and production of our aircraft, while we need to ramp up to meet our commitments.

The Paris Air Show was highly appreciated with an important visitor numbers on trade and general public days. It was an opportunity for meetings and discussions with government and foreign delegations. The popularity of our aircraft was illustrated by the success of the Rafale: in flight (demonstration), at the static display (new simulator) and on the stand (Rafale Export mock-ups), the impact of the multi-mission Falcon (Albatros, Japan Coast Guards, Archange, Falcon Fire Fighter, etc), the strong impression made by the Falcon 6X (in flight and on static display) and by the Falcon 10X mock-up, with prospects from all around the world. The airshow has been the opportunity to disclose our actions toward decarbonation (SAF, etc) and to lead ambitious recruitment operations.





The environment remains a major issue for the Group, which is working to reduce the carbon impact of its industrial processes and aircraft. The use of Sustainable Aviation Fuels (SAF), the energy saving plan and the development of tools to improve flight plans are levers to be among the first in the aviation industry to become carbon neutral. Business aviation is not included in the EU taxonomy, unlike commercial aviation.

This is particularly disappointing given that business aviation is paving the way: Falcon flights operated by Dassault Aviation already fly on 30% SAF; they could fly on 50% SAF today if those blends were available. Falcon 10X will be the first 100% SAF compatible Falcon. In the United States, industries are receiving subsidies and making rapid progress; Europe is putting less money on the table and imposing standards. We are considering legal actions for breach of the principle of equality while business aviation has begun its decarbonisation.

In the military sector, during the 1st half, we delivered 4 Rafale (2 Export and 2 France) and 4 pre-owned Rafale to Greece, and provided support to the French and export fleets. We also continued the development work on the F4 standard and negotiations and business development for the Rafale.

Regarding the FCAS, for which Dassault Aviation is lead contractor for the New Generation Fighter demonstrator, work on phase 1B has begun in March. The teams of German and Spanish manufacturers are on site, alongside the Group's employees, at the

dedicated physical workspace created in Saint-Cloud.

For multi-mission aircraft, we delivered the 1st of the 4 Falcon 2000 ordered by Republic of Korea in 2022, and the 7th and last ATL2 modernised by Dassault Aviation to France. We continued the development works on the Archange and Albatros programmes, and began working on the architectural design based on the Falcon 10X for a future maritime patrol aircraft, a project on which we are competing with Airbus. We also unveiled the mock-up at the Paris Air Show of a firefighting specialised Falcon project: the "Falcon Fire Fighter".

In the civil sector, in the 1st half of 2023, we recorded 12 Falcon orders, compared with 41 in the 1st half of 2022 and we delivered 9 Falcon, compared with

14 in the 1st half of 2022. Test flights for the Falcon 6X have been completed. The aircraft was showcased with its cabin fitted out at EBACE and at the Paris Air Show; its demo flight was one of the highlights of the Paris Air Show. We are awaiting its certification to start the deliveries. Development of the Falcon 10X is ongoing (the detailed technical specification phase has been completed) and we are now in the industrialisation and early manufacturing phase.

In a challenging supply chain environment, our 2023 guidance remains unchanged: delivery of 15 Rafale and 35 Falcon (including Falcon 6X); decrease in net sales compared with last year." ➡

**Text and photos: Dassault Aviation**



# Exercise Orion phase 4



In this realistic space-time, this last phase of ORION in northern France, April/May 2023, met the three main objectives: the conduct of a high-intensity operation against an equal adversary, the integration of operational effects in all environments and all fields and the ability to integrate allied and partner armed forces in this maneuver.

## Orion phase 4 AIR

During the 4th phase of ORION, some 750 missions were flown by 50 involved fighter jets, 10 transport aircraft and some drones. Most aircraft were from the French Air Force (Armée de l'Air et de l'Espace, AAE). Foreign support was delivered by Greek Mirage 2000s, Indian Rafales and Spanish F-18 Hornets. At the French Army training camp at Sissonne, some 50 helicopters were based.

Seven Spanish Army Airmobile Force (Fuerzas Aeromóviles del Ejército de Tierra, FAMET) helicopters from all helicopter battalions (BHELA I, BHELEME II, BHELMA III, BHELMA IV and BHELTRA V) were located on a rectangular grass strip. The helicopters were two Tigers, two NH90s, one Chinook and two Cougars.

On another location, some 40 French helicopters were located. Most helicopters from 1er Régiment d'Hélicoptères de Combat (1RHC) based at Phalsbourg, augmented by helicopters from 3RHC (3e Régiment d'Hélicoptères de

Combat) based at Étain and 5RHC (5e Régiment d'Hélicoptères de Combat) based at Pau. The helicopters were Gazelles, Tigres, NH90s and Cougars.



## Orion phase 4 GROUND

The main battle ground was in the north-east of France, where 3 large training areas were used; near Sissonne, Mourmelon and Suippes.

At Camp de Sissonne, many important elements of the ORION exercise were located on the 60 km<sup>2</sup> large area. At



the 'Centre d'Entraînement aux actions en Zone Urbaine' (Urban Zone Combat Training Center, CENZUB), a fake village named Jeoffrécourt was used for urban warfare. On a rectangular grass strip seven Spanish helicopters were located. And on a huge pasture, some 40 French helicopters were based.

On the terrains of Sissonne, several tank and armored vehicle units were training from France, the United Kingdom and Belgium. A special location was reserved for the chemical decontamination of vehicles and soldiers.

During a media day at Sissonne, a raid on the Jeoffrécourt urban warfare village was witnessed. Followed by a visit to the Spanish and French helicopters. In the end a chemical decontamination was visited. Near the end of the ORION exercise, a large demonstration of all capacities was held at the Mourmelon training area, south-east of the city of Reims.



### Interview Spanish detachment commander:

Comandante (Major) Soler is the Spanish detachment commander (detco). During the years he gathered some 2100 flying hours since he started flying the Spanish helicopters in 2007. Comandante Soler said that all FAMET helicopter battalions were present in France, with NH90s, Tigres, Cougars and a Chinook. The group came together in Spain, one day before the ORION exercise and after some refueling stops they reached northern France. The goal of this exercise for Comandante Soler, was to fly many training admissions with his French allies.

Comandante Soler said that the weather of northern France is different from the Spanish warm and sunny weather in central and southern Spain; although in northern Spain the mountainous terrain can be green due to the rainfall in that area. "We can perform the training of our missions with the French allies. They are friends and there is a good relationship between the Spanish FAMET battalions and the French ALAT regiments. They would like to fly together as much as possible so they will learn from each other".



**Interview French detachment commander:** Colonel Michon is the commander of 1er Régiment d'Helicopteres de Combat (1RHC, the first helicopter regiment) of the Aviation Legere de l'Armee de Terre (ALAT, the French light aviation department of the French Army). And 1RHC is located at Phalsbourg airbase in north-east France and it consists of the following helicopter types: The Aerospatiale Gazelle helicopters in the reconnaissance and light attack role; the Eurocopter Tiger helicopters in the attack role and NH Industries NH90 Caiman as medium transport helicopter.

1RHC brought all helicopter types to the Sissonne training area; additional helicopters were supplied by the 3RHC (3e Régiment d'Helicopteres de Combat) based at Etain and 5RHC (5e Regiment d'Helicopteres de Combat) based at Pau. The 3 helicopter regiments operate during the ORION/4 exercise as one Air Mobile Group (Groupement Aero Mobile, GAM). The size of the group is about 500 soldiers.

All types of French helicopters were available during the ORION/4 exercise, reconnaissance helicopters (Gazelle), attack helicopters (Tigre) and assault helicopters (Caiman, Cougar).

Colonel Michon said that for this exercise, there were no special preparations needed. This exercise fitted well in the continuous training for the ALAT helicopter crews, although it was on a much larger scale. The 1RHC helicopters also participated in the amphibious landing phase 2 of ORION, flying from the 2 helicopter carriers PHA Mistral and PHA Tonnerre. During phase 2, the helicopters were used to secure some airfields. One of the tasks of the helicopter force was to degrade or destroy the enemy's capacity to fight at war, by attacking the enemy in the rear. ➡

**Report: Joris van Boven and Alex van Noije**

**Photos: Joris van Boven**



# Grifone 2023 – bringing SAR to the next level

From the 3 to 7 July 2023, the Aeronautica Militare (AM/ Italian Air Force) organised their yearly SAR (Search and Rescue) training exercise. This year the event took place at Frosinone Air Base in the Lazio region, South-East of Rome. The activity is planned and conducted annually by the Italian Air Force through the Rescue Coordination Center (RCC) of the Aerospace Operations Command (COA) within the international agreement Search And Rescue Mediterraneo Occidentale (SAR.MED.OCC/Western Mediterranean SAR), in collaboration with the National Alpine and Speleological

event. All this, with the participation of foreign assets and personnel. The primary purpose of the event is training to save lives. It is key to train for SAR activities as there is a variety of participants and different kind of equipment involved. Being able to work closely together with all the involved parties, making sure they are all known with the equipment and aircraft is very important to ensure that the focus in a real-life event can be on saving lives. In addition, there are possibilities to develop synergies between the service and other public departments, and to constantly improve



*Different rescue workers gather to take a wounded person to the ambulance for treatment*

Rescue Corps (CNSAS). To ensure all involved parties are making use of all their abilities and have a new environment to work in each year, the event takes place in a different region each year. This way the operational area is different each time and the emergency services participating will be new, which increases the learning opportunities. This is a key goal of the training event, so in case there is a real event taking place, all involved parties know how to adopt to the different scenarios they are facing.

Grifone 2023 brought together all the SAR “actors” to deepen mutual knowledge of means, equipment, procedures, and capabilities, exactly as would happen in a great real

techniques and procedures to carry out Search and Rescue missions. As highlighted by the director of the exercise, Col Giacomo Zanetti, during one of the meetings with all the staff, “the exercise is an opportunity open to the whole world of SAR. It is good to get to know each other better and train as a single team, exchanging experiences, techniques, procedures for the noble purpose of safeguarding human life”.

Being a SAR training exercise, all participating air assets operated with helicopters. In previous editions some fixed wing aircraft also participated, but this year it was only the helicopters that made up the participating hardware. Most Italian armed services were present with their newest assets.



*A French air force Eurocopter AS-555AN Fennec, from EH05.067 based at Orange waits for a new mission. In the background different teams are preparing with their designated helicopters.*



*An Italian Navy SH-90 awaits the activities of the day. A hoist basket and rescue equipment can be seen next to the helicopter.*

The Italian Army brought one NH Industries UH-90A of the 3 Reggimento Elicotteri per Operazioni Speciali 'Aldebaran' (special operations), from Viterbo.

The Italian Navy sent one MH-90A of the GRUPELICOT 5 (5th Helicopter Group), based at Sarzana Luni. The Italian Air Force participated with one of their Leonardo HH-139B's of the 85 Centro CSAR (85th Combat SAR) from Pratica di Mare. In addition, the Italian Air Force flew one Breda Nardi TH-500B of 72 Stormo (72nd Wing) of Frosinone as well as one TH-500B of the Squadriglia Collegamenti Linate (Milan Linate Connection Squadron). Of the semi-military operators, the Italian Carabinieri participated with one UH-139D of the Raggruppamento Aeromobili (Aircraft Group) from Pratica di Mare. The Guardia di Finanza send one PH-139B and one Leonardo UH-169A of the Servizio Aereo (Air Section) also from Pratica di Mare. Finally, the Polizia send one UH-139C's of the 1 Reparto Volo (1st Police Flight Department) also based at Pratica di Mare. Foreign participants came from Spain and France. The Ejército del Aire (Spanish Air Force) brought one of their Sikorsky S-76C's from Ala 78, based at Granada. Finally, the Armée de l'Air de L'espace (French Air and Space Force) came to Italy with one Eurocopter AS-555 AN, from EH05.067 based at Orange. During the exercise there was a strong presence of international observers. These included representatives from countries like Switzerland, Jordan, Algeria, Morocco, Macedonia and Uzbekistan.





