



Exercise MILAN 2024
MBDA missiles for IAF
Indian Army exercises

India's FRCV project
SFF: The Two Twos
HALs record revenues


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Cover : Indian Navy's Vikrant 'R11' (IAC-1) aircraft carrier during Exercise Milan. Photo by Angad Singh (Twitter @zone5aviation)

38

Exercise MILAN 2024

Angad Singh reports on Exercise MILAN 2024 of Indian Navy. This edition was twelfth and largest yet, bringing in 51 naval delegations, 16 foreign vessels and one foreign patrol aircraft (a French Atlantique 2).



44

Indian Army Exercises

The Army Commander Western Command accompanied by GOC Kharga Corps witnessed integrated firepower exercise Ex Kharga Shakti in conjunction with IAF to achieve "seamless synergy effectiveness destruction of the enemy". Besides this, we cover a few dozen more exercises.



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54

Vayu visits MKU facilities

Vayu's Nitin Konde and Rishav Gupta report on MKU facilities in Kanpur, UP. In 20 years of existence till its rebranding as "MKU Ltd" in 2005, the company had made its reputation within the Indian Army, as it supplied critical protection systems like fibreglass helmets, from 1989 itself.



55

India's future battle tanks and concerns

Sankalan Chattopadhyay writes on India's future ready combat vehicle. It is a highly ambitious project aiming to have a main battle tank (MBT) capable of withstanding emerging and future threats of the mid to late twenty first century.



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58

Special Frontier Force: The Two Twos

Abhinav Negi reports on the highly motivated men and women of the Special Frontier Force or SFF has again proved the force as a well trained and highly effective force after the 2020 Eastern Ladakh conflict, by carrying out successful operations and capturing strategic heights.

61

MBDA missiles for IAF's Rafale

Sayan Majumdar writes on MBDA missiles enhancing the combat capabilities of IAF Rafale fleet. To bolster the capability of IAF Rafale omni-role strike fighters, MBDA as of now has transferred SCALP, MICA RF and MICA IR and Meteor BVRAAMs.

119 I Learnt more than flying from them

Harish Masand remembers Alan Mourice Mascarehas who was an instructor in NDA at the time in early 1968. 'Mascy', as he was known those close to him was a reputed pilot attack instructor who had been on the staff of PAI school in Jamnagar as a flying officer.

123

The Death Followed

Jai Samota reports on the 1962 war series the conflict that claimed a great deal of Jats' lives. Of 33 that fought at Kongma, just 7 made it out alive.



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Admiral Arun Prakash says....

War Hero and Pacifist

Admiral Laxminarayan Ramdas, APVSM, AVSM, VrC, VSM, former chief of the naval staff, sailed into the sunset on 15 March. He had lived a life in keeping with his high principles, beliefs and convictions, and many admirers mourn his demise. Born in the Tamil-Brahmin neighbourhood of Matunga, Mumbai, Adm Ramdas (fondly known as “Ramu” in the navy) grew up and received his education in Delhi. Consequently, he could startle guests by switching from chaste Tamil to rustic Punjabi with felicity. Having served with distinction at every rung of the naval hierarchy, in India and abroad, he became the first Indian-trained officer (of the first course of the Joint Services Wing), to reach the apex of the Indian Navy in 1990.

In 1992, when I received orders to report to New Delhi as naval assistant to the chief of naval staff, I was shocked. The general consensus was also that the CNS had taken a risky call in picking a naval aviator with zero staff experience as his aide. But, as I was to discover, decisiveness and a sound instinct were characteristic of Adm Ramdas. For me, this tenure in the proximity of a demanding and cerebral chief proved to be a hugely educational experience. The 1990s were an eventful decade. No sooner had the USSR disintegrated than the US promptly made overtures for military-to-military cooperation with India. While the other services hesitated, Adm Ramdas decided that it was time for the Indian Navy (IN) to shed its insularity and initiated the first ever Indo-US naval drills in May 1992. This was the first “Exercise Malabar,” whose 26th edition took place in 2023.

Malabar was shortly followed by an invitation to visit Washington. Accompanying him to interactions with the US Navy Chief, the

Chairman Joint Chiefs, as well as politicians and diplomats, it was obvious to me that his intellectual depth, knowledge of international affairs and suave demeanour had won Adm Ramdas much respect and many friends, in the Pentagon as well as in Foggy Bottom.

His vision of an outward-looking Indian Navy encompassed the novel idea of an “Indian Ocean panchayat,” which he mooted in many forums, but which did not, then, find favour with the diplomatic establishment. It was two years after his retirement that this concept bore fruit; first, in the form of “Exercise Milan,” which saw a gathering of five navies in Port Blair, and later as the Indian Ocean Naval Symposium (IONS) in 2008.

At home, the economic crisis had imposed severe budgetary constraints on the navy’s operations, as well as logistics support and maintenance resources. Urging the fleets and dockyards to improvise, Adm Ramdas coined a slogan for the navy, “Much more, with much less,” which inspired us to tighten our collective belts, and find innovative ways of maintaining the navy’s operational tempo.

Parents of three bright daughters, the Admiral and his wife were strong advocates of gender equality and opportunities for women, causes not frequently espoused then. In November 1992, they were proud witnesses, as the Indian Navy became the first amongst Indian armed forces to commission 22 women officers in Goa.

A veteran of the 1971 war, in which he was decorated for gallantry, Adm Ramdas remained an ardent votary of nuclear restraint as well as peace and harmony in the Subcontinent. I recall his profound anguish as news of the demolition of the Babri Masjid trickled in on 6 December 1992, and he sought an urgent meeting with

then Prime Minister PV Narasimha Rao to convey his concerns about the maintenance of communal harmony in the country.

On doffing his uniform, Adm Ramdas made a brief foray into party politics as an anti-corruption campaigner and then retired to his rural retreat in Alibaug, Maharashtra, to serve social causes. His enduring concerns about the armed forces remained focussed on what he perceived as creeping politicisation, and the dangers of possible contagion with the communal virus.

Having ably helmed the navy at a critical juncture, when India was coming to terms with the post-Cold War era and coping with an economic crisis, he transitioned smoothly into civilian life, as a doughty crusader for social causes and for his strongly-held political beliefs. His passing leaves a void, not only for the naval fraternity, but also for his many admirers and acolytes in national life. ➡



In the photo above is
Admiral (Retd) Arun Prakash

Richard Gardner from London says....

....UK to upgrade global defences

Following growing political pressure in the UK and increasing concerns in military circles that British force levels and capabilities have shrunk too far following three decades of cut-backs during the so called “Peace Dividend” years, the UK government announced on 23 April 2024 a major increase in defence spending that would see the annual budget increasing to £87 billion by 2030. This will add an extra £75 billion to the previous budget and will represent a significant measure following this decision to ramp up national industrial capacity and production of ammunition and defence systems, and to simplify and speed up the acquisition of new weapons and systems. He said industry was now being put “on a war footing” spending £10 billion to replenish and modernise ammunition stocks. New capabilities were being introduced and a Defence Innovation Agency was being set up to develop new weapons to exploit emerging technologies and to get them into service faster and at less cost than previously.

The UK Prime Minister, Rishi Sunak, was speaking in Poland alongside NATO Secretary General Jens Stoltenberg as he explained that the Russian military invasion of Ukraine and continuing air attacks had signalled an end to one era and had underlined the growing need to stand up against global threats caused by the aggressive policies being promoted by autocratic nations including China, North Korea and Iran. He pledged another £500 million for Ukraine and stated that the annual £3 billion in defence aid to Ukraine would be maintained at this level for the rest of this decade.

It is hoped that by raising UK defence spending to 2.5% of GDP this will give other NATO nations an incentive to follow the lead. Already many of those “front-line” East European countries directly facing Russia are already achieving this,

but Sunak has called on more to follow as he said that the USA had been providing the biggest NATO contribution by far for decades and it was time for the collective European partners to do more, especially as the US was providing an increasing pace of defence support in the Asia Pacific region. The UK was determined to increase its own support for allies in this theatre as well. Part of the re-look at what was needed for Army resilience, initially for European defence, is the Anglo-German decision to co-operate on a new generation of 155mm Howitzer field artillery design which will be unmanned.

A large amount of ammunition, especially shells, surface to air and cruise missiles, had been given to Ukraine by the UK and had been shown to be highly effective against surface, sea and air targets. Replacement stocks were needed for the UK's own defence requirements and this is being addressed as a matter of urgency, and there is a re-examination underway of what new weapons and other systems are needed to provide a better balance of weaponry and supporting systems available to UK forces. Three decades of combat, ranging from Bosnia to Iraq and Afghanistan, slewed operations to counter-terrorist warfare but now state-on-state as well as traditional battlefield threats need to be addressed and this requires new generations of equipment, as well as specialised training for crews. Drone swarms and autonomous systems, along with new high-speed missiles have emerged over Ukraine and in the Middle East and countering such threats needs to be considered in a strategic overview. New offensive hypersonic missiles are part of the solution with advanced ground based air defence systems playing a big part in co-ordinated regional defences. The UK Dragonfire directed energy (laser) weapon is described as a true Game Changer and is destined to

be introduced from 2027. Capable of destroying all types of air targets as well as being a disrupter of sea and surface targets, it will provide an almost instantaneous response to multiple threats while providing a far cheaper counter than just relying on missiles and fast-firing guns and will initially be fitted to Royal Navy warships. It will also be developed in an Army format for land battle use and area defence.

Although precision weapons have been shown to be key in taking out priority targets, they are relatively expensive yet are needed in large quantities. The UK government has recognised that as well as developing superior performing weapons solutions, modern warfare results in a need to re-think not only how to deploy and operate these tools to best effect, but to have sufficient trained experts to be behind the control centres, even with more autonomous systems and Artificial Intelligence playing a growing role, and to keep development costs under control. Getting all these evolving requirements in line with changing needs means there is no choice except to re-think how things are done. More of the same is no longer credible, and this new UK initiative is aimed at a major catch-up in capabilities that have been squeezed over and over again in the belief that global state-on-state war was a thing of the past. This is no longer valid and there can be no doubt that China and North Korea are watching what happens in Russia and Ukraine very closely. Rebuilding its surface and submarine fleets will have a high priority in the UK strategic revision and providing more combat jets to populate its two super-carriers will be one of them. A Far East RN carrier deployment is due to take place next year. The last was severely disrupted by the Covid restrictions, but a more extensive series of operational exercises with allied forces is due. ➡

Lt Gen Kamal Davar says...

....Expediting Integrated Theatre Commands: A call to action



It is a universally accepted truism that militaries the world over display an uncanny propensity for reluctance towards ushering change in their basic structures, operational concepts, and methods of warfighting, SOPs confronting tactical challenges, and social habits, amongst others. Time-honoured traditions do rule the roost in many military customs and practices. While most of these aforesaid aspects may deserve preserving, constant assessment of the factors enhancing security and operational preparedness, the challenges emerging across new domains of warfare, and the cost effective employment of the latest technologically driven weaponry and platforms need to be undertaken to prepare the armed forces for future confrontations.

Notwithstanding India's victory in the Pakistan Army engineered Kargil War in 1999, India realised the need for defence reforms. The Kargil Review Committee (KRC) headed by Dr K Subramanyam suggested many path breaking and long awaited reforms which were duly approved by the then appointed Group of Ministers in 2001 in the Vajpayee government.

Among the many reforms suggested by the KRC for Higher Defence Management was the creation of the post of Chief of Defence Staff (CDS) to render single point defence advice to the government, and, the dire need

to achieve the necessary jointness and operational synergy among the three services—the Indian Army, Navy and Air Force. After much debate, the three services concluded that the concept of Integrated Theatre Commands (ITCs) would be the answer to achieving critical jointness among the services. The fact that even today this major step in restructuring has not been implemented displays the ongoing professional chasm between the three services. Meanwhile, the government in August 2023 passed in Lok Sabha the Inter-Services Organisation (Command, Control, Discipline) Bill terming it “A series of military reforms being undertaken by the government to empower the nation.” Many defence experts consider it as a precursor to the creation of ITCs. Nevertheless, the current impasse on the exact restructuring of the number of, shape, size and operational responsibilities of the proposed ITCs continues to bedevil the three services. That there is no easy answer to the problem and mutual acceptability among the three remains non-existent is more than evident.