*An Italian Army UH-90A was one of two UH-90's participating during Grifone 2023. In the background a local Vigli del Vuoco AB-206 performs a training mission.*

In the case of search and rescue it is not only important to have air assets, but likely as important are the men and women on the ground. These teams of professionals can go to places and search for victims where air assets have difficulty to approach them. Such teams are either approaching from the ground (trekking to and through an area) or are airlifted to a particular search area. A total of 430 specialists and volunteers participated in this year's edition. During Grifone 2023 ground rescue teams were provided by the Corpo Nazionale Soccorso Alpino e Speleologico (CNSAS Alpine and Speleological Rescue) of Lazio, consisting of 16 teams plus one dog unit and one medical team. Also, the Julia Alpine Brigade of the Italian Army participated with two SAR teams.

The Italian Air Force sent one team of their Fucilieri dell'Aria (Air Fusiliers) of the 16th Wing. One team plus one dog unit of the Alpine Rescue division of the Guardia di Finanza was also present during the exercise. A contingent of 12 volunteer nurses also contributed to the Posto Base Avenzano (PBA Advanced Base Post) of the Italian Red Cross and the Azienda Regionale Emergenza Sanitaria (ARES Emergency Health Services) 118 Lazio. The CNSAS has developed its own computerised system to track and control all team members working in the rescue area. The president of CNSAS Lazio, Roberto Carminucci, underlined, "For us rescuers, the Grifone exercise represents a fundamental moment of meeting, discussion and, last but not least, interpersonal knowledge sharing between the various participants involved in emergencies. The collaboration of different rescue workers

enhances the success of our task: saving lives. This type of activity means that all the rescue workers can talk to each other finding possible critical issues. These are fundamental moments to make the teams known, with an important psychological and human component. Because when you get to know each other, you create relationships that enhance the success of the work in the operational part."



*A rescue dog eagerly awaits his turn to go out for another mission. Two dog teams were present during Grifone 2023.*





*A HH-139B crew member is hoisted back on board of the rescue helicopter after finding a victim and bringing the victim safely on board.*

Frosinone, being an active base in use with 72 Stormo of the Italian Air Force, has many flying activities for training new pilots. This added to the real-life scenarios of busy air space in case a forward operation base needs to be established to coordinate the activities of the different helicopters. All additional facilities are integrated in the scenarios, with different logistics and support departments of the Italian Air Force providing support. This was clearly the true nerve centre of the training activities. Anything from preflight briefings, helicopter marshals and maintenance as well as facilities for the rescue workers was all provided in a separate section of the active air base. In the morning of the first day there were familiarisation sessions between the rescue workers and the helicopter crews. Getting familiar with the helicopters is an important part of the exercise. The individual teams need to be able to get in and out of the helicopter in an efficient and safe manner.



*An Italian air force HH-139B flies low of the Simbruini Mountains looking for an injured person.*





*A pair of UH-90's sit on one of the ramps at Frosinone after a busy day of SAR missions.*

Flight activities started late morning/early afternoon and lasted until after sunset, with a total of 48 flying hours flown, through 65 missions, during the duration of the exercise. This close collaboration and perfect synchronisation of activities contributed to the overall success of the exercise.

The flight activities during the exercise were carried out in the areas designated for field training. This included one on the Lepini Mountains southwest of the Frosinone. The other operating area was one on the Simbruini Mountains northeast of Frosinone. With a wide operating area that included mountainous terrain, it was ideal for simulations of the various possible emergency scenarios. "Giving the maximum always and in any case is the goal of each SAR crew", as Col. Giacomo Zanetti explains. "The Grifone exercise involves many teams and many people who with the passion to collaborate for the protection of human life put their skills in place. And as one team we exchange experiences, technical knowledge and procedures for this goal." Joint ground rescue teams faced a variety of realistic scenarios, including rescuing injured hikers, recovering people lost in the mountains, extracting canyoneers stranded in gorges, and cave-trapped cavers.

These simulations tested the teams' operational and decision-making skills, allowing them to gain valuable experience in handling complex, high-risk situations. During

the day rescue teams were assigned to a helicopter after which they would be airlifted to their designated area. In that area they would perform their tasks depending on the mission. During these missions there would be constant contact with the control centre, from where the coordination of all missions took place. Once a victim was found and identified if and what their injuries were, a different helicopter would be assigned to pick up the stranded or wounded person including the rescue team. The assigned helicopter would then head to the area and begin their initial search followed by the rescue mission. This would include hovering over the area and picking up the victim and team in confined spaces. Once everyone was back on board, the helicopter would return to Frosinone where ambulances would be ready to pick up the injured person. In a catastrophic event, such as the recent flood in the Emilia Romagna region, the mobilisation and coordination of national resources is vital to start up SAR tasks as soon as possible. To gain the competence to manage air traffic of different operators at such a large scale takes practice. This makes a SAR exercise like Grifone so valuable. Managing so many aircraft operating simultaneously in a crisis area is an operation that cannot be improvised on the spot. ➡

**Text and photos: Erik Bruijns and Mark de Greeuw**

# Visit to the USS Ford



On 7 August 2023, we visited the latest American aircraft carrier USS Ford (USS Gerald R. Ford, CVN-78). This aircraft carrier is named after the 38th President of the United States of America, who served in the US Navy during the Second World War. Gerald R. Ford was the 38th President of the United States of America, from 1974 to 1976. He lived from 1913 until 2006 and during his service time in World War II, he served in the US Navy on an aircraft carrier in the Pacific Ocean.

## Trip to the USS Ford

On 8 August, 2023, a group of aviation reporters gathered in the departure lounge at NAS Sigonella (ICAO code: LICZ) on the island of Sicily (Italy). With a Grumman C-2A 'Greyhound' (used for Carrier Onboard Delivery, COD), the group flew in some 45 minutes towards the USS Ford,

sailing between Sicily and Greece. Near the USS Ford, the C-2 entered the landing pattern and made a 'controlled crash' in the arresting wire on the flightdeck. After unboarding the C-2, the group went to the PAO office, where "Sage" the ship's dog, was met for an 'interview'.

Later the group got dressed for the flightdeck operations: wearing long sleeves, long trousers, a cranial with a visor, a white security vest, protective gloves. During the first flightdeck session, 3 F/A-18s were launched as a 'cycle 1 launch' and the flightdeck was cleared. Every person of the group had a one-on-one flightdeck handler to prevent dangerous situations on deck. After the launch, the flightdeck was prepared for the landing of the three F/A-18s that were launched earlier, 'cycle 1 landing'.

That concluded the short trip onboard and the protective equipment was returned to the USS Ford PAO. Everybody





boarded the C-2 again and after half an hour, the C-2 was launched via the catapult for the 45 minute flight back to NAS Sigonella. During this embarkment, the USS Ford participated in the 'Sage Wolverine' exercise.

## First impressions

In comparison to the previous USS Nimitz aircraft carrier class, the USS Ford class of aircraft-carriers has some visual differences. The deck is larger than the USS Nimitz class decks, giving more opportunities to locate helicopters and aircraft. On the Nimitz class carriers; the helicopters, the C-2s and the E-2s are normally located before or around the island. On the USS Ford these are located on other locations on the flightdeck. There are only two arresting cables in use, with one spare arresting installation. On most Nimitz class carriers, there are four wires across the deck ('pilots are aiming for the third wire during landing'). The last carrier of the Nimitz class, the USS Bush, only had three arresting cables across the deck. No steam. All previous US Navy aircraft carriers used steam catapults to launch their aircraft, resulting in clouds of steam crossing the deck during these launches. With the electric launch system (EMALS), there is no more steam on the deck.

## Carrier Strike Group 12

Carrier Strike Group Twelve (CSG-12 or COMCARSTRKGRU 12) is one of four US Navy carrier strike groups currently assigned to the United States Fleet Forces Command. Carrier strike groups gain and maintain sea control as well as project naval airpower ashore. USS Gerald

R. Ford is the aircraft carrier assigned as the Carrier Strike Group Twelve flagship. Units currently assigned to Carrier Strike Group Twelve included Carrier Air Wing Eight; the Ticonderoga-class cruisers Vicksburg and Normandy; and Destroyer Squadron 2. Carrier Strike Group Twelve is lead by Rear Admiral Erik J. Eslich, who started his command on 24 May 2023; while the USS Ford anchored outside of Oslo, Norway.



## USS Gerald R Ford












The USS Gerald R. Ford is the 78th aircraft carrier of the United States Navy and the nickname is 'WARSHIP78', which can be found on social media as '#WARSHIP78' or '@WARSHIP\_78'. As all US Navy carriers have their own callsign, the USS Ford uses the callsign 'WOLVERINE'. The motto of the ship is "Integrity at the Helm", which means "taking care of, and looking out for, our shipmates." The USS Gerald R. Ford adopted the 38th President's name along with the words of the Ford Foundation's motto, "Integrity at the Helm".

After the delivery to the US Navy in 2017, the USS Ford suffered for some serious 'teething problems' with the armament elevators and the electric launching system (Electromagnetic Aircraft Launch System, EMALS). Using state of the art new technologies meant that only rigorous testing in real-life environments would prove that the proposed solution could work and could be repaired.

This caused some delays until the ship was fully operational in September 2022. In order to weed out the last details, a small shake-down cruise was held in October and November 2022, which brought the USS Ford to the Atlantic Ocean and European seas. The first full blown maiden cruise of the USS Ford started in May 2023 followed by a transfer to the US



Squadron	Insignia	Squadron name	Nickname	Aircraft	Code
HSC-9		Helicopter Sea Combat Squadron 9	Tridents	MH-60S Seahawk	AJ-6xx
HSM-70		Helicopter Maritime Strike Squadron 70	Spartans	MH-60R Seahawk	AJ-7xx
VAQ-142		Electronic Attack Squadron 142	Gray Wolves	EA-18G Growler	AJ-xx
VAW-124		Carrier Airborne Early Warning Squadron 124	Bear Aces	E-2D Advanced Hawkeye (with refueling probe)	AJ-6xx
VFA-31		Strike Fighter Squadron 31	Tomcatters	F/A-18E Super Hornet	AJ-3xx
VFA-37		Strike Fighter Squadron 37	Ragin' Bulls	F/A-18E Super Hornet	AJ-1xx
VFA-87		Strike Fighter Squadron 87	Golden Warriors	F/A-18E Super Hornet	AJ-4xx
VFA-213		Strike Fighter Squadron 213	Black Lions	F/A-18F Super Hornet	AJ-2xx
VRC-40		Fleet Logistics Support Squadron 40 Det. 2	Rawhides	C-2A Greyhound	





Navy 6th Fleet with headquarters in Napoli, Italy. The 6th Fleet has an Area Of Responsibility (AOR) of the European and African continents, servicing the US European Command (USEUCOM) and US Africa Command (USAFRICOM). During the maiden cruise, the ports of Oslo (Norway) and Split (Croatia) were visited for some Rest and Recreation of the crew on board.