When the United States (US) encountered a similar situation, the US defence establishment stepped in and then via the Goldwater Nichols Act of 1986 it ushered in a massive changeover and restructuring of their armed forces. This Act vastly reorganised the US Department of

Defence to improve military advice to the US President and their Secretary of Defence and placed clear cut responsibilities on the commanders of their specified and unified combat commands. The Indian Armed Forces also need to look inward and sort out their restructuring as best strategically, operationally, technologically, and financially possible. The fact that for restructuring our armed forces, we need not blindly follow any foreign forces template but create one suitably adapted to our operational requirements brooks no elaboration. The Chinese have established only one theatre command against India while the US has eleven geographic and functional commands owing to their self-assigned global responsibilities.

There can be no two opinions that the Indian Armed Forces, confronting present challenges and those likely in the foreseeable future, have to be fully geared up to ensure security preparedness 24/7 in a two-front war and also must have some capabilities for a counter-insurgency/internal security scenario. Currently, the Indian Armed Forces has 17 C-in-C level Commands (seven each with the Army and IAF, three with the Indian Navy) and two joint integrated commands, namely the Andaman and Nicobar Command and the nuclear responsible Strategic Forces Command. In addition, India has

OPINION

the Defence Cyber Agency and the Defence Space Agency which can be elevated to a Command level along with raising a Special Operations Command. This step will ensure that the current 19 C-in-C level 3-star officers are suitably accommodated. In addition, as we gradually go in for the larger geographically responsible commands, there is a case for some of these larger commands to be led by 4-star general officers and equivalents. The CDS must be a 5-star equivalent. In addition, the CDS should have the three chiefs under them and all must have operational responsibilities. Aspects of recruitment, training, logistics, etc. can be looked after by 3-star officers already authorised to the services.



Many models for restructuring have been suggested within the establishment and by defence experts. Without even the slightest loss of our overall operational capabilities, we can consider having (east onwards) an Eastern Theatre Integrated Command (primarily against China and also looking after Myanmar, Bangladesh, and Bhutan). A Central Theatre to look after Nepal, Uttarakhand, a Northern Theatre looking after Tibet, China, portions of Gilgit-Baltistan and Pakistan occupied Kashmir (POK) including Jammu and Kashmir (J&K). We may have the Western Integrated Theatre Command in the South of J&K which

would be responsible from Pathankot including Punjab and northern portions of the desert sector to cover West Pakistan. It could be followed by the Southern Command which also coopts the current SW Command. The geographical divisions to include Sindh, Karachi, and subsequently Sri Lanka and the western seaboard, amongst others, can be finalised later.

The Navy could have under its responsibility two integrated commands—one each for the western and eastern seaboard. It needs to be further explored whether The Andaman and Nicobar Command should be subsumed by the Navy's Eastern Command. It must be noted that the West Asian waters are crucial

for India's oil supply; it has lately seen turbulence due to the ongoing Israel–Iran– Hamas conflict. In addition, the Chinese disregarding internationally accepted law of the seas for freedom of navigation in international waters. The Indian Navy will have to be ready to play a major role in the Indian Ocean and look after the sea lanes heading towards the Malacca Strait, much of South East Asia and onwards towards Japan. One solution could be that Eastern Theatre Command looks after the ground and aerial aspects while the entire Bay of Bengal and the Indian Ocean region is made the responsibility of the Andaman and Nicobar Command.

Allocation of each service responsibility or its rotation for leading the respective Commands is a matter of careful evaluation and can be evaluated judiciously by a battery of service experts, even retired and even taking impartial counsel of civilian–military thinkers in the country.

Nevertheless, we can commence with reorganising the Eastern Theatre Integrated Command first, evaluate its functioning for two years or so, and then gradually restructure the entire edifice one by one, ensuring no gaps in India's overall defence preparedness. The Eastern Theatre Command will uniquely have all three services being represented and thus will be the ideal to test the efficacy of the Integrated Command.

As an emerging global and regional power, India's military preparedness has to keep pace with newer challenges across all domains of warfare and thus the restructuring of its antiquated Defence structures is *sine qua non*.

This critical restructuring should not be further delayed. By concerted inter-services thinking and a vision for the future, India's overall security preparedness must be of the highest order given its growing regional and global responsibilities. ➡



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

Admiral Arun Prakash says....

More firepower for nuclear deterrence

April 2012 saw two important developments within days of each other, which served to enhance India's strategic profile – the commissioning of nuclear attack submarine INS Chakra, leased from Russia, and the successful test firing of the 5,000 km ballistic missile, Agni V. Chakra, with its cruise missiles, could be a maritime game changer, and the Agni V could target cities deep in China, from launch pads in central/south India. This created expectations that these two events would convey messages of deterrence to China about its hegemonic behaviour, and to Pakistan about cross-border adventurism. However, neither seemed to take the hint, and it would take a Balakot and a Galwan to convey India's resolve in the conventional domain.

Much has changed, concurrently, in the status of India's nuclear deterrent, which now comprises a "triad". The airborne component was bolstered by the induction of the 5th generation Rafale strike fighter in 2019. The underwater leg became operational when the nuclear submarine (SSBN), INS Arihant, went on its first patrol in 2018, armed with ballistic missiles. And now, the land based component has acquired a new dimension with the successful test firing of an Agni V, armed with multiple, independently targetable re-entry vehicles (MIRV).

While dubbing it, expectedly, "as a warning sign of an emerging arms race", the Federation of American Scientists (FAS) comments that India's action has only followed China's deployment of MIRVs and Pakistan's test of MIRV capable "Ababeel" missile in 2017. FAS notes that Russia and the United States (US), having reneged from the Strategic Arms Reduction Treaty ban on land-based MIRVs, are replacing single warheads with MIRVs. India's late start in this is due, more likely, to lethargic decision-making than to capability deficit.

India's 2003 nuclear doctrine aimed to: (a) prevent an attack with nuclear or chemical/biological weapons on "Indian territory or Indian forces, anywhere" and; (b) to threaten the attacker with "massive retaliation designed to inflict

unacceptable damage". Espousing "no first use" (NFU), the doctrine pledged to maintain a "credible minimum deterrent", leading many politicians to declare that "a few" or "a few tens" of nuclear weapons would be sufficient to deter a nuclear adversary.

Such beliefs were delusory since the NFU restraint would require India to absorb the loss of a proportion of its warheads to an enemy "first-strike", and then to launch a response with surviving warheads. Clearly, India needed to possess more nuclear warheads than the enemy could destroy in a first strike. This brings us to adversary nuclear capabilities and intentions.

Both our neighbours are actively expanding and diversifying their nuclear arsenals. While Pakistan is reported to have about 170 nuclear warheads and is adding 5–10 annually, it is estimated that China possesses an arsenal of 500 warheads, which is forecast to grow to 1,500 by 2035. Against this backdrop, it is obvious that India, without entering an "arms race," will need to maintain some kind of parity for its deterrence to remain credible.

The dramatic growth of China's nuclear arsenal is motivated by its competition with the US. But the assumption that Beijing is dismissive of India as a threat is controverted by two facts. First, ever since the 1974 nuclear test, China has been targeting Indian cities with nuclear tipped missiles; and second, it has propped up Pakistan as a proxy to checkmate India, arming the former with nuclear and conventional weaponry. Pakistan, for its part, sees the threat of nuclear first-use not only as guaranteeing protection against India's conventional military superiority but also as a cover for waging a sub-conventional war.

It is in this context that MIRV capability assumes significance because it enhances the credibility of a deterrent by enabling a single re-entry vehicle to carry multiple warheads. Not only can one MIRV deliver many live warheads on the same or dispersed enemy targets, it can also deceive and

defeat enemy anti-ballistic missile defences with dummy warheads.


However, since the missile payload capacity remains constant, MIRV capability demands miniaturised warheads while retaining adequate explosive yield.

Herein lies a problem. China, after extensive testing, has operationalised a set of nuclear warheads with yields ranging from a few hundred kilotons to a few megatons. In India's case, given the controversy about the yield and efficacy of the thermonuclear device tested in May 1998 and the ill-advised commitment to forgo further testing, ambiguity has persisted about its ability to deliver "massive retaliation" through high-yield weapons.

Bypassing this debate, Indian scientists have steadfastly maintained that one or more of their "boosted fission" warheads with a yield of 300–400 kilotons is adequate to inflict "unacceptable" damage on Pakistani or Chinese cities targeted.

India must, therefore, persevere with this programme and install MIRVs on as many land-based missiles as required. Far more urgent is the need to expedite the MIRV enabled K-series of long range submarine launched missiles, given the future salience of the triad's underwater leg.

China's 2023 defence policy reaffirmed its commitment to NFU "at any time and under any circumstances," a pledge that India has always stood by. This, and the mutual belief that nukes are "political" rather than "warfighting" weapons, undergirds India-China deterrence stability.

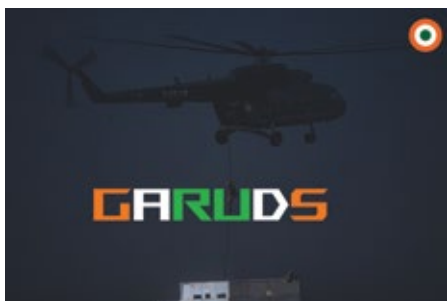
In the case of persistent India-Pakistan deterrence instability, it has been India's restraint that has often circumvented crisis situations. However, Pakistan's transition to a policy of "full spectrum deterrence" and possible targeting of India's nuclear arsenal with non-nuclear missiles would add a new dimension to their nuclear equation. This calls for deep reflection by decision-makers. 

Abhinav Negi says....

India's Special Forces needs an urgent re-organisation and downsizing



GARUD SF (Photo by IAF)



GARUDS (Photo by Mayyank Kaul and artwork by Abhinav Negi)

The recent operations in the Indian Ocean Region (IOR) by the elite Marine Commandos (abbreviated MARCOS) of the Indian Navy, showcasing their Anti-Piracy and Hostage-Rescue Ops has again brought the Indian Special Forces in limelight again. Last time it was the elite PARA SF of the Indian Army which did the same through the 2016 Cross Border Raids across the LoC (Line of Control).

When talking about SFs in the Indian context, one should always keep in mind the fact that only some units that carry out 'Special Ops' under the armed forces are considered SFs. The Army, Navy and Air Force have their respective SF units which are the PARA (SF), MCF & GCF. On one hand the Indian Special Forces have always showcased their operational preparedness and combat

skills, whenever called to take on a task. But on the very other hand they are suffering from the upsizing of the force, undermining the thumb rule of SF which says "A bunch of well trained and equipped men operating behind the enemy lines are far more effective than a large force taking on the enemy from the front". The elite PARA SF of the Indian Army being the core of the ISF in terms of providing manpower, are one such victims of the recent upscaling of the force dating to the July of 2022, when the conversion of the erstwhile PARA Airborne units began, making them the now PARA SF units. Airborne units like 5, 6, 7, 23 and 29 PARA were converted one by one to the now 5, 6, 7, 23 and 29 PARA SF, additionally a new unit was also raised in Bengaluru called the 13 PARA SF 'The Thunderbolts'. Taking the overall strength of the PARA SF units from nine to the now fifteen.

While the now big number of the SF sounds like a good idea to many, this rang a bell in the heads of many concerned i.e. the PARA SF vets and SF geeks like myself. The PARA SF is already not so fond of being used as a CI/CT SOF (Special Operations Force) in the J&K region or the NE Indian States, the operatives in the force always prefer to operate across or on the LoC. The premature decisions by the local sector commanders to call in the nearest SF squad to finish off the Ops quickly is taking a heavy toll on the SF personnel on both the moral and physical grounds, apart from this the main and the most important concern regarding the upsizing of the elite PARA SF is that the bigger the force, the more weapons and equipment required to equip the force up-to the SF standard which is sadly being done on a very slow speed. Only the similarities between the PARA SF



MARCOS (Photo by Indian Navy)

OPINION

troops are the standard issue weapon and some gear which is the service-related equipment, which sadly also is not at par with the SF standards. The smaller the force, the more well equipped they can be, especially if they are the only Special Force of the army. Sadly, PARAs aren't the only one suffering from upsizing of the force, the Navy's elite MARCOS and the Air Force's GARUDs are also having the same fate.



MARCOS (Photo by Indian Navy)



MARCOS with Seaking Helicopter (Photo by Indian Navy)

The MCF (Marine Commando Force) is the smallest force of the three with an estimated 1100 operatives, which is all set to increase the number by 250 taking the total number of men to approximately 1350. The GARUDs are also on the same boat,



GARUD SF (Photo by IAF)

raising more flights of GCF from an estimated 12 to 15 flights now. The upscaling and current structure of the Special Forces has many voids and disadvantages, the primary being the lack of standard equipment and gear among the PARA SF units as the MARCOS and GARUDs are comparatively better equipped. The three SFs still need to standardise equipment and gear among the force as the armed forces are already going through modernisation and it's the best time for the SFs to take their fair share from it.

In my opinion the Indian Special Forces, especially the PARA SF needs an urgent downsizing and an organisational structure change which could be done with these major changes:

- Creation of a separate SF Regiment in the Army with units like 1, 4, 9, 10, 11, 13 and 21 PARA SFs being transferred from the PARA Regiment to it.
- The remaining units like 2, 3, 5,

6, 7, 12, 23 and 29 PARA SFs being converted to Airborne SF, adding the 'Airborne' tag to their existing suffix.

- Above two points will make sure that the SF is separated and downsized from the existing fifteen battalion strong force

under the PARA Regiment.

- The existing Ghatak Platoons should be put under a new separate regiment, structuring them like a force similar to the Rangers Regiment of the US Army.
- The MARCOS should retain its current strength.
- The GARUDs should focus on gaining more experience in their designated roles with limited addition to the manpower.

Now to summarise the above write-up, it's the need of an hour for the Indian Special Forces to have downsize the existing force and have a structural re-organisation.

(PS: This is my personal opinion on the Indian Special Forces and nowhere does it reflect the views of the magazine I'm writing this 'opinion' for). ➡

By Abhinav Negi of Team VAYU
(Twitter: @ThatArticleGuy)
All images from X/Twitter



GARUD SF Badge



MARCOS Badge



PARA SF Badge



5 PARA SF Badge

DRDO launches Agni-5 with MIRV's

Defence Research and Development Organisation (DRDO) conducted first successful flight test of indigenously developed Agni-5 missile with Multiple Independently Targetable Re-Entry Vehicle (MIRV) technology on 11 March 2024. The flight test named Mission Divyastra was carried out from Dr APJ Abdul Kalam Island in Odisha. Various telemetry and radar stations tracked and monitored multiple re-entry vehicles. The Mission accomplished the designed parameters. Prime Minister Mr. Narendra Modi stated, "Proud of our DRDO scientists for Mission Divyastra, the first flight test of indigenously developed Agni-5 missile with Multiple Independently Targetable Re-entry Vehicle (MIRV) technology."



New gen Agni-Prime tested

Strategic Forces Command (SFC), along with Defence Research and Development Organisation (DRDO), conducted the successful flight test of New Generation Ballistic Missile Agni-Prime from Dr APJ Abdul Kalam Island off the coast of Odisha at around 1900 hrs on 3 April 2024. The test met all the trial objectives validating its reliable performance, as confirmed from the data captured by a number of range sensors deployed at different locations, including two downrange ships placed at the

terminal point. The launch was witnessed by the Chief of Defence Staff, Chief of Strategic Forces Command and senior officials from DRDO and the Indian Army.



DRDO in trials of MPATGM

Man Portable Anti-tank Guided Missile (MPATGM) Weapon System, indigenously designed and developed by Defence Research & Development Organisation (DRDO),



has been field evaluated in different flight configurations several times with the objective of proving the technology with high superiority. The system consisted of the MPATGM, Launcher, Target Acquisition System, and the Fire Control Unit. Adequate number of missile firing trials have been successfully conducted towards achieving compliance of complete operational envelop as stipulated in the General Staff Qualitative Requirements (Infantry, Indian Army). The Warhead Flight Trials were successfully conducted at the Pokhran Field Firing Range, Rajasthan on 13 April 2024.

ITCM successfully tested by DRDO

Defence Research and Development Organisation (DRDO) conducted a successful flight test of Indigenous Technology Cruise Missile (ITCM) from the Integrated Test Range (ITR), Chandipur off the coast of Odisha on 18 April 2024.

During the test, all subsystems performed as per expectation. The missile performance was monitored by several Range Sensors like Radar, Electro Optical Tracking System (EOTS) and Telemetry deployed by ITR at different locations to ensure complete coverage of the flight path. The flight of the missile was also monitored from the Su-30MKI aircraft of the Indian Air Force.



Test of new version of MRBM

A successful launch of the new variant of a Medium Range Ballistic Missile was carried out under the aegis of the Strategic Forces Command on 23 April 2024. The user launch has proven the operational capability of the Command and validated new technologies. Other details are unknown.

SMART successfully tested by DRDO

Supersonic Missile Assisted Release of Torpedo (SMART) system was successfully flight tested at around 0830 hrs on 1 May 2024 from Dr APJ Abdul Kalam Island off the coast of Odisha. SMART is a next generation missile-based light weight torpedo delivery system, designed and developed by the Defence Research and Development Organisation (DRDO) to enhance the anti-submarine warfare capability of the Indian Navy far beyond the conventional range of lightweight torpedo.

This canister based missile system consists of several advanced sub-systems, namely two stage solid propulsion system, electromechanical actuator system, precision inertial navigation system etc. The system carries advanced light-weight torpedo as payload along with parachute based release system. The missile was launched



AEROSPACE IN INDIA

from the ground mobile launcher. Several state of the art mechanisms such as symmetric separation, ejection and velocity control have been validated in this test.

Defence exports of Rs 21,083 cr in FY 2023–24

Defence exports have touched a record Rs 21,083 crore (approx US\$ 2.63 billion) in the Financial Year (FY) 2023–24, a growth of 32.5% over the last fiscal when the figure was Rs 15,920 crore. The recent figures indicate that the defence exports have grown by 31 times in the last 10 years as compared to FY 2013–14. The defence Industry, including the private sector and Defence Public Sector Undertakings (DPSUs), have made tremendous efforts in achieving the highest-ever defence exports. The private sector and the DPSUs have contributed about 60% and 40% respectively.

Brahmos delivered to Philippines

The first consignment of BrahMos cruise missiles was delivered to its first export customer Philippines on 19 April 2024.



MoD contracts with HAL for 34 ALHs

Consequent upon approval of the Cabinet Committee on



Security (CCS), the Ministry of Defence signed two contracts for a combined value of Rs 8073 crore with Hindustan Aeronautics Limited (HAL), Bengaluru on 13 March 2024 for acquisition of 34 Advanced Light Helicopters (ALH) Dhruv Mk III along with Operational Role Equipment for Indian Army (25 ALHs) and Indian Coast Guard (9 ALHs) under Buy Indian–IDDM–Indigenously Designed, Developed & Manufactured category marking a significant move towards indigenisation in defence manufacturing.

HAL for MLU of 25 Dornier's of Indian Navy

The Ministry of Defence signed a contract with Hindustan Aeronautics Limited (HAL) on 15 March 2024 for Mid Life Upgrade (MLU) of 25 Dornier's along with associated equipment for the Indian Navy at a cost of Rs. 2,890 cr. The MLU for the Dornier's includes an upgrade to incorporate state of the art avionics systems and primary role sensors. The upgrade would significantly enhance the operational capability of the Dornier aircraft of the Indian Navy to perform primary roles of maritime surveillance, coastal surveillance, electronic intelligence and development of maritime domain awareness. In addition, this upgrade will also enable Indian Navy Dorniers to carry out secondary roles of search and rescue, medical/casualty evacuation and communication link.



BEL receives orders worth Rs. 1,940 Cr

Bharat Electronics Limited (BEL), on 14 March 2024, entered into a contract valued at Rs.847.70 Cr plus taxes with Larsen & Toubro Limited (L&T) for the supply of

14 Communication and Electronic Warfare (EW) sensors and systems. These systems, manufactured domestically by BEL, will be installed on three Cadet Training Ships for the Indian Navy. Additionally, BEL has secured other orders valued at Rs.1092 Cr following the last disclosure on 13 February 2024. These orders encompass the supply of LRUs for T-72 and T-90 tanks, communication systems for the Indian Navy, as well as other spares and services.



MoD inks MoU with BEML, BEL and MIDHANI

Ministry of Defence has signed a tripartite Memorandum of Understanding (MoU) with BEML Limited, Bharat Electronics Limited (BEL) and Mishra Dhatu Nigam Limited (MIDHANI) for indigenous development of Advanced Fuelling and Control System for Engines for heavy duty applications on 4 March 2024. This collaborative initiative will focus on leveraging indigenous capabilities to design, test, and manufacture an Advanced Fuelling and Control System that offers enhanced efficiency, performance and reliability. By harnessing the latest advancements in engine technology and control systems, the companies aim to extend their domain expertise for development of engine systems which will ensure self-reliance in the field of combat vehicles.

DRDO/ADA systems to HAL for LCA Tejas Mk.1A

DRDO's Aeronautical Development Agency (ADA) has handed over the first batch of the indigenous Leading Edge Actuators and Airbrake Control Module to Hindustan Aeronautics Limited (HAL), marking a significant leap



towards self-reliance in aeronautical technologies. The HAL, Lucknow has already made preparations for the production of these units for the current 83 LCA Tejas Mk.1A order.

The Secondary Flight Control of LCA Tejas, comprising Leading Edge Slats and Airbrakes, now boasts state of the art Servo-Valve based electro-hydraulic servo actuators and control modules. These high pressure, redundant servo actuators and control module, characterised by astute design, precision manufacturing, assembly, and testing, represent a "culmination of ADA's relentless pursuit of indigenous technological prowess".

DRDO develops light BPJ

DRDO's Defence Materials and Stores Research and Development Establishment (DMSRDE), Kanpur has successfully developed the lightest Bullet Proof Jacket in the country for protection against 7.62 x 54 R API (Level 6 of BIS 17051) ammunition. Recently, this bullet proof jacket was successfully tested at TBRL, Chandigarh as per BIS 17051-2018. This jacket is based upon new design approach, where novel material along with new processes have been used. The front Hard Armour Panel (HAP) of this jacket defeats multiple hits (6 shots) of 7.62 x 54 R API (Sniper rounds) in both ICW (In-conjunction with) and Standalone design.



AVNL for upgrades of 693 BMP2 to BMP2M

The Ministry of Defence, on 13 March 2024, signed



AEROSPACE IN INDIA

a contract with Armoured Vehicles Nigam Limited (AVNL) for the procurement of 693 Armament Upgrades of Infantry Combat Vehicle BMP2 to BMP2M. This upgrade includes Night Enablement, Gunner Main Sight, Commander Panoramic Sight and Fire Control System (FCS) with Automatic Target Tracker under Buy (Indian-Indigenously Designed Developed and Manufactured) Category.

India's defence stronger than ever: Raksha Mantri

"Aatmanirbharta in defence manufacturing is the biggest change brought about by the Government, which is giving a new shape to India's defence sector including steps taken by the Ministry of Defence to achieve self-reliance, including setting up of Defence Industrial Corridors in Uttar Pradesh and Tamil Nadu. The annual defence production, which was around Rs 40,000 crore in 2014, has now crossed a record Rs 1.10 lakh crore. The defence exports today have touched Rs 16,000 crore from a meagre Rs 1,000 crore nine-ten years ago. We have set a target to achieve Rs 50,000 crore of exports by 2028-29".



Activation of ELF

On 18 March 2024, Indian Air Force fighter and transport aircraft carried out operations on an Emergency Landing Facility (ELF) airstrip on National Highway 16 near Addanki in Bapatla district. Su-30MKI, LCA and Hawk fighters etc successfully carried out overshoots during the activation, while An-32 and Dornier transport aircraft landed and subsequently took off from the strip. The activation showcased the high level of synergy and liaison between civil agencies such as National Highways Authority of India (NHAI), district administration, state police and the IAF towards conduct of complex multifaceted activities.

Previously, such an activation was conducted on 29 December 2022. The 4.1 km long and 33 mtr wide concrete airstrip has been constructed by the NHAI as per specifications provided by the IAF. While other airstrips are already operational in various parts of the country, this

ELF in Andhra Pradesh has been recently operationalised in peninsular India.

ELF highway airstrips enhance flexibility of air operations during contingencies and are invaluable assets during Humanitarian Assistance and Disaster Relief (HADR) operations in far flung areas. IAF, with Ministry of Road Transport and Highways (MoRTH) are working jointly for creation of ELF's at suitable locations.



Induction of HU at AFS Thanjavur

In a recent redeployment of IAF assets, one Helicopter Unit was inducted at Air Force Station Thanjavur on 19 March 2024. Air Marshal B Manikantan AOC-in-C SAC was present during the induction ceremony. Induction of the helicopter unit at Thanjavur would ensure availability of sufficient resources with HQ SAC to enhance operational capabilities as well as meet the peacetime tasks of Search and Rescue, Humanitarian Assistance and Disaster Relief (HADR) and Casualty evacuation.