## Sage, the onboard Labrador Retriever

Next to the fact that the USS Gerald R. Ford is used as a modern weapons platform; it also has a different crew member. The carrier has a service dog onboard with the name Sage. The dog is a three year female Labrador retriever, and she is the first dog to deploy with a ship's crew through a pilot programme. This programme is meant to address

mental health and resiliency. the dog has been trained for at least 120 hours in the United States since Sage was just eight weeks old. The dog will comfort sailors onboard of the carrier and is trained to help them to reduce their operational stress. The dog is raised by the nonprofit company Mutts. The company was founded in 2008 to train service dogs for wounded warriors with PTSD and mobility disabilities. The organisation in 2019 expanded its mission to train dogs for law enforcement and first responders. In the summer of 2022, the group sent dogs to the George H.W. Bush carrier ahead of its deployment to Europe. The group has also sent dogs to visit crews in ship repair yards and other stressful environments as part of this morale boosting effort. Before the deployment of the USS Ford was started, the dog was sent already to the ship several times to let the dog getting used to



the life onboard of an aircraft carrier. The Navy will evaluate the effectiveness of this programme during the USS Ford's deployment and determine whether future carriers or other ships might deploy with dogs of their own. This evaluation will consider the number of interactions between sailors and Sage, whether she increases their morale and willingness to seek out help, and how well she adjusts to life at sea. The



dog will be scheduled daily onboard to meet the sailors of the vessel. Also mental boosting sessions will be organised on the ship where Sage is present. The whole goal is to boost the mental health of the sailors at sea. Sage is already a beloved member of the crew since the ship left for the cruise on 2 May 2023.

## Air Defender 2023 exercise

In June 2023, a large exercise was held in northern Germany, with many US Air National Guard fighter jets at the airbases of Hohn (ICAO: ETNH) and Schleswig-Jägel (ICAO: ETNS). A detachment of the USS Ford CVW-8 participated in this exercise from Hohn AB, with F/A-18 E/F/Gs. ➡

Article and photos: Joris van Boven and Alex van Noye





# BA Évreux, Bastille Parade overhead Paris



## Paris Parade

Every year on July 14th, the National Military Parade (‘défilé’) is held in the French capital Paris; to commemorate the beginning of the French Revolution. On 14 July 1789, the Bastille prison was raided by the people from Paris, an event that started the French Revolution. A military parade is held on the ground on the Champs Elysees with foot-soldiers, trucks and tanks; while overhead aircraft and helicopters make a flyby overhead Paris in the air parade (‘défilé aérien’).

The theme of this year was the 25th anniversary of the Indian–French military cooperation, with many aircraft and helicopters cooperating together overhead Paris.

Indian Prime Minister Narendra Modi was treated to one of France’s most spectacular accolades on Friday as guest of honor at the 2023 Bastille Day military parade, part of a visit that has sealed high-profile defense deals. Prime Minister stood next to the French president Emmanuel Macron in Paris.

In 2015, a contract was announced to deliver 36 Dassault Rafale fighter jets to the Indian Air Force and in 2019, the first aircraft were delivered. During the visit to France of the Indian Prime Minister, another order for 26 naval Dassault



Rafale M aircraft for the indigenous aircraft carrier INS Vikrant (R 11) was announced.

For this special occasion 4 Indian Rafales were flown to BA Évreux (northwest of Paris) to participate in the Bastille Parade over Paris on the 14th of July.





## Flight overhead Paris in a CASA-235

After visiting BA Évreux for many years during the take-off of the fighters, in 2023 we had the opportunity to fly overhead Paris in a CASA-235 of 'Escadron de Transport 3/62 "Ventoux" (ET 3/62)'. During the weeks before the 14 July, the section-leads exercised the Bastille Parade overhead BA Orleans. And a few days before the 14th, a general rehearsal was performed overhead Paris.

About an hour before the start of the Bastille Parade, all aircraft were allocated separate 'racetracks' or 'hippodromes' around Paris. Where each group circled in formation until it was their turn to head towards Paris. As the section-leads participated in the rehearsal, the rest of the formation just had to follow the section leader.

## Force projection group

The CASA-235 of the photoflight was part of the "Force projection" group and consisted of one Airbus A330, one C-130J, two CASA-235 and one A400M, most flying with the CUJAS callsign:



Type	Registration	Callsign	Position in the formation	Remark
Airbus A-330-200	F-UJCT	'MEXICAIN'	first	
Lockheed Martin C-130J-3	5847	'CUJAS73'	second	
CASA-235	200	'CUJAS72'	2 CASA's parallel on the third position	
CASA-235	197/64-HE	'CUJAS74'		Photoplane
Airbus A-400M	0014/F-RBAF	'CUJAS75'	last	

The assigned racetrack was near the city of Beynes, some 30 kilometers west of Paris. For an hour, the racetrack was flown to align all other racetracks around Paris. At the correct moment, the "Force projection" group flew eastbound, over the suburb 'La Defense' with the futuristic skyscrapers. Then along the Eiffel tower, over the Avenue des Champs-Élysées towards eastern Paris. There the formation broke up and the C-130 followed by the two CASA-235, setup some formations for the photographers onboard, in order to make photos from the open ramp. After the photo session, the three aircraft landed at their home base Évreux. The crew onboard of the CASA-23 consisted of adjudant Xavier, commandant Sandrine, lieutenant-colonel Antoine (no last names).

## Cujas

The CUJAS callsign of the transport aircraft, is a reference to French legal expert Jacques Cujas (1522-1590), who was born in Toulouse (FR). Originally, the French Air Force transport training unit (Centre d'Instruction des Equipages de Transport, CIET) was created in 1946 at the Toulouse Franczal airbase. And during the years, the CUJAS callsign





was used to honor the work of Jacques Cujas on human rights. These days, the CIET is operating from the Orleans airbase and the CUJAS callsigns are still used by French transport aircraft.

## Participants

The Indian Rafale aircraft and personnel at BA Évreu, were mainly consisting out of IAF's No. 101 Squadron "Falcons" based at Jalpaguiri/Hashimara Air Force Station (AFS) in the States of West Bengal and the Aircraft & Systems Testing Establishment (ASTE). The latter is India's Air Force test unit and has its homebase at Bangalore/Yelahanka AFS.

## Aircraft parade

Opening of the parade: 9 Alphajets (Patrouille de France Aerobatic Team), in a formation called Big Nine.

25 years of strategic partnership between France and India: 3 Rafale Cs (Indian Air Force) and 1 Rafale C (30th Fighter Squadron).

90 years of the Military Aeronautical Expertise Center (CEMA): 1 Rafale C (Fighter and Experimentation Squadron) and 2 Mirage 2000 Ds (1/30 "Côte d'Argent" Fighter Squadron).

Airspace protection: 1 E-3F AWACS (36th Airborne Early Warning and Control Squadron "Berry"); 2 Mirage 2000-5s (1/2 "Cigognes" Fighter Squadron); 1 Rafale C (30th Fighter Squadron) and 1 Rafale B (4th Fighter Squadron).

NATO Enhanced Air Policing: 1 Rafale C (30th Fighter Squadron); 1 Typhoon (Royal Air Force); 1 Rafale B (4th Fighter Squadron); 1 Mirage 2000-5 (1/2 "Cigognes" Fighter Squadron) and 2 F-16s (Belgian Air Force).

Defence of vital and strategic interests: 1 A330 MRTT Phénix (1/31 "Bretagne" Air Refueling and Strategic Transport Squadron) and 3 Rafale Bs (4th Fighter Squadron).

Force projection: 1 C-130J (Binational Air Transport Squadron); 1 A330-200 (Estérel); 2 CN-235 CASA (64th Squadron) and 1 A400M Atlas (61st Transport Squadron).

Intervention: 1 C-135 (4/31 Air Refueling Squadron "Sologne"); 1 Rafale C (30th Fighter Squadron) and 4 Mirage 2000 Ds (3rd Fighter Squadron).

Carrier Air Group: 1 E-2C Hawkeye (4F Squadron); 8 Rafale Ms (17F Squadron) and 1 DA 10 (575 Squadron).

Maritime patrol aircraft – Operation NARCOPS: 1 Falcon 50 M (24F Squadron) and 2 ATL 2s (21F and 23F Squadrons).

Reconnaissance / Anticipation: 1 ALSR Vador (64th Transport Squadron).

Training: 3 PC-21s (Fighter Aviation School) and 4 Xingus (Fighter Aviation School).

Firefighting: 1 Dash 8 (Civil Security).

Competition and excellence: 2 Extra 330s (French Air and Space Aerobatic Team).

National Gendarmerie Air Force: 2 AS 350 (Écureuil), 2 EC135, and 2 EC145 helicopters.

Army Light Aviation School: 2 Calliope H120s and 2 Fennecs.

Major operation: 1 Gazelle, 3 Tigers, 1 Puma, 1 Cougar, and 3 Caimans.

Army Light Aviation 2030: 1 Airbus Helicopters H160 (Guépard).

Operations on the national territory: 1 Puma, 1 light combat Fennec, 1 Fennec with a sniper, and 1 H160.

Mastering the air and sea spaces, naval combat, and rescue at sea: 1 NH90 Caiman Marine, 1 NH90 Caiman (Italian Navy) 1 Dauphin and 1 Dauphin Pedro. ➡

**Text and photos by Joris van Boven and Alex van Noye**



# High Skill, High altitude

## The Gendarmerie Mountain flying Training Center



*An H145 returns from a mission in the mountains, the flight engineer keeps a close eye on the landing zone.*

Situated in the French Alps, the town of Briançon houses the Gendarmerie CVM, or Centre de Vol en Montagne, the mountain flying center. The mountain training is a part of the overall training of the Gendarmerie Air Forces (FAGN) pilots and flight engineers. Deputy head of the Gendarmerie National Helicopter Training Centre Major Orain and Lieutenant Juste gives us a deeper look on the tasks and operations of the CVM and its international connections.

### The Mountain flying Training Center itself

The CVM in its current location exists since 2014 and shares it with the SAG Briançon, but training has been conducted from the previous operational base. In service with the FAGN since 2012 and a mountain flying instructor since 2019, Major Orain is not based at Briançon, but he is currently assigned to the CVM and he is present every quarter to participate in the mountain training courses, he explains: "I have to ensure, under the directives of my chief,

the good progress of the training courses followed by the pilots and the flight engineers of the gendarmerie in all the fields and on our three types of helicopters". These types are the AS350 Ecureuil, EC135 and the EC145.

But it's not just helicopter pilots they train at the CVM, the modern age also requires drone remote pilots to be trained in the mountains, all with the highest standard of safety in mind.

Each FAGN pilot begins its initial training at Dax flying school of the Army aviation in southwestern France, alongside pilots from the army, navy, and air force, where they learn to fly the helicopter on the EC120. The training to become a military helicopter pilot at the Dax air school takes about a year and a half and the students must fly about one hundred and thirty hours in real time and twenty hours in the simulator. When they come to the Gendarmerie Air Forces, the pilots also receive their qualification training at BA120 Cazaux on one of the three types of helicopters the FAGN operates (AS350,





*The EC145 is equipped with a hoist on the right side, here the flight engineer hoists down the mountaineer onto a drop zone.*

EC135, EC145). This depends on the unit they are going to. The training is about five weeks and twelve flying hours. After this initial training, they go to their environmental training for the Gendarmerie.