Project Seabird facilities inaugurated

Raksha Mantri Rajnath Singh inaugurated two major piers and seven residential towers comprising 320 houses for Naval Officers and Defence civilian personnel and 149 single officers' accommodation in Naval Base Karwar on 5 March 2024.

Phase I of Project Seabird was designed to accommodate 10 ships and was successfully concluded in 2011. The infrastructure comprised a breakwater, a pier capable of berthing 10 ships, a 10,000 ton ship lift and dry berth, a Naval Ship Repair Yard, logistics and armament storage facilities, accommodation for 1000 personnel, a Headquarters/Depot Organisation, and a 141 bed Naval Hospital. The CCS (Cabinet Committee on Security) approval for Phase IIA of the Project was accorded the berthing of 32 ships and submarines, along with

23 Yardcraft. Upon full operationalisation, the base is projected to provide government employment to around 8,000 personnel.

Indian Navy commissions INS Jatayu at Minicoy

INS Jatayu was commissioned at Minicoy island, Lakshadweep in presence of Adm R Hari Kumar, the Chief of Naval Staff, Administrator of Lakshadweep, Praful K Patel, V Adm V Srinivas, Flag Officer Commanding-in-Chief, Southern Naval Command on 6 March 2024. This milestone event strengthens Indian Navy's foothold in the Lakshadweep island while extending capacity building, operational reach and sustenance in the region. The establishment of Naval Base at Minicoy will augment connectivity with the main land focusing towards comprehensive development of the islands.



RADSIM inducted

The first Radar Simulator (RADSIM) of Indian Naval Aviation was inducted on 18 March 2024 at AIRCATS, Goa in the presence of Rear Admiral Ajay D Theophilus, Flag Officer Naval Aviation. The simulator would play a pivotal role in enriching training experience for ATCOs of the Indian Navy. RADSIM has been developed by Software Development Institute (SDI), a premier software development establishment of IAF. Indigenously developed for ATC controllers for their training during their basic training stage, the same has now been further upgraded and being rolled out in other IAF Stations. The RADSIM will be installed at 5 naval bases, including Goa.



Indian Coast Guard orders 9 ALH Mk.III's

On 13 March 2024, the Indian Coast Guard (ICG) took a significant step in enhancing its operational capabilities with the signing of a contract for the acquisition of nine Advanced Light Helicopters (ALH) Mk.III, along with Operational Role Equipment, Engineering Support Package (ESP), and Performance Based Logistics (PBL) from HAL Bangalore. The contract, valued at Rs.4079 Cr, includes an Indigenous Content (IC) of 61.07% and falls under the Buy (Indian-IDDMM) Category.



5th and 6th ASW SWC ships launched at GRSE

'Agray' and 'Akshay', the 5th and 6th ships of 8 x ASW Shallow Water Craft (SWC) Project being built by GRSE for Indian Navy, were launched on 13 March 2024 at GRSE, Kolkata. The Launch Ceremony was presided over by Air Chief Marshal V R Chaudhari, Chief of the Air staff. The contract for building eight ASW SWC ships was signed between MoD and Garden Reach Shipbuilders & Engineers (GRSE), Kolkata on 29 April 2019. Arnala class of ships will replace the in-service Abhay class ASW Corvettes of Indian Navy and are designed to undertake anti-submarine operations in coastal waters, Low Intensity Maritime Operations (LIMO) and Mine Laying Operations.



UK ships at L&T's shipyard

On 28 March 2024, in a significant development emphasising the robust ties between United Kingdom and India, Royal Fleet Auxiliary (RFA) ships RFA Argus and

RFA Lyme Bay arrived at L&T Shipbuilding's Kattupalli Shipyard for Assisted Maintenance Period (AMP) and Self Maintenance Period (SMP) respectively. This marks a historical milestone in the longstanding collaboration between UK and India in the maritime domain.

Steel cutting of first FFS

'Steel Cutting' ceremony of first of the five Fleet Support Ships (FSS) was held at Hindustan Shipyard Limited, Visakhapatnam on 10 April 2024. Contract with HSL for acquisition of five Fleet Support Ships was signed in August 2023 and the ships are scheduled to be delivered to the Indian Navy, commencing mid-2027. On induction, the Fleet Support Ships will bolster the 'Blue Water' capabilities of the Indian Navy through replenishment of fleet ships at sea. The ships, with more than 40,000 tonnes displacement will carry and deliver fuel, water, ammunition and stores enabling prolonged operations without returning to harbour, thus enhancing the Fleet's strategic reach and mobility.



NewSpace contracted for HAPS

Contract for design and development of an indigenous High Altitude Pseudo Satellite (HAPS) for the Indian Navy, under the iDEX initiative was signed with NewSpace Research & Technologies on 13 March 2024. "Enhancing the Navy's prowess with extended surveillance period, this is a strong move towards ensuring a Future Proof Navy

AEROSPACE IN INDIA

in consonance with GoI's vision of AatmaNirbharBharat", stated the Indian Navy.



JD Taurus begins operations

Jindal Defence Systems Private Limited (JDSPL) have begun production in its firearms manufacturing plant in Hisar as part of a joint venture with Brazil based Taurus Armas S.A. Under the brand name J D Taurus, JDSPL is "poised to transform the landscape of firearms manufacturing in India and reduce India's reliance on imports". The manufacturing plant has an annual production capacity of up to 2,50,000 weapons, "strategically positioning JD Taurus to address the growing demand in the country and in the next Financial Year, the company aims to manufacture between 25,000 to 30,000 weapons".



Kopin in 3rd order for thermal vision systems

Kopin Corporation, a leading provider of application specific optical solutions and high performance microdisplays for defence, enterprise, consumer and medical products, has further expanded its customer base by receiving a third production order for its Organic Light Emitting Diode (OLED) microdisplays, for use in thermal

imaging vision systems – both mounted and handheld for Indian Armed Forces. Under the terms of the latest production order for over 1,200 units, deliveries take place over a six month time span.



Maiden test of 1500 HP engine for MBTs

Defence Secretary Mr. Giridhar Aramane presided over the maiden test-firing of India's first indigenously made 1500 Horsepower (HP) engine for Main Battle Tanks at BEML's Engine division in Mysuru complex on 20 March 2024. The first test firing of the 1500 HP engine signifies the completion of Generation One, focusing on technology stabilisation.

Generation Two will see BEML producing engines for various trials at Combat Vehicles Research and Development Establishment, a DRDO laboratory, and their integration into actual vehicles for user testing.

Guyana for 2 HAL Do-228s

The Guyana Defence Force (GDF) has officially secured a \$23.27 million USD loan from the Export-Import Bank of India for the procurement of 2 HAL produced Dornier Do-228s. The Dornier's will be used in utility and MPA roles. In the photo is the delivery via IAF C-17s.



Saab technologies at Indian airports

“In the bustling control tower of Ahmedabad airport, controllers handle monthly passenger traffic of more than 1 million. With Saab’s Advanced Surface Movement Guidance and Control at their disposal, every aircraft and vehicle on the ground is tracked with absolute precision. The system’s Human–Machine Interface provides controllers with a comprehensive view of movements, displaying clear maps, tracks, labels, and safety alert indicators”, stated the company. Besides Ahmedabad, the platform is transforming modern air traffic control, improving controllers’ situational overview and reducing their workload at Guwahati, Jaipur and Lucknow airports.



BEL’s Akashteer flagged off

The first lot of fully indigenous Air Defence Control & Reporting System (Akashteer) was flagged off on 4 April 2024 by DCOAS (CD&S), Lt Gen JB Chaudhari, in the presence of CMD BEL from BEL’s Ghaziabad Unit.



IAI launches AeroSpace Services India (ASI)

Israel Aerospace Industries (IAI) has opened AeroSpace Services India (ASI), its Indian subsidiary in New Delhi. The opening of ASI is a “strong demonstration of IAI’s strong collaboration with the Indian government’s ‘Atmanirbhar Bharat’ vision. This also shows the commitment to the strong partnership between IAI and DRDO in developing and supporting advanced systems for the Indian armed forces” stated the company. ASI

trades in Indian Rupees and is the sole authorised OEM’s Technical Representative for the entire Medium Range Surface to Air Missile (MRSAM) system. The system includes an advanced phased array radar, command and control, mobile launchers and interceptors with advanced RF seeker. MRSAM is jointly developed by IAI and DRDO for the Indian forces.



AMPL in PAR order

Astra Microwave Products Limited has received an order from HAL for the supply of one Precision Approach Radar. Gross order value is 56 crores including 10 years comprehensive AMC.

Astra Microwave Products Ltd.
ON A WINNING WAVELENGTH

Airport Radars

PAR - Salient Features

- MAIN PARTS
 - Antenna system (AESA)
 - Radar Equipment cabin
 - Power supply unit - Diesel generator, UPS unit
 - Fire-fighting system
 - Security electronic system
- BASIC PARAMETERS
 - X-Band precision approach radar
 - Range of up to 40 km
 - The radar excels in low maintenance requirements
 - AESA Electronic Scanning
 - Possibility of transport by container carrier

ASR-MSSR - Salient Features

- Scanning speed up to 15 rounds per minute with 250 NM coverage in ELS and EHS-S
- The output power of the transmitter (impulse) is at least 2500 W
- Altitude coverage 66 000 ft
- Operation in II / SI code with EUROCONTROL certification (EC 262/2009)
- Ability Mode S Clustering
- Mode S parameter setting
- Receiving ADS-B data from detected signals
- Independent four-channel ADS-B system with 360° coverage
- A fully modular system

PAR

ASR-MSSR

AEROSPACE IN INDIA

TASL announces TSAT-1A satellite launch success

Tata Advanced Systems Limited and Satellogic announced the successful deployment into space of TASL's TSAT-1A satellite aboard the Bandwagon-1 mission, which SpaceX's Falcon 9 rocket launched from Launch Complex 39A at Kennedy Space Center, Florida, USA, at 23:16 UTC on 7 April 2024. TSAT-1A has been assembled



in TASL's Assembly, Integration and Testing ("AIT") plant at its Vemagal facility in Karnataka. This achievement follows the collaboration signed between TASL and Satellogic in November 2023, leveraging Satellogic's expertise to develop and integrate an advanced Earth Observation satellite in India and TASL's capability to undertake complex system integration.

Boeing collaborates with AIESL

Boeing and AI Engineering Services Limited (AIESL) have agreed to work together to enhance aircraft maintenance training in India. Boeing will provide training materials, aids and instructor support to help ensure standardisation of AIESL training programmes. AIESL will provide infrastructure and instructors, while securing Civil Aviation Regulation (CAR)147 approval from the Indian regulatory authority to conduct maintenance training for customer. The Boeing-AIESL collaboration will be the latest initiative under the Boeing India Repair Development and Sustainment (BIRDS) hub programme. The BIRDS hub is a local network of suppliers working to build a robust MRO ecosystem for defence and commercial aircraft.



2nd C-295 delivered to the IAF

The 2nd C-295 was delivered to the IAF on 3 May 2024. Of the total 56 aircraft ordered by India, 16 will be produced by Airbus in Seville, Spain. As part of an

industrial partnership, the remaining 40 are going to be produced by Tata Advanced Systems (TASL) in the C295 Final Assembly Line in Vadodara in western India. The first 'Make in India' C295 is scheduled to roll out of the Vadodara plant in September 2026.



MARCOS in action!

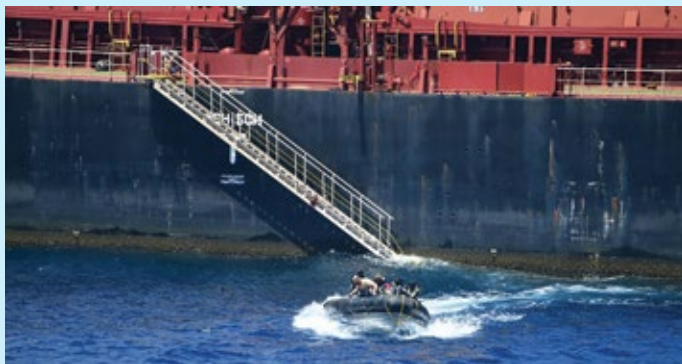
Great photos! Air drop by an IAF C-17 of the Indian Navy's MARCOS on the hijacked MV Ruen on 16 March 2024. It is commendable that the drama and successful end took place 2600 kms away from India's coastline; all hostages freed and 35 pirates captured.