As mentioned previously, at the CVM there is training four times a year, so every season and weather conditions are covered, and usually takes about two weeks to accomplish. There is only one instructor pilot permanently assigned to the CVM, which is Lieutenant Arnaud Juste, once a course started, the CVM is complemented with additional instructors to make total of ten. The team is then composed of personnel with different experiences, and most of them are operational pilots of other FAGN Mountain bases, this is to transmit

methods and experiences as completely as possible. A week after the pilots have performed their technical qualification on the aircraft, they will come to the CVM to make some more flying hours on their respective type and to do initial training in the mountains, not a full qualification.

## The Fleet

The CVM has one AS350 and one EC145 on strength and although being part of the Gendarmerie Air Forces, they are normally not used for any operational sorties; they are there for training only. Only in exceptional situations where the normal SAG fleet is not sufficient and needs reinforcements, the CVM fleet is used, as was such the case during the crash of the Germanwings A320 in 2015. The crash site was hardly reachable by land and there was a high demand for flying officials and investigators to the crash site.

The helicopters used by the CVM are equipped like any other unit of the FAGN, the only modification is done is winter time when they are equipped with snow skids. Flying in higher altitudes does have an impact on engine performance and when there is a compromise required between aircraft weight and performance, the helicopter goes on a quick diet. The crews then often land at a base camp to offload equipment and personnel not required for the mission, just to reach the rescue point, making as much round trips as required to rescue everybody.

## Course and instructor

As stated, before there are two different types of training at the CVM, the initial training of two weeks and a full qualification course of up to eight weeks, Lieutenant Juste gives us a closer look on the complete process of the training.



*The flight engineers provide an extra set of eyes during maneuverings close to the ground or obstacles.*





*An EC145 of the CVM in front of some special red colored rocks in the Alps during a training mission*

“We train Pilots and flight engineers not only to fly in the mountains but also to fly at the limited power of the aircraft they use. They also train the method to make a safety decision to land in confined airspace”, Lieutenant Arnaud Juste stated. Every pilot comes to the CVM for a week after their technic qualification on the AS350 Ecureuil or the EC145. “We make them fly in confined airspaces and apply the method to make a safety decision to land according to the aircraft limits and the specification of the terrain. It makes them also flight hours on the helicopter and have more experience on it. So, it is not a mountain qualification but only an initiation”, he commented.

For this training they fly about eight hours with an instructor in the different terrains they have near Briançon.



*The EC145 flying through the mountains.*

These flights in confined airspaces also improve their feeling of the helicopter and experiences. And after this intense week of flying in the mountains, they go back to their unit. If they are willing to fly in the mountains and have the conditions, they must spend a specific rating week at the CVM. The pilots who passed, begin the training course of mountain flying. This takes will last eight week which is two weeks per season.

## **The training to fly in the mountains at night**

The pilots must perform a training to fly with Night Vision Goggles (NVGs) before they come in a mountain air unit. They need to have a minimum of seventy hours of NVG flights and two hundred hoist operations by daylight and then pass a training which takes one week with about five hours of flying. And to perform in mountains they need to train as each crew every year more than twelve hours (minimum).

“We train the pilots in night flying by training as we do by day. We make about the same analysis method for landing, and we perform these training flight in every kind of terrain (high and low altitude, snow, dry, very dark night, and full moon conditions – the light conditions are quite different by night and through the NVGs. We need to train regularly to get used to them (no relief through the NVGs),” Lt. Juste explains.

## **The different training phases**

Lieutenant Juste about the selection process: “The selection is performed before the training which is one week of flying and a motivational interview with our instructors. The candidates are volunteers, and they must let us know





*Instructor Chauvanne during one of the training flights*

by informing their hierarchy and they must hold at least thousand flight hours”.

The mountain flying training course is made up of four stages after the rating week. The first phase is the elementary phase. During this phase, the pilots are learning the basic mountain terrain and work on the flying skills without any horizon reference, security of the paths, aerologic analysis. The second phase is the fundamental phase. During this phase they will learn the analysis methods in all types of areas and hardening on the EC145 C2. The third phase is the development phase. During this phase, the pilots will analyse methods in rough terrains, snow landings, working in areological and in degraded (unfavorable) weather conditions. And the fourth and the latest phase is the synthesis phase. During this phase they train the operational rescue management. As said before, this training takes eight weeks plus the qualification rating on the EC145 C2 helicopter.

## The different difficulties to fly in the mountains

For a pilot without experiences, it is not easy to fly in the mountains. The differences to fly in the mountains are to fly and evolve in a confined environment and airspaces with rough weather conditions. Besides this it is difficult to fly at the limits of the helicopter when all items are combined. “As a pilot in the mountains you have to consider the perfect knowledge of the performances of the helicopter, analysis of the situation, you can make a safety decision and that you have to engage when it is necessary”, Lieutenant Juste commented.

For the pilots there are also circumstances they can't fly. The first circumstance is that there is an extremely poor weather situation at the departure location or at the rescue point. These two conditions are for the pilots a reason to abort their mission.

After their training at the CVM the pilots can fly in the mountains. But after their training they still must train with the crew members and rescuers of their future unit. Besides this, they must make reconnaissance flights to learn the obstacles, the dropping zones, and the difficulties of the area.

## The training of the hoist operators at the CVM

Besides the pilots, also the hoist operators are trained at the CVM. This course takes about two weeks. All the candidates are volunteers, and they pass by a selection during three days of security briefing, knowledge, hoist operations, ease or ability in confined spaces and high altitudes. “The training takes two weeks. The hoist operators perform hoist operations in the different spaces we have here like the canyons, high altitudes, forest, snow, snow lifts in the ski resorts. Besides this, they also improve their skills in the areas of the rescue missions and their involvement in the security of the helicopter and the people they carried with them”, Lieutenant Juste added.



*EC145 on the flight during the night flying operations.*



*Two mountaineers of the PGHM waiting to be picked up by the EC145.*

## The diverse types of missions

In the mountains, the pilots of the FAGN perform about five diverse types of missions. The first mission is the law enforcement mission. During these missions they search for information, local crisis, information to the administrative authorities, search for missing persons, security of the borders. The second are the judicial missions. During these missions they are searching for criminals, carrying investigators or interventions groups. The third type of missions are the rescue missions. During this type of missions, they are rescuing mountain hikers, mountaineers, people buried under avalanches, patient transport. The fourth type of mission is the training mission. During these missions they train at day, night (with NVG's) and the hoist operations. At the fifth and last missions are the technical flights. During these missions they train to maintain the helicopter during a flight and at a certain location.

## Performing a rescue mission in the mountains

If a 112 call comes in, it will be forwarded to the Departmental Fire and Rescue Operations Center. First, the employee tries to calm this person down, ask his name, ask as accurately as possible about the location where this person is and give the nature of the report such as what the accident is. With this information, the employee can estimate exactly what help is needed. Then this employee calls the air unit of the gendarmerie (SAG) of Briançon and the report is passed on.

When the DAG at Briançon get this rescue alert by phone or radio they will have a briefing with the information they received. During this briefing they will talk about the type of alert, the location, weather situation, degree of urgency, number of people involved. After the briefing they fly first to the hospital which is a few hundred meters away to pick-up the doctor and fly from the hospital directly to the specific location. During the flight they brief between the crew members, rescuers, and doctor according to the local situation and decide. During a rescue mission they fly with one pilot, hoist operator, two rescuers and one doctor. The tasks of the crew members are the security of the flight, the paths, the hoist operations, and the people they carried with them during the flight. The tasks of the rescuers are to secure the involved people and management of the rescue operation. And



*EC145 during one of its landings in the high mountains.*

the task of the doctor is to stabilise the patient for its flight to the hospital.

To fly at high altitudes the helicopters do not need any modifications. "It is only a compromise between the helicopter performances and the height of the rescue spot. We often need to land in a base camp to lose weight like rescue equipment, rescue people or the doctor. Without this equipment or people, we can reach the rescue point. We will perform as many return flights as needed", Lieutenant Juste explained. "And yes, we wear appropriate suits and jackets to fill with the weather situations and there is also a rescue bag in the helicopter in case of an emergency landing. It contains everything needed to spend some days in complete autonomy like winter clothes, food, water, etc. To land on the snow, the helicopters is additionally equipped with snow skids".

## International relations

The CVM doesn't just train French Gendarmerie crews (pilots and flight engineers), there long-running international connections with the Spanish Guardia Civil air forces, Moroccan Royal gendarmerie air forces, and further down the past there have been exchanges with Chile, Peru, and Ecuador. The co-operation with the Guardia Civil started back in 2020 and once per year they travel to Spain to train with them and once per year, the Spanish come to the CVM. For them it was the application of a method for landing in the mountains and winching. They know these techniques because they normally train in the South of the Pyrenees for the mountain rescue, but they came to France to seek the expertise in mountain flying that the French Gendarmerie has set up at the CVM in Briançon which has an incredibly unique training in the world. The training of the pilots and flight engineers takes about fifteen days. The Moroccan connection goes even back further to 2012, and up to today, it is still highly active. The instructors travel to Morocco to train the pilots several times per year, and they also welcome them at the CVM. The main goal is to adapt to their needs, but they give them the same training as they would do in France. ➡

*We would like to thank Major Orain, Lieutenant Juste from the CVM, and Captain Lahri from the HQ of the Gendarmerie Air Forces for their help to makes this possible.*

**Article/photos: Roelof-Jan Gort & Björn van der Flier**





# Exercise Anatolian Eagle

One of the major exercises held in Europe annually is Anatolian Eagle. The Turkish Air Force organised the first edition in 2001. Since then 49 exercises have been held which saw the participation of 15 countries. Anatolian Eagle aims at training fighter aircraft crews. A few years ago, the Turkish Air Force started a new exercise, Anatolian Phoenix, devoted to helicopter crews named.

All Anatolian Eagle exercises are organised at the 3rd Main Jet Base at Konya. Stationed here are 131 Filo (E-7T), 132 Filo (F-16C/D block 30 and 50), 134 Filo (NF-5A/B, better known as the Türk Yıldızları – Turkish Stars) and 135 Filo (AS532UL, CN235-100M, T-70 and Hürkus C).

On the eastern side of the base, the Turkish Air Force built a ramp and buildings to facilitate flying operations

by the participants. On the western side of the base the headquarters and other support buildings were built. The HQ building houses the main briefing room where all missions are briefed and debriefed.

Except AE exercises, Konya AB is also used to accommodate bilateral training between the Turkish Air Force and other countries. At some point the People's Liberation Army Air Force (PLAAF–Chinese Air Force) visited Konya. Each country who participated at a bilateral or AE exercise has her flag presented in the main mess hall.

## Anatolian Eagle 23-2

The 3rd Main Jet Base hosts several AE exercises per year. During one of these exercises, both media and aviation enthusiasts are invited to visit. It offers the Turkish Air Force an opportunity to present the exercise and its objectives to the media. Aviation enthusiasts can photograph aircraft from several angles. This year's exercise saw one media and two spotters' days. The official presentation listed Saudi Arabia as a participant with its F-15's. It was not mentioned if these were F-15C Eagle or F-15SA (Saudi Advanced, a derivative of the USAF F-1E Strike Eagle). However, the Saudi's cancelled their participation. Azerbaijan (Su-25), Qatar (Typhoon), Pakistan (F-16C/D block 52), United Arab Emirates (F-16E/F block 60), Royal Air Force (Typhoon FGR.4) and of course the host nation took part in AE 23-2. Especially the participation of the Qatari Typhoon is of note. The country ordered 24 aircraft, all built in the UK by BAe Systems at their Warton facility. Of these ten have been delivered by mid-May. Three single seat Typhoon and two dual seat Typhoon T were deployed to Konya.





and training range provides several threat emitters. All participants can focus on their own training need during the afternoon missions.

## Exercise area, missions and goals

The Anatolian Eagle missions can use area over land but also one over water totaling 50.000 square miles. Mainland Turkey offers a 180NM long by 215NM width (39.000 square miles) are while the Mediterranean Sea, roughly between the city of Alanya and Cyprus, offers an area of 140NM long and 75NM width (11.000 square miles). Both areas offer a realistic training environment where pilots can increase their experience both in a COMAO operations or their specific training scenarios. One of the other objectives of AE is to provide a forum to exchange ideas and lessons learned between the participants.

## The organisation

The Anatolian Eagle organisation is structured around three forces, these being blue, red and white. To start with the later, the white force is responsible for the overall exercise. Its tasks are related to determining the level of training needed leading into the scenario development. It releases the Air Tasking Orders. Furthermore, the members are responsible for monitoring and command and concluded with assessment and analysis of the exercise.

The goals for the red force (aggressors) are obvious. Provide realistic adversary training to the blue forces. Red is structured into three cells: Hancer (Dagger. Nickname of 132 Filo), Hammer (air defence personnel) and Redeye. The latter monitors the exercise areas and assist 132 Filo pilots. Blue forces generate one COMAO mission per day designing a game plane to achieve their planned objectives. To provide realistic threats the nearby Konya electronic warfare test





## AE daily mission plan and participant details

Anatolian Eagles takes place for three weeks. The first week is devoted to the arrival of the participants and all their support equipment. All crews need to be on base by Wednesday. The next two days are spent with the mass briefings, planning and familiarisation flights. Flying starts in the second week. The third week consists of four flying days. The Friday is used for the mass-out brief followed by the departure of the participants. ➡

## Anatolian Eagle 23-2 participants Operating from Konya Air Base



Country	Op.	Aircraft	Squadron	Home base	No.	Role
Azerbaijan	AF	Su-25	Su-25 Esk.	Kyurdamir	2 (2)	A/G
NATO	AF	E-3A	NAEW&CF	Geilenkirchen	1 (1)	C2
Pakistan	AF	F-16C/D	5(MR) sqn	Shahbaz AB	5 (5)	MR
Qatar	AF	Typhoon (T)		Tamim	3 / 2 (5)	MR
Saudi Arabia	AF	F-15C/D/SA?	Cancelled			
Turkey	AF	F-4E-2020	111 Filo	Eskişehir	4 (4)	A/G
Turkey	AF	F-16C/D	113 Filo	Eskişehir	4 / 1 (6)	MR
Turkey	AF	F-16C/D	132 Filo	Konya	10 / 3 (10)	AGRS/ MR
Turkey	AF	F-16C	151 Filo	Merzifon	2 / 0 (3)	MR/SE AD
Turkey	AF	F-16C/D	152 Filo	İncirlik	3 / 1 (4)	MR
Turkey	AF	F-16C/D	161 Filo	Bandırma	1 / 1 (5)	MR
Turkey	AF	F-16C/D	162 Filo	Undisclosed	3 / 0 (0)	
Turkey	AF	F-16C/D	181 Filo	Diyarbakir	0 (3)	MR
Turkey	AF	F-16C/D	182 Filo	Diyarbakir	1 / 1 (0)	MR
Turkey	AF	F-16C/D	191 Filo	Balıkesir	0 (3)	MR
Turkey	AF	E-7T	131 Filo	Konya	1 (1)	C2
UAE	AF	F-16E/F	Shaheen 2 sqn	Al Dhafra	2 / 2 (5)	MR
UK	RAF	Typhoon FGR.4	6 sqn	RAF Lossiemouth	4 (4)	MR

**Notes:** Numbers between brackets are taken from the official participants list. The other numbers refer to the aircraft seen participating during the days of the visit. Konya Air Base serves as a Forward Operating Location for the NATO E-3A Component/NATO Airborne Early Warning & Control Force (NAEW&CF). Two AWACS aircraft were present at Konya of which one was assigned to AE 23-2.

132 Filo is stationed at Konya. It has approximately 35 F-16's, block 30 and 50, assigned. Ten aircraft were assigned to AE, another three F-16C's in the "Solo Turk" F-16 solo display color scheme were seen. 162 Filo was disbanded in July/August 2018. The squadron was not listed in the official media presentation. However, two F-16's wearing the 162 Filo batch were photographed. The Turkish Air Force PAO politely answered with "no comment" on the question if the squadron has been reactivated and if so where it's based.



### Operating from home base:

Country	Op.	Aircraft	Squadron	Home base	No.	Role
Turkey	AF	KC-135R	101 Filo	Incirlik	0 (1)	AAR
Turkey	AF	ANKA-S	302 Filo	Incirlik	0 (1)	Recce
Turkey	AF	AKINCI	341 Filo	Incirlik	0 (1)	Recce

**Note:** The Turkish Navy participated with its ships but without air assets. Taken from the official presentation 64 aircraft participated. These were divided between 42 aircraft from the Turkish Air Force and 22 foreign participants.

*The author wishes to thank the Turkish Air Force and its PAO team for their support.*

**All photos: Manolito Jaarsma**  
**(Instagram: Phantomaviation Twitter: @Phantomaviation)**



# Air Defender 2023: Stronger together is more than just a motto



June 2023 saw an unprecedented amount of movement of military aircraft all over Germany and surroundings. The reason was exercise Air Defender 2023. Over 250 aircraft, including some 190 fighter jets and over 10,000 soldiers of 25 nations were on the move for two weeks.

Four years of preparations culminated in the largest air exercise since the foundation of NATO in 1949. Having said that, the exercise was not a NATO exercise, but a German one with input from many NATO partners plus a few others. Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Japan, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Sweden, Slovenia, Spain, Turkey, United Kingdom and the USA all sent assets, which in many but not all cases included aircraft. Most noteworthy was the large delegation from the USA, where especially the Air National Guard (ANG) sent no less than 100 aircraft over the ocean. Although sometimes called 'weekend warriors', the ANG showed they are more than capable to deploy overseas and fight a war if needed.

All deployed aircraft were divided over seven airbases in Germany namely Jagel and Hohn in the Northern part of the country, Wunstorf, Geilenkirchen and Spangdahlem in the middle and Lechfeld and Neuburg in the South. Apart from those bases, the Dutch contingent operated from their homebase Volkel, while the Czech did the same from Caslav, both doing the prebriefing and debriefing via video conference. The three main exercise areas reflected this division, being North (including the northern part of Dutch airspace and Denmark), East and South. Two additional exercise areas were in Poland and the Czech Republic. Moreover, participants

conducted Composite Air Operations (COMAO) into Estonia and Romania on so-called out-and-back missions in support of the exercise scenario.

This scenario was a basic 'article 5' scenario, where the attack on one NATO member is considered an attack against all, and a collective defence by all other members follows. History has learned that when hostilities break out, air forces most of the time act as 'first responder'. Therefore focus was on this theme, with both the fighter jets that are the first to go in and all other aircraft types that are necessary for support. The fighter contingent consisted of American F-15s, F-16s from Denmark, The Netherlands, Greece, Poland, Turkey and the USA, Dutch, Norwegian and American F-35s, Eurofighter Typhoons from Germany, Spain and the United Kingdom, German Tornado and JAS-39 Gripen from the Czech Republic, Hungary and Sweden. Last but not least the US Navy were present with 6 F/A-18 Super Hornets and two EA-18G Growlers while Finland deployed the classic F/A-18 Hornet. The support aircraft included transport aircraft like the C-130, of which no less than 10 different ANG units deployed one to Wunstorf, but also the German A400M and the Romanian C-27. During the exercise these also practised MedEvac and regular evacuation of both military personnel and civilians, like recently had to be done in Kabul and Sudan. The odd ones out were the venerable American A-10 Thunderbolt II aircraft with their specific role, providing close air support to friendly ground troops attacking vehicles and forces on the ground. During Air Defender they supported German CH-53 helicopters in combined Personnel Rescue Missions. Other helicopters were German H-145M light helicopters which are mainly used by Special Forces. During



*An F-16C of the South Dakota ANG takes off with full afterburner.*

Air Defender those were integrated in combined special operations. E-3A airborne warning and control aircraft of the NATO and France acted as eyes and ears in the air.

Because of its scale, logistics were a challenge before and during the exercise. For example 1,600 tonnes of all different materials had to be flown in from the USA. And as the Northern part of Germany was not attached to Cold War NATO fuel lines, some 17,000 tonnes of rocks had to be moved and used to build 2 kilometres of fuel line to support the exercise. A very useful experience, Major Peter of the

German Luftwaffe explains, “After doing this we can cut the 5 month construction time that was needed here in half.” Apart from fuel on the ground, fuel in the air is very important as well. Where Europe in the past mostly depended on the USA for aerial refuelling, there has been growing self-sufficiency recently. This was visible during Air Defender, with the participation of A330 MRTTs from the Multinational MRTT Unit and the Royal Air Force and A400s from the Luftwaffe. The USAF added the venerable KC-135 Stratotanker and its successor KC-46 to these.

Where Germany used to be very reluctant to use or show military power after World War II, and investments in the military were minimal, this has changed recently. Large orders for multiple weapon systems have been placed and a lot of effort is put in improvement. Illustrative for the huge improvement of the status of the military is the serviceability of the EF2000 fleet, that went up from 35% in 2018 to 80% today. Organising Air Defender is another clear sign of this changed attitude. “Our goals for this largest deployment exercise since the foundation of NATO are comprehensive,” stated Lieutenant General Ingo Gerhartz, chief of the German Air Force. “We want to demonstrate the agility and swiftness of Air Forces as a first responder and showcase NATO Air Power. In addition, we as the Luftwaffe show that we can plan, organise and execute such a large exercise. We take responsibility. With AD23, we underscore Germany’s capability to ensure command and control of multinational Air Forces. Another important aspect is to facilitate continuation training for Air Force units and reinforcing our cooperative bond with the eastern flank of NATO by conducting Air Defence missions in the Czech Republic airspace. The transatlantic dimension,



*Four Legacy F/A-18 Hornets, two of which are getting ready for another mission.*





*The German Tornado with the special tail is seen taxiing in after a mission, showing the “US side” of its tail here.*

with 100 US Air National Guard aircraft flying in Europe, is a rock-solid proof of NATO cohesion and solidarity,” Gerhartz concluded, underlining the importance of Germany as a hub for Allied defensive operations within Europe.

So with a real war only a few borders away, NATO simulated one. As mentioned planning started 4 years ago, so well before Russia invaded the Ukraine. But now the scenario is more realistic and less hypothetical than it has been for decades. With NATO beefing up its defences as a result,



*The Hungarian air force deployed 5 JAS-39 Gripens to Jagel, one two-seater and four single seaters. They are part of the 59th Fighter Wing at Kecskemét airbase, as can be seen on the tail.*

German Defence Minister Boris Pistorius said he saw the exercise as a clear sign of deterrence. “Moscow is sure to see and hear a lot of what is going on here,” Pistorius said at Jagel airbase, which he visited towards the end of the exercise with NATO Secretary General Jens Stoltenberg.

The aim of this kind of exercise is twofold. One obvious target is training operating together with allies so procedures can be finetuned. Apart from this, there is a signal to possible adversaries. And although the exercise was already planned before the invasion of the Ukraine, the events there were on everybody’s mind during the exercise. During a visit to one of the participating units, German chancellor Olaf Scholz stated, “There is a turning point in history associated with the Russian war of aggression against Ukraine, because that is the statement that a powerful country is ready if it has the power to invade its neighbours to take part or all of its territory. In the recent past we all agreed that this no longer should happen within Europe, borders should be inviolable and should not be moved with force. With this exercise we train together with our allies so that the statement is taken seriously by everyone that we are ready and willing to defend every inch of our territory, and that is important.”