"INS Kolkata, a mission deployed in the Arabian Sea, through the sustained high tempo of operations has thwarted the designs of the Somali pirates to hijack ships transiting through the region by intercepting the pirate ship MV Ruen, on 16 March. The merchant vessel had been hijacked in December 2023 and was under the control of the Somalian Pirates till now" stated the Indian Navy.

"In a remarkable display of Jointness and Integration, an IAF C-17 aircraft executed a precision airborne drop of

two Combat Rubberised Raiding Craft (CRRC) boats, along with Indian Navy MARCOS in Arabian Sea in support of ongoing anti-piracy Operation Sankalp. Flying for almost 10 hours to an area 2600 kms off the Indian Coast, the Operation was carried out to rescue crew of bulk carrier vessel MV Ruen.

Working seamlessly with the Indian Navy, the mission was successful with all the 17 crew on-board recovered safely" stated the IAF.



Garuda Aerospace launches Trishul

Garuda Aerospace has announced the launch of Border Patrol Surveillance Drone Trishul. Launched as Garuda Aerospace's flagship Border Patrol Surveillance Drone, Trishul will "empower forces in times of need for monitoring and analysis and people movement".

Trishul can also be used in times of natural disasters, calamities and emergencies to gain access to real-time images and videos or to gain access to suspicious activities. The drones can also be used to assess traffic situations.



Rohde & Schwarz's new facility in Delhi

Rohde & Schwarz India, the Indian subsidiary of the German based, global technology company Rohde & Schwarz, celebrated the grand opening of its new facility located at Mohan Cooperative Industrial Estate, in New Delhi.

Rohde & Schwarz India has been a pivotal ecosystem partner in India's technology industry, catering to critical sectors such as defence, civil aviation and surveillance.

In the next 10 years, R&S expects more than twice growth in India.

The company even expressed intentions of manufacturing in India, when there is strong enough demand.



MoD signs deal with Big Bang Boom Solutions

Big Bang Boom Solutions Pvt. Ltd. (BBBS), an Indian defence sector start-up, has secured an order worth Rs. 200 crores from the Indian Air Force and the Indian Army, for its anti-drone technology.

"This historic contract, the largest under the Indian Defence Exhibition (IDEX) initiative, and one of the largest signed by the Indian MoD with an Indian startup is a testament to BBBS's unmatched expertise in deeptech products especially, anti-drone solutions", stated the company.



SPACE by DRDO inaugurated

A Submersible Platform for Acoustic Characterisation and Evaluation (SPACE) was inaugurated by Secretary, Department of Defence (R&D) and Chairman DRDO Dr Samir V Kamat at Underwater Acoustic Research Facility, Kulamavu in Idukki, Kerala on 17 April 2024. The SPACE, set up by the Naval Physical & Oceanographic Laboratory of DRDO, has been designed as a premier testing and evaluation hub for sonar systems destined for Indian Navy onboard various platforms including ships, submarines and helicopters.

IndiGo orders 30 Airbus A350-900s

IndiGo is further defining its long term future by strengthening its fleet with the introduction of widebody aircraft to its fleet. IndiGo agreed to place an order for 30 Firm A350-900 aircraft, which will enable IndiGo to spread its wings further and expand its network. Currently, IndiGo operates over 350 aircraft. Last year, in June 2023, IndiGo placed the largest ever single aircraft order by any airline for 500 aircraft with Airbus. With that,



AEROSPACE IN INDIA

the outstanding orderbook of A320 Family aircraft stands at almost 1,000 aircraft which are yet to be delivered well into the next decade. This IndiGo order book comprises a mix of A320NEO, A321NEO and A321XLR aircraft.

IndiGo orders 60 R-R Trent XWB engines

Rolls-Royce announced that IndiGo has agreed to place an order for 60 Trent XWB-84 engines. This is the first ever agreement for Rolls-Royce with this leading Indian airline. As part of the deal, the health and maintenance of the engines will be covered by Rolls-Royce's comprehensive TotalCare service.



Vistara receives its 70th aircraft

Vistara, end March 2024, took delivery of its last Boeing 787-9 Dreamliner, which is the 70th aircraft in its fleet. This marks the culmination of the order placed in 2018 for aircraft across Airbus and Boeing, and this was to set out on a path of being a very customer oriented airline with numerous firsts and a very fuel efficient one with the newest generation of technology.



Airbus Helicopters H160 gets DGCA type certification

Airbus' H160 helicopter has been granted the letter

of type acceptance from the Directorate General of Civil Aviation (DGCA), marking a significant milestone for the rotorcraft that will pave the way for its entry into the Indian market. "Airbus Helicopters is committed to developing a holistic helicopter ecosystem in India including bringing the most advanced helicopter platforms to India, developing local MRO capabilities and, as we announced in January this year, by starting to produce helicopters in India," stated Sunny Guglani, Head of Airbus Helicopters, Airbus India and South Asia.



FLY91 gets AOP from DGCA

Goa based airline FLY91, received its Air Operator Certificate (AOC) from the Directorate General of Civil Aviation (DGCA), Ministry of Civil Aviation on 6 March 2024. FLY91 received its first ATR 72-600, one of the two aircraft leased from Dubai Aerospace Enterprise late February 2024. The aircraft flew in from Hyderabad to be part of the regional airline's fleet, which will be based out of the Manohar International Airport, Mopa in Goa. The regional airline code will be code 'IC'.



FLY91 commences commercial operations

FLY91, the latest entrant in India's aviation sector, commenced its commercial operations with its first flight taking off for Kempegowda International Airport,

AEROSPACE IN INDIA

Bengaluru on 18 March 2024; the flight departed from Goa's Manohar International Airport at 07.55 am. The regional airline also operated its maiden flight to Sindhudurg from Bengaluru on the same day.

The airline currently has two ATR 72-600 aircraft with four more aircraft expected soon.



P&WC engine services agreement with FLY91

Pratt & Whitney Canada (P&WC) has signed a multi-year engine services agreement with FLY91 for the maintenance, repair and overhaul of the PW127M engines that power its fleet of ATR 72-600 turboprop passenger aircraft.

GE Aerospace partnership with Air India

GE Aerospace announced a landmark flight operations software contract with Air India. This strategic collaboration marks a significant milestone as Air India becomes the first enterprise in India to adopt GE's FlightPulse pilot app together with Safety and Fuel Insight for its entire group. With Safety Insight, Air India will have access to advanced analytics and real time data



Air India A350 (Photo: Rishav Gupta)

monitoring to enhance safety measures and ensure optimal performance across its fleet. Fuel Insight will provide the enterprise with comprehensive fuel efficiency solutions, enabling the group to optimise journeys for more efficient fuel management.

CAE agreement with Akasa Air for 737MAX pilot training

CAE has signed a long-term agreement with Akasa Air to provide Boeing 737MAX pilot training at CAE's facilities in India.

Akasa Air will leverage CAE's best-in-class training facilities, trainers and latest generation full flight simulators for the next 15 years; CAE has trained Akasa Air pilots since the start of the airline's operations in 2022 plus CAE has a long and significant presence in India, operating 13 state of the art simulators in three commercial aviation training centres and delivering essential pilot training and training services to airlines in India.



Official signing ceremony (Photo: CAE)



Boeing 737MAX (Photo: Durgesh Singh)

Air Works in its 74th year!

Air Works Group, India's MRO and aviation services major, has completed 73 years and has begun its 74th year. It was in 1951, barely four years after India's independence, that Air Works commenced its pioneering business under its co-founders – aircraft engineers Late Mr. BG Menon and Late Mr. PS Menon – at the Mumbai airport. Over the past seven decades, Air Works has grown and transformed from a pureplay business aviation and MRO services company to one with the industry's widest portfolio of customers and certifications to maintain over 50 types of aircraft, across several types of commercial, business and defence aircraft, together with multiple maintenance facilities and a pan-India support network across 27 cities at over 50 locations. ➡



APPOINTMENTS

Admiral Dinesh Kumar Tripathi is new Chief of the Naval Staff

Admiral Dinesh K Tripathi assumed command of the Indian Navy on 30 April 2024 as the 26th Chief of the Naval Staff. He succeeds Admiral R Hari Kumar who retires upon superannuation, after an illustrious career in the Indian Navy.

Admiral Dinesh Kumar Tripathi was commissioned into the Executive Branch of the Indian Navy on July 01, 1985. A Communication and Electronic Warfare specialist, he has had a long and distinguished service spanning nearly 39 years. Prior to taking over as the Vice Chief of the Naval Staff, he had served as the Flag Officer Commanding-in-Chief, Western Naval Command.



Vice Admiral Krishna Swaminathan is Vice Chief of Naval Staff

Vice Admiral Krishna Swaminathan assumed charge as Vice Chief of Naval Staff on 1 May 2024. The Flag Officer was Commissioned into the Indian Navy on 1 July 1987 and is a specialist in Communication and Electronic Warfare. He is an alumnus of the National Defence Academy, Khadakwasla; the Joint Services Command and Staff College, Shrivenham, United Kingdom; the College of Naval Warfare, Karanja; and the United States Naval War College, USA.



On promotion to the rank of Vice Admiral, the Flag Officer was Chief of Staff of the Western Naval Command and Controller of Personnel Services at NHQ. Prior to his current assignment as Vice Chief of the Naval Staff, he served as Chief of Personnel at NHQ.

Air Marshal Nagesh Kapoor is AOC-in-C Training Command

Air Marshal Nagesh Kapoor assumed the appointment of Air Officer Commanding-in-Chief (AOC-in-C) Training Command (TC) on 1 May 2024. Air Marshal N Kapoor was commissioned into the Fighter stream of the Indian Air Force on 6 December 1986. He is an alumnus of the National Defence Academy, Defence Services Staff College and National Defence College. A Qualified Flying Instructor and a Fighter Combat Leader, he has more than 3400 hours of flying experience.



ITCM: A significant milestone



On 18 April 2024, India's 1,450 kg Indigenous Technology Cruise Missile (ITCM) was successfully tested from Integrated Test Range (ITR) powered by Gas Turbine Research Establishment (GTRE) developed Manik Small Turbo Fan Engine (STFE). ITCM's solid-propellant booster engine took the missile vertically to a height of 800 m when a mechanism in the missile tilted it horizontally subsequently jettisoning the booster. This was followed by ignition of the Manik STFE fed by a submerged air intake and 'deployment' of wings enabling ITCM to cruise at sea level with a 300 kg dummy warhead. The missile displayed very low altitude subsonic (Mach 0.7) sea skimming flight and used way point navigation to follow the intended course. The GTRE developed Manik STFE has proven to be dependable, as demonstrated by this successful flight test. To provide improved and dependable performance, the missile was additionally outfitted with updated avionics and software. The missile was followed by one of Indian Air Force (IAF) Sukhoi Su-30MKI jet for observation and recording.

ITCM is developed by Defence Research and Development Organisation (DRDO) that can carry both nuclear and conventional warheads over 1,000 km. The 7.8 metre long ITCM with a diameter of 520 mm was designed by the Aeronautical Development Establishment (ADE), Bangalore, a DRDO facility and shares a similar physical profile with the United States Tomahawk and Russian Kh-55 cruise missiles, featuring a slim cylindrical fuselage and a set of folding, pop-out wings for flight

control. The Research Centre Imarat (RCI) contributed the primary navigation system called the ring-laser gyro inertial navigation system (augmented by GPS/NavIC), the redundant navigation system/micro-navigation system, the control actuators and battery systems as well as the all important Radio Frequency (RF) seeker. The Research and Development Establishment (Engineers), Pune, DRDO, specifically designed the mobile launcher. The Advanced Systems Laboratory, DRDO, Hyderabad, contributed the missile's booster motor.

A compact version of ITCM, the Submarine Launched Cruise Missile (SLCM) is a sea skimming missile designed to launch from torpedo tubes of submarines. It has a stated range of 500 km (to be extended to 800 km), with a cruise length of 5.6 metre, diameter of 0.505 metre, all up weight of 975 kg and Mach 0.7 speed. It would feature INS/GPS navigation, with a RF seeker for terminal guidance. It comes with two variants: a Land Attack Cruise Missile (LACM) and Anti-Ship Cruise Missile (ASCM). Being subsonic, the missile will have a lower Infra-Red (IR) signature and will be able to re-attack the targets even if once fooled by decoys. Initially to be tested on Kilo (Sindhughosh) Class submarines, the missile shall be a part of the weapons package of Project 75(I) submarines.

The induction of the Nirbhay LACM in India's Services will open up enormous flexibility of military operations both during wartime and in apparent peace troubled by low intensity conflicts (including terrorism). Flying at an altitude of just 5 metre below ground based radar observation the missile qualifies to be an excellent Suppression of Enemy Air Defence/Destruction of Enemy Air Defence (SEAD/DEAD) weapon striking at enemy's radar and Surface-to-Air Missile (SAM) installations at onset of conflicts. The loitering capability will further complicate the defensive mechanisms of enemy's air defence network plus will also be invaluable in decimating relocated terrorist hideouts. A payload of 450 kg is expected, including a high explosive PCB, Blast cum Fragmentation or small (12-kT) nuclear warhead. ➡



Article by Sayan Majumdar

IAF in Operation Meghdoot



Operation Meghdoot was launched on 13 April 1984, when the Indian Army and Indian Air Force (IAF) advanced to the Siachen glacier to secure the heights dominating the Northern Ladakh region. The operation involved the airlifting of Indian Army soldiers by the IAF and dropping them on the glacial peaks. Although the operation began in 1984, IAF helicopters were already operating in the Siachen glacier since 1978, flying the Chetak helicopters which was the first IAF helicopter to land in the glacier in October 1978.

By 1984, Pakistan's cartographic aggression in the uncharted territory of Ladakh, allowing foreign mountaineering expeditions in Siachen, was becoming a cause of concern. Having received intelligence inputs about an impending Pakistani military action in the area, India decided to thwart Pakistan's efforts to legitimise its claim on Siachen. The Indian Army launched Operation Meghdoot, to secure strategic heights on Siachen with the deployment of troops. Playing an irreplaceable role in this effort, IAF's tactical and strategic airlifters, An-12s, An-32s and Il-76s transported stores and troops and air dropped supplies to high altitude airfields, from where Mi-17, Mi-8, Chetak and Cheetah helicopters ferried men and material to dizzying heights on the glacier, far above the limits set by the helicopter manufacturers. Soon, about 300 odd troops were positioned on the strategically important peaks and passes of the glacier. By the time the Pakistan army reacted by advancing its own troops, the Indian Army was occupying strategically crucial mountain peaks and passes, thereby gaining a tactical advantage.

In extending valuable support to the Army's fight for maintaining military dominance on this desolate glacier since April 1984, the IAF's incredible performance at the extremes of temperature and altitude remains a continuing saga of fortitude and skill. While the initial operations involved only the use of transport and helicopter aircraft transporting men and material, the IAF gradually expanded its role and presence in the region with the deployment of fighter aircraft as well.

The IAF's Hunter aircraft kick-started fighter operations from the high altitude airfield at Leh, when a detachment of Hunters from No. 27 Squadron commenced operations in September 1984. In the next couple of years, the Hunters flew an impressive total of more than 700 sorties from Leh. As an increasingly large number of fighter sweeps and simulated strikes began to be carried out over the glacier itself, it served as the ultimate morale booster for Indian troops deployed on the glacier, and sent a stern message to the adversary to avoid any misadventures in the area. Later, live armament sorties were carried out at the high altitude firing range at Kar Tso, south of Leh.

With the ground infrastructure becoming more conducive for fighter flying, MiG-23s and MiG-29s also started operating from Leh and Thoise. The IAF also inducted the Cheetal helicopters for operating in the glacier in 2009. The Cheetal is a Cheetah helicopter which is re-engineered with a TM 333 2M2 engine having better reliability and load carrying capability at high altitude. More recently, on 20 August 2013, in a significant show of capability, the IAF landed one of its latest acquisitions, the Lockheed Martin C-130J Super Hercules four engine transport aircraft at Daulat Beg Oldie (DBO), the world's highest airstrip, near the line of actual control in Ladakh.

Today, nearly all the aircraft of the IAF including Rafale, Su-30MKI, Chinook, Apache, Advanced Light Helicopter (ALH) Mk.III and Mk.IV, Light Combat Helicopter (LCH) Prachand, MiG-29, Mirage-2000, C-17, C-130J, Il-76 and An-32 operate in support of Op Meghdoot.

In the highest battlefield in the world, known for its extreme climatic conditions, IAF helicopters form the lifeline and the sole link of Indian troops with the outside world, playing a critical role in continuing the four decade old military operation; responding to emergencies, supplying essential logistics and evacuating the sick and wounded from the 78 km long glacier. Flying in such ruthless terrain, records of human endurance, flying and technical proficiency are being set by the IAF nearly every day.

Text and photos: IAF

Agni-V: India's Determined Iron Hand

On 11 March 2024, India's Prime Minister Narendra Modi celebrated the successful completion of Mission Divyastra, the country's maiden flight test of the Agni-V ('Fire' in Sanskrit) Inter-Continental Ballistic Missile (ICBM) using Multiple Independently Targetable Re-entry Vehicle (MIRV) technology, which was developed in-house. "Proud of our DRDO scientists for Mission Divyastra, the first flight test of indigenously developed Agni-V missile with Multiple Independently Targetable Re-entry Vehicle (MIRV) technology," PM Modi tweeted. As of now, the United States, Russia, China, France and the United Kingdom are known to have MIRV equipped missiles.

Testing of Agni-V commenced on 19 April 2012 at 08.05 am, when the missile was successfully test fired by Defence Research & Development Organisation (DRDO) from the Launch Complex 4 of the Integrated Test Range (ITR) at Abdul Kalam Island (former Wheeler) using a rail mobile launcher. The flight time lasted 20 minutes and the third stage fired the re-entry vehicle into the atmosphere at an altitude of 100 kilometres. The missile re-entry vehicle subsequently impacted the pre-designated target point more than 5,000 kilometres away in the Indian Ocean.

On 10 December 2018 at about 1.30 p.m. India's Inter-Continental Ballistic Missile (ICBM) Agni-V was successfully test-fired for the seventh time by DRDO from the Launch Complex 4 of the ITR at Abdul Kalam Island off the coast of Odisha. The ICBM was test-fired in a lofted trajectory, thus completing the pre-induction trials.


The missile is usually programmed to attain an apogee of 600 km above prior descent, while the third stage firing the Re-entry Vehicle (RV) separates at 6 km/sec thereafter encountering the atmosphere at an altitude of 100 km. The RV subsequently attained further acceleration due to gravity to record a speed of Mach 25+ and impacted the pre-designated target point at "pin-point accuracy", within a few (reportedly single digit) metres of the designated target point around 2,000 km away. Although the exact range of Agni-V is classified, the road mobile missile is comfortably expected to reach targets in excess of 7,000 km if armed with a single 200 kt nuclear warhead thereby obliterating any hostile targets in Asian landmass from secure launch points deep interior India. The missile was 'cold launched' from a hermetically sealed canister mounted on a Tractor-Erector-Launcher (TEL) ensuring rapid launch sequence, higher reliability, longer shelf life, less maintenance and enhanced mobility to ensure survival.

With a length of 17.5 metres, diameter of 2 metres and "launch mass" of around 50 tonnes, thanks to extensive use of composites to reduce weight, the Agni-V is a three stage solid fuelled missile with composite motor casing in the second and in the miniaturised third stage. Agni-V incorporates advanced technologies involving Ring Laser Gyroscope based Inertial Navigation System (RLG-INS) plus Micro Inertial Navigation System (MINS) and

accelerometer for navigation and guidance further to be boosted by military grade precise signals from Indo-Russian GLONASS satellite navigation system. Both these systems have been developed by Research Centre Imarat (RCI). Agni-V uses a System on Chip (SOC) based On-Board Computer (OBC) whose weight is around 200 grams for control and guidance. All stages of the missile have nozzle based control systems.

Agni-V will also carry at least three MIRV payloads within its 1.5 metre diameter all carbon composite RV (Capable of withstanding temperatures of up to 5,000 degrees Celsius) to deliver multiple manoeuvring 'intelligent' warheads at different targets each of which is designed to be delivered at a different speed and along a different trajectory to strike distinct targets hundreds of kilometres apart or on a single target to execute saturated strike to overwhelm enemy Ballistic Missile Defences (BMD). In this context DRDO has successfully demonstrated the hypersonic air breathing scramjet technology with the flight test of Hypersonic Technology Demonstration Vehicle (HSTDV), (also capable of propelling manoeuvring nuclear warheads) at 11.03 a.m. on 7 September 2020 from the same location. Lofted to an altitude of 30 km by a proven solid rocket motor, the HSTDV working at high dynamic pressure and high temperature sustained a speed of Mach 6, for 20 seconds. The night trial conducted on 15 December 2022 suspected to have included a hypersonic glide vehicle due to the low velocity of the projectile as seen in the camera shot images although authorities remained silent on the issue.

A sea launched variant with a length of less than 12 metres may be anticipated for ballistic missile armed nuclear powered submarines (SSBN) that may in peacetime double as Satellite Launch Vehicle (SLV) fired from proximity of equator to put multiple satellites in geosynchronous orbits with ease. Agni-V is poised to emerge as India's standard ballistic missile to be put to mass production to ensure assured deterrence in foreseeable future. The stunning accuracy consistently displayed by the Agni-V prototypes (as confirmed by Project Director Sheena Rani), along with extensive mobility and indigenous BMD will enable India for the first time to adopt a "limited deterrence" posture by adopting both counter force and counter value stance.

Finally the matured response of major global powers in response to India's ICBM tests has affirmed India's position as a responsible nuclear weapons State with self imposed non-proliferation obligations. These tests also eliminated Peoples Republic of China's (PRC) long time dream to dominate the Asian landmass in due course. It is also high time for the Indian scientific community to conduct a couple of round of nuclear weapons tests to fine tune the thermonuclear devices to be mounted on Agni-V. A promise of signing Comprehensive Test Ban Treaty (CTBT) thereafter will certainly ensure global acceptance. 

Sayan Majumdar

HAL for procurement of RD-33 turbofan engines for MiG-29s



On 1 March 2024, a contract for RD-33 aeroengines for MiG-29 aircraft was signed with Hindustan Aeronautics Limited (HAL) at a cost of Rs 5,249.72 crore. These engines will be produced by the Koraput Division of HAL and are expected to fulfill the need of Indian Air Force (IAF) to sustain the operational capability of the MiG-29 fleet for the residual service life. The aero-engines will be manufactured under Transfer of Technology (TOT) license from the Russian OEM. The programme will focus on indigenisation of several high value critical components, which would help increase the indigenous content of future Repair and Overhaul (ROH) tasks of RD-33 aeroengines.

India has been an important partner of United Engine Corporation (UEC) for many years and one of the key markets for the holding's products. Large scale cooperation between the UEC and Indian partners is developing mainly through military-technical cooperation. The large scale project is the ongoing supply of technological kits of AL-31FP turbojet engines (installed on Su-30MKI multirole fighters) within the framework of contracts previously concluded through Rosoboronexport for their licensed production in India.

At an event at New Delhi, which was organised by HAL some time ago, was attended by representatives of

the Indian Ministry of Defence, various branches of the country's Armed Forces, a delegation of Rosoboronexport JSC and Russian companies participating in military-technical cooperation programmes with India. The official signing of the acceptance certificate between HAL and the Indian Air Force of the 50th AL-31FP engine, manufactured according to one of the final phases of licensed production (high level of development of serial production competence) took place.

Licensed production of AL-31FP engines is carried out at the HAL Corporation branch in Koraput. The Indian side previously conducted long term tests of engines in phases IV and V of licensed production, thereby confirming the readiness of its production for the full cycle of manufacturing, assembly and testing. Currently, all phases of licensed production of AL-31FP have been mastered by the Indian side. Along with the organisation of licensed production, HAL has fully launched the overhaul of AL-31FP engines and their components.

Since 2005, about 130 specialists from various divisions of the Ufa UEC-UMPO have been sent to HAL. Training and transfer of experience were carried out to Indian specialists in mastering complex metallurgical, welding, production and assembly operations, as well as testing of the AL-31FP. Many UEC-UMPO specialists received recognition and words of gratitude from HAL management for their contribution to the development of production, which allowed the Indian customer to fulfill plans for the development and production of AL-31FP engines. Some UEC-UMPO specialists were awarded orders, medals and certificates of the Republic of India for their contribution to the development of Russian-Indian relations.

In March 2017, UEC and HAL entered into a long-term cooperation contract during the Russian-Indian military-industrial conference. The document defines the key aspects of interaction between the parties in the aftersales service of aircraft engines AL-31FP, RD-33 of various series, R-25-300, R29B-300, operated by the Indian Ministry of Defence. ➡





Successful first flight of LCA Mk.1A

The first aircraft LA5033 of the Tejas Mk.1A aircraft series took to the skies from HAL facility in Bengaluru on 28 March 2024. It was a successful sortie with a flying time of 18 minutes. “HAL achieved this significant production milestone with concurrent design and development amid major supply chain challenges in the global geo-political environment subsequent to the contract signature in February 2021”, stated Mr. C. B. Ananthakrishnan, CMD, HAL.