NATO Secretary General Jens Stoltenberg recalled the importance of air defence. He explained “This exercise sends a very clear message, that NATO is ready to defend every inch of Allied territory and every inch of Allied airspace. It is also a strong display of Germany’s commitment and abilities and it demonstrates the strong bond between Europe and North America, working together in NATO.” He as well mentioned the war in the Ukraine, looking ahead to the NATO summit

that is to be held in August in Vilnius. “Russia’s war against the Ukraine has fundamentally changed our security environment. So it is vital that we continue to invest in our defence. In Vilnius we will agree on a more ambitious investment pledge, with 2% of the national GDP as the floor, not the ceiling.”

When asked about the possible reaction of Russia, he says, “The aim of this kind of exercise is not to provoke a conflict, but to prevent one. As long as every possible adversary knows that the whole of NATO is there, and that we can quickly reinforce, there will be no attack. So the purpose of NATO is not to fight a war, but to prevent a war!”

During the two weeks, Air Defender lasted, 24 COMAOs were flown with an average of 52 aircraft per COMAO. In total 1,808 sorties were flown out of a planned 2,034, so around 90%, a very impressive rate during an exercise of this scale. Now it’s time to evaluate the lessons learned. General Gerhartz already mentioned one, “In today’s modern world of air power, we all have to have the different capabilities in one network. We do that by datalink, which is really, really complex. During the exercise, we found out it didn’t work for all assets on the first day. We improved to 80 to 90% on day two and got it fully fixed on day three. This proves you cannot



*Four F-15C Eagles of the Massachusetts Air National Guard, coded MA, are returning after a mission, performing a nice break over Hohn airbase.*



*A fully packed platform at Wunstorf, with next to two based German A.400M all 10 participating American C-130s and the Romanian C-27 in the back.*



simulate it, you have to do it.” There will be a full report on the lessons learned. But unsurprisingly that will be classified.

What’s clear though, as F-15 Eagle pilot Col. Joshua of the USAF explained, “A strong offence is your best defence. It is best for everyone to come to a peaceful resolution, but if called to active, we’re ready”. And illustrating the exercise motto ‘Stronger Together’, he concluded, “If you mess with one of us, you mess with all of us”. ➡

**Text and photos by Patrick Dirksen & Frank Mink**



*The pilot of this A-10 Thunderbolt keeps his aircraft low during take-off, before going into a steep climb. The distinctive configuration of the engines is clearly visible here.*



*The main exercise areas and air bases.*



*This frontal view of the A-10 Thunderbolt shows the nozzle of the huge cannon in the nose. Due to the size of this cannon, as big as a Volkswagen Beetle, the nose wheel had to be moved from the centreline of the aircraft, as can be seen here as well.*

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

# .....RAF Sharjah & Promotion

**I**t was in 1959 when, as a young Fg Offr and Engineer Officer of 27 Sqn at Ambala, I had taken a team of technicians (one Flt Sgt, one Sgt and four Cpls) to RAF Sharjah to carry out an engine change on a Hunter aircraft and rectify a fuel leak on another. These were brand new Indian Air Force Hunters being ferried, from the Hawker Siddeley factory in Dunsfold (UK) to Ambala, by Royal Air Force pilots. My team and I were flown out to RAF Sharjah in an Agra based IAF C-119 ("Packet") transport aircraft, and were expected to be there for about ten days. There was no hangar in Sharjah (nor was there a paved runway, taxi tracks or even a tarmac), so we had to work out in the open and, it being as hot as hell, we

used to take off our uniforms and work in our shorts.

One Saturday afternoon, as we were about to pack up for the weekend, an RAF Pembroke landed and the pilot, a Flt Lt, got out and walked over to where we were working. He, very imperiously, asked, "Which one of you is Flt Lt Ramdas?" I meekly confessed that I was Fg Offr Ramdas, at which he sternly asked me why I was improperly dressed! (Those were the days when Flt Lts inspired a lot of awe and some terror). So I hastily put on my bushshirt and cap (completely forgetting to put on my trousers!), smartly turned towards him and saluted. He thundered, "You are still improperly dressed!", but before I could reach for my trousers he took a couple

of steps towards me, reached forward to my shoulders, removed my Fg Offr's rank badges and replaced them with a Flt Lt's rank badges!!! Then, stepping back, he said, "Now you are properly dressed!"

I was absolutely flabbergasted! He then explained everything to me. An IAF "Packet" (C-119) was being positioned at RAF Bahrain to bring our team back and the navigator happened to be Sqn Ldr "Barney" Fernandes who was a great friend of my CO (27 Sqn), Sqn Ldr Arthur Berry. My promotion signal had arrived in Ambala, while I was away in Sharjah, and "Boss" Berry had, very thoughtfully, sent the Flt Lt's tapes to Sqn Ldr Fernandes to give them to me so that I could wear them on my way back



*The author in his "mini-skirt"! (Please see separate section on this)*



to India. But Sqn Ldr Fernandes had a brighter idea and sent the rank badges to me at RAF Sharjah through this Pembroke pilot, Flt Lt Walter Walmsley, who was based at RAF Bahrain and was operating logistics flights along the Persian Gulf. Flt Lt Walmsley had, of course, added his own bit to the drama!!! What a thrill it was for me to receive my promotion this unusual way, right in the middle of nowhere. And that too, from a Royal Air Force officer.

But that is not all. I had just about recovered from the shock when Flt Lt Walmsley asked me whether I would like to come to Bahrain for the weekend and that he'd arrange to drop me back in Sharjah on Sunday evening. I had already told my team that we would not be working on the Sunday so, when they heard Flt Lt Walmsley's offer, they urged me to take it up and go to

Bahrain. Which I did, and flew all the way to Bahrain, sitting in the copilots seat of the Pembroke.

On landing at Bahrain, I asked Flt Lt Walmsley whether he could drop me off at the Officers' Mess, but he didn't say anything. The next thing I knew, we had stopped outside his house and he declared that I was going to stay with him! I protested I didn't want to impose on him, but he insisted and said that Mrs Walmsley was already expecting me! I shall never forget their warm and gracious hospitality.

Those were the days, Sir! There used to be so much camaraderie and esprit de corps between Air Force officers, irrespective of nationality.

PS: Flt Lt Walter Walmsley was in the Indian Air Force before he took premature retirement, in 1952, and joined the Royal Air Force. ➡



**Air Marshal (Retd) Shashi Ramdas**

(The author of this piece was commissioned in the Technical branch of the IAF in 1955 but had enjoyed being with aircraft for the major part of his 36 years in service)

## The “mini-skirt”!

“Mini-Skirt” indeed!!! That was the standard summer uniform of my time. It was a pucca military khaki and was properly starched. Lightly starched and worn with ribbons for daily use. And stiffly starched and worn with medals for parades and formal occasions. Frankly, in the latter case, it may well have looked like a mini-skirt!

Our winter uniforms were far more stylish; ranging from dark blue battle jackets, with shoulder rank badges, for daily wear, to smart tunics with rank badges on the long sleeves.

And the winter mess kits were the most spectacular; with gold braid all over. Starting with gold braid on the “bundgallas” and sleeves of the tunic to gold braid down the entire length of the seams of the trousers. And, if the rank warranted it, there were the gold braid aiguillettes worn on the right or left, dependent on appointment. The summer mess kit was a mite sober, being white with gold only on the shoulder epaulettes. But there was a sneaky way of wearing the white tunic with the blue trousers with gold braid.

I think our old uniforms were far smarter with gold braid than the current blue uniforms with silver braid. Fortunately, I had to wear the blue uniform on only one occasion; and that was after I left the Air Force!

While on the subject of old times, I thought you might like to see some pictures which show the aircraft on which I had my first flying lessons, well before I joined the IAF. No, these are not the aircraft which those intrepid Wright brothers flew. They are the gliders which we flew in the Poona Gliding Club in the early 1950s. And that too at the cost of Re 1/- per launch! Believe it or not, that 9-year old boy actually flew that specially modified glider. His father was our Chief Flying Instructor who wanted to demonstrate how safe it was to fly gliders.



# Aircraft spotting!

Photos by Saheb Singh Chadha (Instagram @sahebclicks)



*An Indigo Airbus A320 Neo glides in for a crosswind landing at Runway 10, Delhi Airport, as an Air India Boeing 787-8 holds for its takeoff. Delhi's cargo terminal and a line of GoFirst, IndiGo, and Jet Airways planes can be seen in the background.*



*An Airbus A321-200 on approach to Almaty International Airport, Kazakhstan during sunset.*



*A FlyArystan Airbus A320-200 with retrofitted winglets rotates out of Almaty International Airport on a rainy morning.*





*An Aeroflot Airbus A330-300 after taking off from Almaty International Airport.*



*The Queen of the Skies, an AirACT Cargo Boeing 747-400F (Converted) touches down at Almaty in the morning.*



*An Air Astana A321 Neo on short final for Almaty. Don't miss the racoon mask!*



*A SCAT Boeing 737-300 approaches Almaty against a dramatic backdrop.*



*Turkish Cargo 777-F glides into Almaty.*



*Vistara Siblings!! Vistara's A321 Neo in the 50+ aircraft strong livery holds at Runway 11L for a takeoff, while a Vistara A320 Neo lands on Runway 11R at Delhi Airport.*



*Almaty being a cargo refuelling stop attracts a lot of common and uncommon freighters. Here, a Silkway West Ilyushin 76 TD-90 is seconds from touchdown at Almaty.*



*With India's rising importance, Delhi Airport gets a variety of aircraft from all over the world, near and far. Here, a beautiful A320 Neo in Drukair's colours from Paro, Bhutan, approaches Runway 10 at Delhi Airport.*



*A DHL 777-F operated by AeroLogic comes into land at Runway 10 at Delhi Airport on a sunny day with bright blue skies.*



*Head-to-head with an intimidating Air India Boeing 777-300ER approaching Runway 10 at Delhi Airport.*



*An Air India Boeing 787-8 Dreamliner rotates out of Runway 29R against a clear blue backdrop. Don't miss the wing flex.*



*A Singapore Airlines Boeing 787-10 Dreamliner, arguably one of the most beautiful liveries, departs Delhi Airport.*



# Air Marshal (R) Harish Masand says...

## I learnt more than flying from them:

### DILIP SHANKAR JOG

In August 1972, a few months after the 1971 War, I was sent from 37 Squadron, in Hasimara flying Hunters, to 221 Squadron in Bareilly for conversion on the Su-7/22. Looking back at the events that led to this move, today I feel like laughing because it was funny and a little sadistic on someone's part to send me on the Su-7. Till then, in over four years of my service, while raising the Annual Confidential Report form, I had never filled the column on Choice of next posting because I always believed that the higher ups or the powers that be in the Personnel Branch would know how best to utilise me based on my past performance. I had been on Hunters for the initial five years of my service, with little flying to show because of the serviceability in Hunter squadrons as well as the number of pilots in each due to the bulge after 1962 (at one time in early 1969, we had 52 pilots on the strength of the Squadron with me 35th in the seniority) while some of our juniors had gone straight to MiG-21s and had more than double our flying experience. Therefore, for the first time in 1971-72, I made the mistake of asking for a conversion on Supersonics thinking that I would get posted to a MiG-21 squadron, particularly after my performance in air combat in the 1971 War. Someone over there in Air HQ obviously had a strange sense of humour and ordered me onto Su-7 since technically even the Su-7 was a Mach 2 aircraft. Anyway, ours is not to reason why but just do and....!