The aircraft was piloted by Chief Test Pilot, Gp Capt K K Venugopal (Retd).

“HAL thanks MoD, Indian Air Force, DRDO/ADA, CEMILAC, DGAQA and the MSMEs who have contributed to the success of this programme. With the continued support of these stakeholders, the country can look forward to early induction of the Tejas Mk.1A by the IAF and more numbers through the three lines of production established at HAL”, stated the CMD.

The Tejas Mk.1A will have an advanced electronic radar, warfare, communication systems, additional combat capability and improved maintenance features. ➡



Naval Commanders' Conference 24/1



The first edition of the Biannual Naval Commanders' Conference 2024 was conducted from 5 to 8 March 2024. The Conference is an institutional forum that enables deliberations on important maritime security issues at the Military–Strategic level. The inaugural session of the Conference was held onboard the aircraft carrier INS Vikramaditya. Follow-on proceedings were conducted at New Delhi, in hybrid format. The Raksha Mantri, Mr. Rajnath Singh, presided over the inaugural session, with Chief of the Defence Staff, Defence Secretary and other senior MoD officials and Naval Commanders in attendance.

Commending the brave and prompt response by the Indian Navy to recent incidents and developments in West Asia and the adjoining seas, the Raksha Mantri exhorted the Commanders to remain poised for operations across the spectrum of conflict. He underscored the leadership role expected of the Indian Navy towards ensuring peace



and prosperity in the Indian Ocean Region. In addition, the Raksha Mantri emphasised the importance of Tri-Services Jointness and Integration to favourably shape and influence the future battlespace.

The proceedings at New Delhi on 7–8 March 2024 included review of major operational, materiel, infrastructure, logistics and personnel related initiatives.



Besides, the senior naval leadership reviewed existing and future plans, including capability enhancements in the island territories, to mitigate contemporary and future challenges in the maritime domain. Service Chiefs of the Indian Army and the Indian Air Force also engaged with the Naval Commanders, sharing their assessment of the operating environment, outlining readiness levels to defend national interests amidst prevailing and evolving security challenges; numerous areas and domains to enhance Tri-Services synergy and cooperation.

On the sidelines of the conference, Naval Commanders also interacted with various 'Think Tanks' during a 'Sagar Manthan' event on 8 March 2024. The forum provided an opportunity to engage with MSMEs, innovators and Academia to deliberate ways, means and novel avenues to further Aatmanirbharta initiatives and enhance self-reliance in defence production. ➡

Text and photos: Indian Navy

ISRO in more success with RLV LEX-02



ISRO has achieved a major milestone in the area of Reusable Launch Vehicle (RLV) technology, through the RLV LEX-02 landing experiment, the second of the series, conducted at Aeronautical Test Range (ATR), Chitradurga in Karnataka on 22 March 2024 at 7:10 hrs IST.

After the RLV-LEX-01 mission was accomplished last year, RLV-LEX-02 demonstrated the autonomous landing capability of RLV from off-nominal initial conditions at release from a helicopter. The RLV was made to undertake more difficult manoeuvres with dispersions, correct both cross range and downrange and land on the runway in a fully autonomous mode. The winged vehicle, called Pushpak, was lifted by an Indian Air Force Chinook helicopter and was released from 4.5 km altitude. After release at a distance of 4 km from the runway, Pushpak autonomously approached the runway along with cross range corrections. It landed precisely on the runway and came to a halt using its brake parachute, landing gear brakes and nose wheel steering system.

This mission successfully simulated the approach and high speed landing conditions of RLV returning from space. With this second mission, ISRO has revalidated the indigenously developed technologies in the areas of navigation, control systems, landing gear and deceleration systems essential for performing a high speed autonomous landing of a space-returning vehicle. The winged body and all flight systems used in RLV-LEX-01 were reused in the



RLV-LEX-02 mission after due certification/clearances. Hence reuse capability of flight hardware and flight systems was also demonstrated in this mission. Based on the observations from RLV-LEX-01, the airframe structure and landing gear were strengthened to tolerate higher landing loads.

The mission was accomplished by Vikram Sarabhai Space Centre (VSSC) along with the Liquid Propulsion System Centre (LPSC) and the ISRO Inertial Systems Unit (IISU). Collaboration from various agencies including IAF, ADE, ADRDE and CEMILAC contributed to the success of this mission. Mr. S Somanath, Chairman, ISRO/Secretary, DOS, congratulated the team for the flawless execution of this complex mission. On the success of the landing experiment, Director VSSC Dr S Unnikrishnan Nair mentioned that through this repeated success, ISRO could master the terminal phase manoeuvring, landing and energy management in a fully autonomous mode, which is a critical step towards the future Orbital Re-entry missions.

The team was guided by Mr. Sunil P, Programme Director, Advanced Technology and Systems Programme, VSSC. Mr. J Muthupandian, Project Director, RLV was the Mission Director and Mr. B Karthik, Deputy Project Director, RLV was the Vehicle Director for this mission. 🚀

Text and images: ISRO



Indian Navy's 'Op Sankalp'



Indian Navy has responded to the manifestation of Israel– Hamas conflict in the maritime domain by re-orienting and significantly enhancing the scope of its ongoing maritime security operations since mid–Dec 23. The navy undertook proactive actions during the hijacking of Malta Flagged Bulk Carrier MV Ruen on 14 December 2023. Today, 23 March 2024, marks the completion of 100 days of the ongoing maritime security operations under the aegis of 'Op Sankalp'. During this time, the Indian Navy has responded to 18 incidents and has played a pivotal role as the 'First Responder' and 'Preferred Security Partner' in the Indian Ocean Region. The significance of IN's contributions has been further underscored with the culmination of actions against the hijacking of MV Ruen.

Since the last 100 days, the naval ships, aircraft and Special Forces have demonstrated an unflinching resolve to 'secure the seas' and protect the maritime community from various non–traditional threats present in the region. Based on the threat assessment in the region, the Indian Navy is conducting maritime security operations in three areas of operations viz Gulf of Aden and adjoining areas,

Arabian Sea and off the East Coast of Somalia. The arduous efforts of IN since December 2023 involved deployment of over 5000 personnel at sea, over 450 ship days (with over 21 ships deployed) and 900 hours of flying by the maritime surveillance aircraft to address threats in the maritime domain.





With the emergence of piracy in 2008, the Indian Ocean Region has witnessed steady increase in the presence of warships from regional and extra regional navies, operating independently or under the ambit of various multi-

national constructs. In the present security scenario, the Indian Navy has taken the 'lead' in responding to security situations arising out of a myriad of threats in the region. With over 110 lives saved (including 45 Indian seafarers),



15 lakh tons of critical commodities escorted (such as fertilisers, crude oil and finished products), nearly 1000 boarding operations undertaken, more than 3000 kgs of narcotics seized and over 450 MVs assured of IN's presence, the ongoing maritime security operations have truly reflected Indian Navy's capability in playing a vital role as a strong and a responsible Navy in the IOR.

In the ongoing endeavour since Dec 2023, Information Fusion Centre–Indian Ocean Region (IFC–IOR) of the Indian Navy at Gurugram, has played a transformative role as a principal hub for enabling information exchange in IOR. In addition, coordinated missions with IAF and national agencies during this period has also highlighted the synergy and interoperability of the Services. ➡

Text and images: Indian Navy

HAL's record revenues in FY 2023–24



HAL recorded the highest ever revenue from operations of over Rs. 29,810 crores (provisional and unaudited) for the financial year ended on 31 March 2024 registering a double digit growth of around 11% as against 9% in the previous financial year. The corresponding figure for the previous year was at Rs. 26,928 crores.

“Despite the major supply chain challenges arising due to geopolitical issues, the Company has met the expected revenue growth with improved performance for the entire year. As on 31 March 2024, Company’s order book stands in excess of Rs 94,000 crores with additional

major orders expected during FY 2024–25”, stated Mr C.B. Ananthakrishnan, CMD (Addl Charge), HAL.

HAL received fresh manufacturing contracts of over Rs 19,000 crores and ROH contracts of over Rs 16,000 crores during FY 2023–24.

An export contract with Guyana Defence Forces for supply of 2 Hindustan–228 aircraft was signed in the current FY 2023–24 and both the aircraft have been supplied in record time within a month of signing of contract due to proactive approach of the Company.

The Company has maintained the growth momentum and has achieved an all-round improved performance. A

very significant milestone was achieved with first production series fighter of LCA Mk.1A completing its maiden flight on 28 March 2024.

FY 2023–24 was very eventful for HAL and was dotted with high profile visits and achievements that make the year special on various fronts such as customer satisfaction, branding and recognition and building stakeholder trust and confidence.

HAL continuously looks





in-India mission and also enhance export potential.

HAL with a robust order book and accelerated delivery plan is expected to sustain and improve the growth trajectory and support the Indian defence services in their endeavor towards defence preparedness of the country. ➡

Text: HAL
Photos: Vayu
Aerospace Review

for opportunities to collaborate and develop newer technologies by forging alliances with global and Indian technology partners.

During the year, HAL and General Electric, USA signed an MoU for ToT and Manufacturing of GE-414 aero-engine in India for LCA Mk.2 aircraft. The Company would receive 80% technology transfer for this programme which would transform the Indian aero engine manufacturing ecosystem to be self-reliant.

A Joint Venture “SAFHAL Helicopter Engines Pvt. Ltd.” was formed with Safran Helicopter Engines, France for indigenous design and development of Engines for IMRH and DBMRH.

During the FY, HAL and Airbus signed a contract for establishing MRO facilities for A-320 family of aircraft in New Delhi. This collaboration will strengthen Make-



BEL achieves record turnover



turnover hitting a new high, courtesy sale of a gamut of products across defence and non-defence segments. Exports have also grown significantly as compared to the previous year, a testimony to the all out efforts made by the company to expand its global footprints and contribute to the MoD's vision of maximising defence exports.

Research & Development continues to be a major thrust area as we focus on in-house R&D efforts and collaborations with DRDO, academia and industry partners. We are in sync with the Government's 'Make in India' initiative as indigenisation, procurement from MSMEs and GeM continue to top our priority list.

BEL will continue to explore new growth opportunities through export initiatives, diversification, capability enhancement, competitiveness and modernisation.”

Bharat Electronics Limited (BEL) has achieved a turnover of around Rs. 19,700 Cr (Provisional & Unaudited), during the Financial Year 2023-24, against the previous year's turnover of Rs. 17,333 Cr registering a growth of 13.65%. In the fiscal year 2023-24, BEL successfully secured orders worth around Rs. 35,000 Cr. Among the notable defence orders obtained during the year were Electronic Fuzes, EW Systems, communication systems for naval warships, fire control systems, Akash Prime Weapon System, radars, sonars, Software Defined Radios, night vision devices,

tactical communication systems and other projects in non-defence sector.

With this, the total order book of BEL as on 1 April 2024, stands at around Rs. 76000 Cr.