So, it was in August 1972 that I packed almost all my meagre belongings in my Ambassador and drove to Bareilly from Hasimara. Most important in these belongings was my prized possession, a Cosmic music system with a turn table with all of 40W output and a collection of close to 100x33 RPM vinyls which, in those days, was something that many did not have. My first meeting with the Commanding Officer of 221 Squadron, then Wing Commander Dilip Shankar Jog, was almost immediate. I found it strange that I was already popular in Bareilly. As I drove in early on that Sunday morning, a number of permanent officers already there



*AOC Bareilly*

offered to share their room with me. As a Flying Officer, I was sanguine enough to know that it had nothing to do with my seniority or personality but more with the magnetism of the music system and the car. Anyhow, I settled in with Flt Lt Prakash "Phad-Phad" Bapat whom I had known earlier from when he was in 7 Sqn Bagdogra. Within the first 15 minutes, we had the Cosmic system unpacked and the latest music, like Jesus Christ Superstar, blaring at all of the 40W it could generate. The block we were staying in had paper-thin walls and the next door neighbour was then Flt Lt CN "Ganju" Ghosh, again a friend from 17 Sqn in Hasimara. However, Ganju was a spiritual man and a Sarod player so he took umbrage to this loud western music and complained immediately. As it turned out, Wg Cdr Dilip S Jog came to play squash next door in the Officers' Mess complex and came across on receiving this complaint. Soon, we were also joined by the O I/c Flying, then Wg Cdr "Chotu" Bakhle. Both Dilip Sir and he actually enjoyed the music while looking at my collection of LPs and told Ganju that if he did not like it, he could move to another room.

While Phad-Phad and I had a great laugh, it indicated to me that both the Wing Commanders were fun-loving and supported lively and spirited activities. Little did I know that Dilip Sir had already received a report on me but decided to see for himself instead of directly acting on it.



*CO 221 Squadron*

The next morning, I formally reported to Dilip Sir, as the CO of 221 Sqn, with my log book and blue books. Almost the first thing he asked me with a twinkle in his eyes and a fleeting mischievous smile, noticeable even through his big moustache, was "what happened to your hair"? He had obviously heard of my 'encounter' with Wg Cdr Johnie Greene, commanding 2 Sqn, on detachment in Srinagar. The story, a little funny now when I look back at it but deadly serious at that time, goes like this as follows in brief. In late April 1972, I was sent off to Srinagar to do the Jungle and Survival Course for about three weeks. In Srinagar, I found a lot of old friends, like Rae De Monte of 20 Squadron and Manchi Captain on Gnats, in 2 Squadron I think. There were also Allan Templeton and Maddu Khanna in the Squadron, both having moved to Gnats from our 37 Squadron. On my last day in Srinagar sometime in May, when I was to board a flight to Delhi for my return journey to Hasimara, Maddu and Allan suggested I drop in at the squadron and have breakfast with them. Please remember, this was the early 1970s, I had come from the East where we generally had longer hair and I had spent almost a month out of Hasimara at an age of barely 25 when

hair did grow pretty fast. So, after the survival course, my hair was a lot longer that day than what would have been permissible as per Air Force norms. As I walked over to 2 Squadron detachment complex, I found Allan and Maddu standing out in front of the complex in the warmth of brilliantly clear and sunny day in Srinagar with a few others including then Wing Commander Johny Greene. To cut the story short, Wing Co Greene took umbrage at my hair and my explanation for that state. On my return to Hasimara a couple days later, while my CO, Wing Co Suppi Kaul did not take the kind of action that Wing Co Johny Greene had perhaps wanted, I was advised to promptly get a haircut. Since the alternate fashionable cut those days for me was a crewcut, I did just that and that is the kind of hair I landed up in Bareilly with, much to the amusement of Dilip Sir who also had been obviously warned against me by Wing Co Greene and was expecting an unruly indisciplined young man with long hair. I can only imagine the mirth with which Dilip Sir gave his feedback to Wing Co Greene but, over there, I was quite apparently on the watch list.

Fortunately for me, my report from the ground school as well as my initial flying with Dilip Sir in September 1972 was apparently to his satisfaction though, initially, I did all my pre-solo sorties with him. It was a bit unusual for a CO to personally take on the conversion of a youngster but then, I suppose, he had to personally assess me because of the negative report he had received on me. Based on my performance and behaviour, in the end he actually started treating me like one of his own instead of any antagonism that I might have expected and, somehow, we kept good relations throughout thereafter.

Another incident that occurred in Bareilly was about a suspected late night reported on me by a doctor. What had actually happened was that a senior pilot, Flt Lt Shergill, met me in the bar while I was having my medicinal and restricted single bottle of beer before dinner and started pouring out his personal troubles and problems to me. Like a Good Samaritan, I listened to his tale of woes sympathetically till about 10.30 pm and then excused myself since I was on the programme for a solo sortie, my second or third solo on type, the next morning. The Flight Commander, then Sqn Ldr SV Bhutani, caught me as I arrived in the squadron after met briefing and castigated me for drinking and having a late night. While his monologue against me was continuing

with threats of stopping my flying, Dilip Sir happened to walk into the Flt Cdr's office and after listening for a while, directly asked me how much I had imbibed the previous night. I truthfully and honestly told him that I was strictly on a single bottle of beer on weekdays and the night before was no different except that I sat with Flt Lt Shergill a little longer than I should have. I also assured him that I had a good night's rest and was absolutely fit.

Dilip Sir then asked me to leave the office and I suspect he told the Flt Cdr to trust my word and let me continue with my sortie that day. These incidents taught me how a commander should actually win the trust and respect of his subordinates by trusting them first after invoking their honesty. Very few individuals then have the inclination to betray the trust placed in them and let their commander/leader down, except for some hard-core guys that one can identify in due course. Because of these two incidents and the way Dilip Sir handled them, he won my respect and loyalty for a lifetime and this showed in the kind of relationship he permitted to be built with me while leaving behind a lesson for me to imbibe.



*Visiting Poona in late 1989 with his brother*

While in Bareilly for almost two months, I realised that Dilip Sir was single, having separated from his wife for reasons I never delved into or found out, and was, therefore, mostly with the younger single officers in the Mess area. Almost every evening, he would be in the squash court playing against one youngster or another and, despite his age, almost always managed to beat the younger guy due to his deft placement of the ball and anticipation. I used to generally just watch him play and admire his game silently since I was not much of a sportsman, in squash or any other racquet game. What I noticed though was that Dilip Sir never rubbed his prowess or the defeat on the younger guy and always had an encouraging smile during and after the game. He

also spent time with us in the bar on weekends and, on many occasions, in my room listening to music and just talking about various things. Due to his easygoing style, I personally found it very easy to be with him despite his seniority and the age gap, as did most youngsters. This easy relationship, of course with due respect to his seniority and age, continued through our respective careers.



*At Bareilly*

After completing my conversion syllabus with the final 13th sortie on 3 October, I bid good bye to Bareilly and drove back to Hasimara. Thereafter, I did not have any professional contact with Dilip Sir for some time till I bumped into him in Delhi in 1977 while passing through on annual leave to cool my heels after having been removed from the No.11 FCL Course starting December 1977. I think he was in JD Air Staff Inspections as a Gp Capt then and with the same smile, indicating that he knew my problem, asked me to come and have a drink with him the next evening in Central Vista Mess where he was staying. I have described this story in adequate detail while writing on "Groupie" Denzil Keelor which was published earlier in the VAYU magazine, available at <https://www.vayuaerospace.in/article/835/air-marshall-r-harish-masand-says-i-learned-more-than-flying-from-them-denzil-keelor>. Therefore, I would not describe the entire episode here except to highlight Dilip Sir's care for his subordinates, particularly once he got to



know them and their potential. With his and “Groupie” Denzil’s help and support, I got out of this problem and went on to redeem myself in No.12 FCL starting March 1978. Once again, I never served under him again but saw him socially at various places while passing through or visiting where he was.

Professionally, I met him again in April 1988 when Dilip Sir was an Air Marshal and SASO/Chief of Staff in Western Air Command and I was commanding 28 Squadron on MiG-

24 May 1988 and also enjoyed it, thanks to all the support we got from Srinagar and WAC largely due to Dilip Sir. I had also invited Dilip Sir to visit us while we were in Srinagar and fly the MiG-29. While he was very keen, the C-in-C decided to be in Srinagar to watch over us during this detachment and flew with us as also introduced the squadron to the Chief Minister, Shri Farooq Abdullah by asking me to do a low-level display for the CM.



SASO WAC

29s. Our Squadron was assigned an operational role in J&K sector and I was asked to report to him in WAC for a briefing and discussions. As usual, Dilip Sir had a warm smile on his face when I entered his office and he made me feel quite at ease during the discussion which was more like an informal chat. Our Op location was already selected as Srinagar and Dilip Sir asked me to go down to Srinagar for a couple of days to familiarise myself and work out the squadron’s technical and administrative requirements when deployed. While there, Dilip Sir also wanted me to consider MiG-29 operations from Leh. On the way back, I reported to him and the AOC-in-C, then Air Marshal MM Singh, and briefed them ending with that we had no problems at Srinagar, where the AOC, then Air Commodore AK Singh whom I had met in my Hunter days, was happy to have us and that, in my opinion, we could also operate from Leh without any problems. Dilip Sir said that we would get an opportunity to do that the next month, in May 1988. Sure enough, we operated a big detachment of 6 or 8 aircraft in Srinagar from 16 till

We operated another detachment with 8 fighters and a trainer in Srinagar in October–November 1988 for an air defence exercise being run by AOC J&K, then AVM Dushyant Singh. By this time, I had lost some of my senior pilots due to posting out, courses and leave and had just a young Sqn Ldr, Ramesh Goyal, who was also my standby low level aerobatics display pilot, and below him, Flt Lieutenants/Flying Officers with the seniormost as Flight Lieutenant Rajiv Kothiyal (of later LCA fame). At that time, Rajiv had just around 150 hours on type, if I remember correctly, with little valley flying experience though he was a professionally capable and upright young man.

Just as we had done area familiarisation with an odd sortie of valley flying and did our first mission in the Exercise on 3 November, I got a call from Dilip Sir to ask me to move with Ramesh Goyal to Palam immediately for a display during the colour presentation ceremony for 17 Squadron and 105 HU which was scheduled on 8 November. When I showed just a hint of hesitation in leaving the detachment for this important

exercise in the hands of a relatively in experienced pilot on type, Dilip Sir gently asked me if I trusted the training I had imparted to my youngsters. He indirectly reminded me that I had been trusted to handle big responsibilities at a low-level of seniority and experience and I should have the same faith in my youngsters. While I did have that faith and trust and encouraged my younger folks to do everything I could and more, I was only worried about AVM Dushyant pushing Rajiv to do something that may be unsound, tactically or flight safety-wise.

In that regard, I still recall one evening earlier when I had flown back from Jamnagar to Poona with my Senior Technical Officer in the trainer and had encountered a severe squall and bad weather just North of Poona moving towards the airfield slowly but surely. The squadron was planning dusk and night flying that evening soon after and after giving my weather report to the Flight Commander, I went home. Soon, I heard an aircraft takeoff but held myself from calling up the squadron to intervene or recall the aircraft. I think, almost immediately it started pouring and Arup Raha, who had just taken off, landed quickly within minutes since I heard the whistle of jet on the landing run avoiding a diversion or an incident. I had learnt from my seniors including Dilip and Denzil Sir to let the younger lot take their decisions to groom them for higher responsibilities as also to be able to accurately assess their capabilities.

Anyway, Dilip Sir’s wish was a command for me and so, without any further reservations and, after briefing Rajiv, Ramesh and I flew to Palam that very afternoon. Fortunately, fortune favours the brave and we didn’t have any issues at Srinagar or Palam. Fortunately for us, the display went well too despite the poor visibility, usual in Delhi at that time of the year, and both Dilip Sir and the C-in-C then, Air Marshal Prithi Singh, complimented us on the display as well as the performance of the squadron in Srinagar.



Srinagar detachment May 1989: Gulmarg



*Srinagar detachment May 1989:  
Pahalgam*



*Srinagar detachment May 1989:  
Sonamarg*

The next time, our detachment in Srinagar was planned in mid-April 1989 for about two weeks. When I received that Op Order, I immediately called up Dilip Sir directly and requested him to shift the planned detachment to early May 1989 because all the school examinations were in the latter half of April and most of the airmen, with older children, generally coached and revised the syllabus with their children and liked to be with their children during examination time. Taking the airmen away at that time, while acceptable in operational conditions, did not make much sense. Dilip Sir readily accepted my logic and agreed to postpone the exercise to early May. That was a huge relief for my technical staff before the word even got to them.

Next, I requested Dilip Sir to make our detachment for 16 days in Srinagar with exact dates from 5 May till 21 May 1989. That perplexed him a bit and he asked jovially, in his exact words, "Harish, you bounder, what do have in mind now?" I told him that 28 Squadron had spent the last one and half years, since barely becoming operational in January 1988, almost 60–70% of the time on detachments due to the novelty

of employing the MiG-29 everywhere, without ever complaining. However, our wives were now clamouring for an opportunity to come along with us, particularly to a holiday destination like Srinagar. Since there were three main touristy locales around Srinagar, Gulmarg, Sonamarg and Pahalgam, these dates would give us three weekends when we could arrange a visit to these three places for the families. I also told him that by June–July 1989, I was likely to be posted out since I was completing two years in command and this would be my parting gift to the families. Dilip sir promptly responded with, "Let this be my gift to your squadron for the wonderful performance you all have put up" and added that he had mentioned this to the C-in-C too who was in full agreement. However, he did add a caveat; that I would have to manage transportation and accommodation for the families by myself. I readily agreed and managed these through PR at various levels and even flew the Squadron Gypsy and a couple of motorcycles to Srinagar in the IL-76 that was provided for the move. Some of the photographs, representative of the great time the families had in Srinagar, thanks to Dilip Sir, are attached in this article.

Dilip Sir had also assured me that he would visit Srinagar and fly the MiG-29 with me during this detachment since he was due to retire the next year. Unfortunately, he could not make it because the C-in-C was also on the move somewhere, I think. Dilip Sir retired in 1990 and we also did not meet again till 1993–96 when he was staying in NOIDA and I was in Air HQ in charge of the MiG-21Bis Upgrade programme (Bison). One evening, when Wg Cdr 'Macky' Palamkote was also visiting Delhi, the three of us got together and I still remember that great evening together. Dilip Sir's honesty and personal courage to admit the truth came out clearly that evening, yet another quality that I admired him for. He was reminiscing his days in the Air Force and suddenly said himself that while he had a great time, he did regret some mistakes that he had made which affected the Service. While what he regretted is not important for this story, the very fact that he was willing to admit such things through the power of self-realisation made me respect him even more as a professional and a human being.

Thereafter, I kept meeting him socially off and on whenever I was

posted in Delhi and always enjoyed the time I spent with him. He led a spartan retired life in NOIDA and was now into regular golf and, on many occasions, he would give me a quick beer or a cup of tea when he had to rush for a game. We did have him over to our house too a couple of times and his routine on a weekday would be to get a game in Racecourse and then come spend the evening with Malini and me.

Unfortunately, after 2005 when I moved to Bangalore and then retired in 2006, we didn't see much of him since I was now taking care of Malini for her ailment. Therefore, it was quite a shock for us when we bumped into him in the RR Hospital in 2010 when I was taking Malini for some treatment and he was coming out with a walker. Cancer had caught up with him too and he was looking quite frail. It was sad to see this jovial man looking so frail and with a walker but he was still smiling and still called me a bounder. We heard about his passing the next year in 2011 with enormous grief. We had lost a mentor and a great father figure in Dilip Sir but his impish smile and the jovial affectionate use of "bounder" still makes me remember him with fondness. I hope he is smiling the same way up there in the Valhalla. ➡



*The author of this series, Air Marshal  
(R) Harish Masand*



# 25 Years Back

## The 1998 Aerospace Journalist Of The Year Awards

The Vayu Aerospace Review was honoured by the Royal Aeronautical Society at the recent “1998 Aerospace Journalist of the Year Awards” ceremony in London on 7 September 1998. In his message on the occasion, Mr Jack Lowe, President of Royal Aeronautical Society stated: “Since our foundation in 1866, the RAeS has sought to promote an understanding of aerospace, so it is not surprising that we should have been the world’s first aerospace institution to recognize the work of aerospace journalists in the form of a major awards scheme.”

## USA Urges Russia to “Cut Defence Ties with India”

On his visit to Moscow on 1 September, the US President Bill Clinton urged his Russian counterpart Boris Yeltsin to stop military cooperation with India and warned that nuclear rivalry in South Asia could eventually lead to a “direct war” between the two nuclear superpowers.

## Sokol “Unhappy” with IAF MiG-21 Upgrade Deal

For the first time, openly, officials of the Sokol aircraft factory at Nizhni Novgorod in Russia have started criticising the “economic logic” of the deal with India to upgrade its MiG-21bis fighters.

## More Russian Weaponry

According to other reports from Moscow, the Indian Navy is to acquire 50 more Russian-made Kh-35 anti-ship missile for its three new 6,700 tonne INS Delhi-class destroyers at a cost of \$150 million.

## Kaveri Core Engine Testing in Russia

The Kabini, which is core of Kaveri turbofan engine being developed by the Gas Turbine Research Establishment (GTRE) at Bangalore, was sent to Russia for tests in mid-August 1998. Consisting of the HP compressor, HP turbine and combustor, the Kabini was subjected to simulated high altitude testing at the Russian CIAM facility, some 65 kms from Moscow.

## From Vayu Aerospace Review Issue V/1998

### Second LCA Rolled Out

Without the fanfare, which preceded the first LCA Technology Demonstrator (TD-1) roll out in November 1995. The LCA’s TD-2 was rolled out at HAL’s Bangalore airport on 14 August 1998, sans publicity.

### Indian Cryogenic Engine Soon: Abdul Kalam

Head of India’s Defence Research and Development Organisation, Dr. APJ Abdul Kalam has said that an indigenously developed 7.5-tonne cryogenic engine would soon be ready for launching geostationary satellites into space.

### Tatas Withdraws Airline Proposal

After a three year wait, Tata Industries on 1 September 1998 withdrew their proposal to set up a domestic airline because of the “absence of a credible time-frame for a decision.” Company officials squarely blamed the civil aviation ministry and charged it with being a “stumbling block” for the proposal.

### Air India Needs Rs 1000 Crore

It is highly improbable that the Government of India will be able to inject Rs 1,000 crore in fresh equity into Air-India in accordance with the recommendations of the Disinvestment Commission.

### Pawan Hans Consider Intra-city Services

Pawan Hans Limited is tying up with Indian Airlines to provide helicopter services between Santa Cruz Airport and Nariman Point in South Bombay. The inter-line deal will allow IA to sell a single ticket for both the aircraft and helicopter journeys by adding about Rs 1,000 to the ticket price.

### Stallion Airlines

A new start-up carrier, Stallion Airlines has been cleared by the Civil Aviation Ministry to launch air services with 19-seater Metro 23s, which have pressurised cabin and a high cruise speed of 550 kmph. Stallion will open new routes in South and Central India.

### US Report On IAF Fighters

According to a report originating in Washington DC, more than 300 Indian Air Force combat aircraft have been grounded, leaving only 50 per cent of the IAF fit for combat operations. “Bureaucratic hurdles and lack of funding has meant that spares are had to come by while the IAF is unable to upgrade its fleet of MiG-21, 23 and 27s, leaving it unoperational for over two years”. ➡

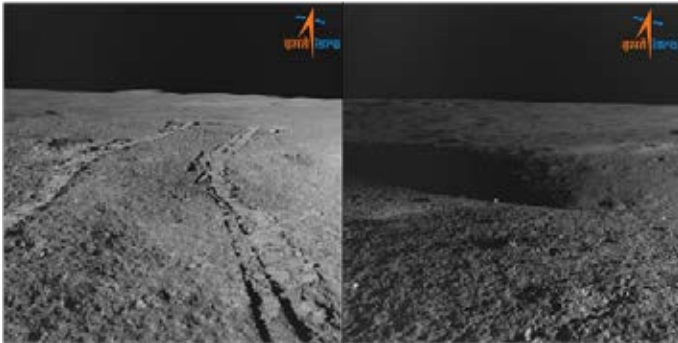
# Tale Spin

**Didn't realise we had diversified so much!**



*From a sailing club to making our own boats—what's next? Perhaps we do need to expand our portfolio!!*

**Not your average village road with potholes!**



After successful landing on the south side of the Moon late August 2023, the Chandrayaan-3 rover came across a 4 meter wide crater. ISRO operators had to retrace its path to avoid the risk of falling in.

**Hmmmm. Not quite.**

**Photo of the year**



ISRO's Vikram lander as seen by its Pragyan rover on 30 August 2023.



Which version of the LCA Tejas is this? We are not too sure!



**Drone flyers watch out!**

Ads in various newspapers in Delhi warning about the do's and don'ts for the G20 Summit. Whatever you do, please keep your Predators and Reapers grounded till it's all over!

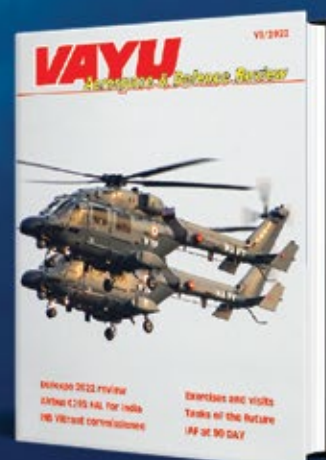
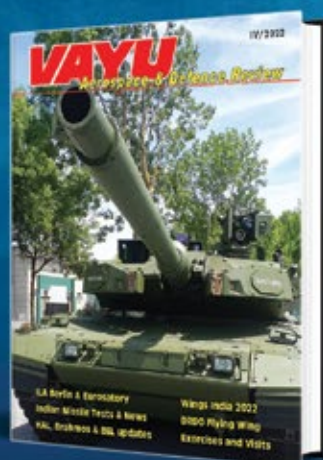
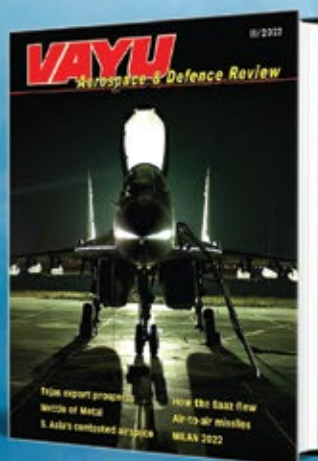
**Afterburner**



# VAYU

**Aerospace & Defence Review**

**49<sup>th</sup> year of Vayu**



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