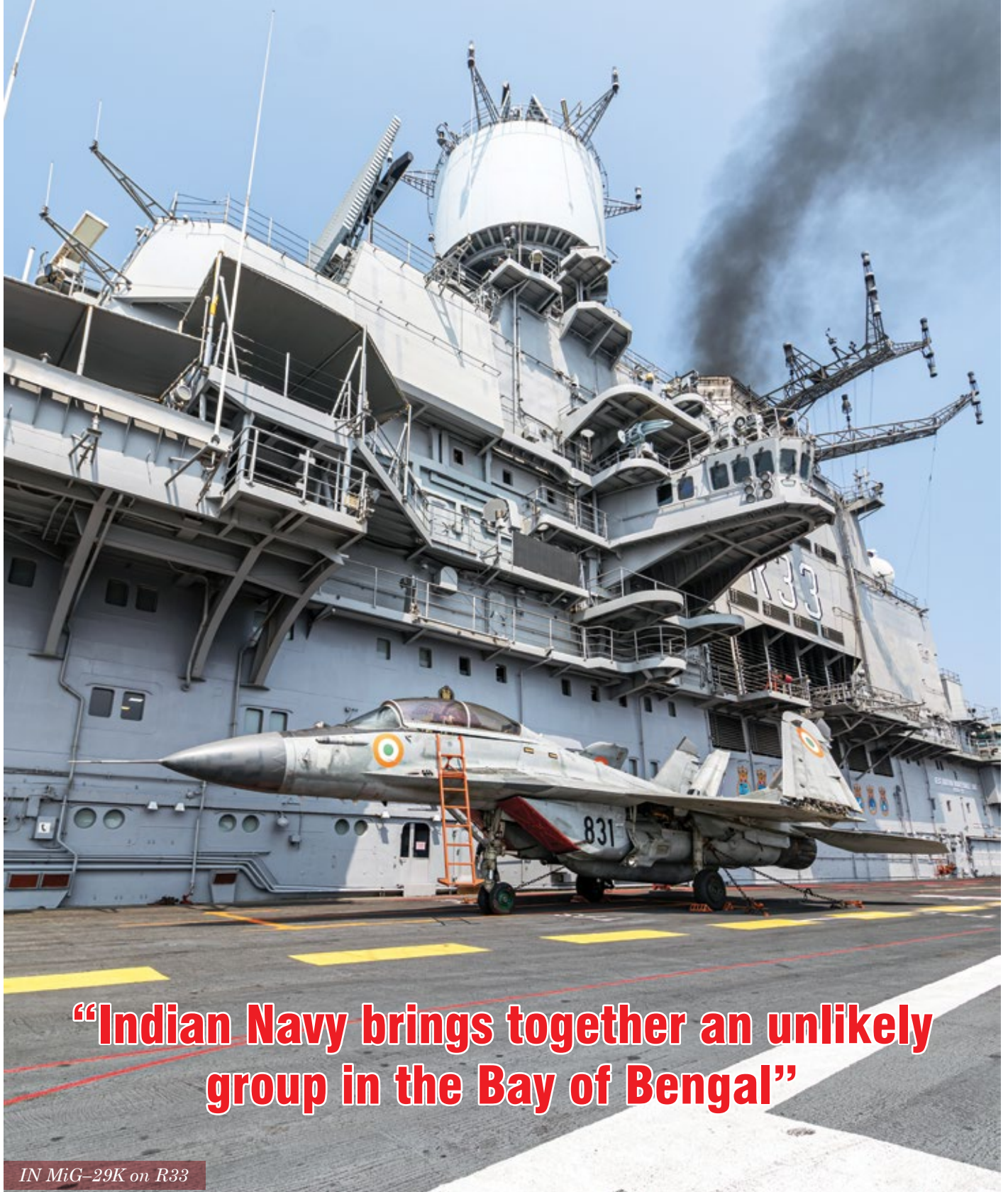
BEL also achieved export sales of around US\$ 92.98 million during FY 2023-24, as against the previous year's export turnover of US\$ 48.33 million, registering a growth of 92%. Major products exported include Transmit & Receive (TR) Modules, Compact Multi-Purpose Advanced Stabilisation System (CoMPASS), radar and electronic warfare systems, medical electronics, communication equipment, etc.

As on 1 April 2024, BEL's export order book stands at USD 407 million, with export orders acquired during the fiscal year amounting to USD 211 million.

Mr. Bhanu Prakash Srivastava, Chairman & Managing Director, BEL, stated, "BEL has yet again proven its manufacturing prowess with its



Angad Singh reports on Exercise MILAN 2024



“Indian Navy brings together an unlikely group in the Bay of Bengal”

IN MiG-29K on R33

MILAN, a Hindi word meaning ‘coming together’ or ‘confluence,’ is an apt name for the Indian Navy’s flagship multilateral exercise. Held more or less biennially since 1995, MILAN has grown from a five-navy regional affair to a truly international event in recent years. Drawing on the Indian Government’s regional maritime cooperation vision, SAGAR (Security And Growth for All in the Region), and India’s G20 Presidency theme of ‘Vasudhaiva Kutumbakam’, which translates from Sanskrit as ‘the world is one family,’ the Indian Navy’s stated objective for MILAN 2024 was “Camaraderie, Cohesion, Collaboration”.



ALH Mk3 operations by night aboard INS Vikrant.

The 2024 edition was the twelfth and largest yet, bringing in 51 naval delegations, 16 foreign vessels and one foreign patrol aircraft (a French Atlantique 2). The Indian Air Force was also included for the first time, sending a detachment of HAL Tejas LCA Mk.1 jets from No. 18 Squadron ‘Flying Bullets’ to operate from INS Dega, the Naval Air Station at Visakhapatnam. Significantly, the exercise included a diverse set of participants, some of which would seem extremely unlikely to the casual observer. The USA, Iran and Russia all sent warships to operate alongside each other — Arleigh Burke-class destroyer USS Halsey, Moudge-class frigate IRIS Dena,



INS Vikramaditya seen through the cockpit of a Sea King 42C as it approaches to land.



A MiG-29K is directed onto the hydraulic restraining gear on INS Vikramaditya’s flight deck to make ready for launch.



HAL Chetak IN455 conducts a SAR winching demonstration alongside INS Vikramaditya.



A MiG-29K from INAS 303 ‘Black Panthers’ conducted a short air display over Vikramaditya before landing.



A MiG-29K coming in for a missed approach on INS Vikramaditya.



An ALH Mk3 hovering over the flight deck of Vikrant with a Delhi-class destroyer and Austin-class LPD INS Jalashwa visible in the background.



Helicopter operations on INS Vikrant – an ALH Mk3 is 'hot refueled' as a Sea King 42C lands.

and Slava-class cruiser Varyag, Udaloy-class destroyer/frigate Marshal Shaposhnikov and Boris Chilikin-class tanker Boris Butoma respectively. The willing attendance of these ostensible rivals highlights not only the Indian Navy's broad-ranging international cooperation, but also its importance as a partner to be courted by countries around the world, irrespective of divergent foreign policies.

Hosted by the Eastern Naval Command at Visakhapatnam, the exercise ran for nine days, divided

into a five-day shore phase from 21–23 February, involving subject matter exchanges, procedural and area familiarisation, and sporting and cultural activities, before culminating in an international city parade to showcase the camaraderie fostered among participating forces. The sea phase then put all this to the test over the next four days, from 24–27 February. Vayu Aerospace and Defence Review was on hand to cover all aspects of the exercise, ashore and at sea.



IN831 approaches the flight deck of INS Vikramaditya on its way to a perfect middle-wire trap...



... and touching down in the 'controlled crash' emblematic of arrested carrier landings.

Twin Carrier Operations

The highlight of the sea phase was of course the Indian Navy's maiden deployment of two operational carriers and their air wings. INS Vikramaditya (formerly Admiral Gorshkov) is a ten-year veteran of these waters, but MILAN was the first major international exercise for the Indian designed and built INS Vikrant, commissioned only 18 months ago. The two MiG-29K/KUB squadrons, INAS 300 'White Tigers' and INAS 303 'Black Panthers' embarked the carriers alongside the usual gamut of helicopters – venerable HAL Chetaks (Alouette IIIs) and Westland Sea Kings operated alongside Kamov Ka-31 AEW helicopters, indigenous HAL ALH Mk.3s, and the Navy's newest rotorcraft, the Sikorsky MH-60R Seahawk.

The Indian Navy also debuted a common satellite communication network at the exercise called NISHAR (Network



The MiG-29K releasing the arresting cable and folding its wings to clear the landing area as quickly as possible.



HAL Chetak being secured on the flight deck of Vikramaditya after its SAR demonstration.



A French Breguet Atlantique 2 from Flotille 23F and assigned to the French Indian Ocean Command ('ALINDIEN') was the only foreign patrol aircraft at the exercise.

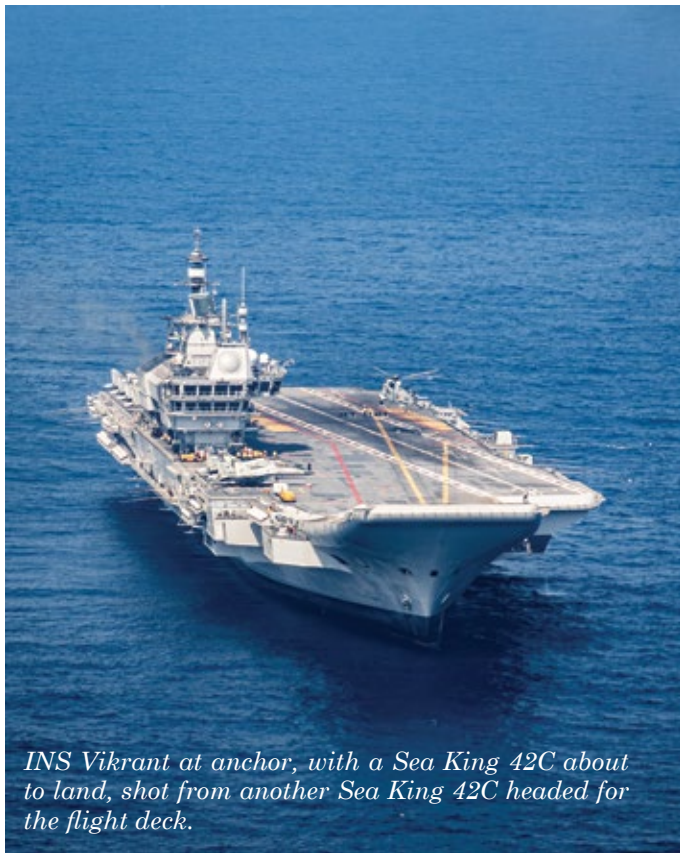
for Information SHARing). NISHAR terminals called Mitra ('Friend') were distributed across all ships to ensure seamless integration of forces at sea as they practiced everything from underway replenishment and basic gunnery to advanced coordinated anti-submarine, anti-surface, and air defence operations. "That we could do all



MiG-29Ks parked on the flight deck of INS Vikramaditya as exercise warships steam away toward Visakhapatnam after the conclusion of the sea phase.

this safely and smoothly is proof of the value of exercises like MILAN," noted a senior IN Commodore as the exercise concluded aboard the aircraft carrier INS Vikrant on 27 February.

The closing day of the exercise also saw a brief operational demonstration aboard INS Vikramaditya, with a single MiG-29K carrying out a launch, display,



INS Vikrant at anchor, with a Sea King 42C about to land, shot from another Sea King 42C headed for the flight deck.



A first time visitor to INS Dega, this Indian Air Force C295MW ferried equipment and personnel from the visiting Tejas LCA squadron.

overshoot and landing cycle, and a Chetak 'plane guard' conducting a mock search and rescue (SAR) drill off the port bow. The carrier then joined the rest of the flotilla at anchorage off Visakhapatnam, and INS Vikrant hosted a range of helicopter operations, including 'hot refueling' of an ALH Mk.3 on the flight deck. ➡

Text and photos: Angad Singh
(Twitter/X @zone5aviation)



The IN's local BAE Hawk squadron, INAS 551 'Phantom,' are a training as well as fleet requirement unit, and participated extensively in the exercise.

Some assorted Indian Army exercises: December 2023–April 2024

The Army Commander Western Command accompanied by GOC Kharga Corps witnessed integrated firepower exercise Ex Kharga Shakti in conjunction with IAF to achieve “seamless synergy effectiveness destruction of the enemy”.

GOC Kharga Corps witnessed the integrated firepower exercise conducted by Deep Strikers Division at Field Firing Ranges. He complimented troops for the high training standards professional competence and offensive spirit.

Charging Ram Gunners carried out field firing and validated operational readiness and drills in an integrated battlefield environment.

Golden Arrow Division conducted field firing exercise to refine battle drills and effective engagement of target thereby enhancing mission readiness.

Team Vajra carried out integrated training with an aim to build upon the tactical, technical and combined arms capability of the formations, incorporating innovations and niche technology.

Charging RAM Warriors of the Western Command (Indian Army) and the IAF undertook special heliborne operations, validating operational plans and strengthening jointmanship and synergy.

Bhagat Brigade conducted field firing to refine battle procedures and drills and validate combat skills to enhance mission readiness.

Konark Gunners culminated intensive field training at Pokhran enhancing combat proficiency.



EXERCISES AND VISITS

Skills to strengthen surveillance grid and collation of information to develop common intelligence picture were rehearsed in detail.

The Desert Hawks executed validation of firing procedures and battle readiness in the deserts through day and night. The mission oriented Training in the rugged terrain tested the “unwavering resolve and skills of the detachments”.

Strengthening operational synergy to execute joint operations, Golden Kata Division conducted a two weeks Field Training with BSF artillery at Dhrangadhra. Aspects of accurate firepower and communications were fine tuned.

Amphibious Warriors of Bison Division displayed unparalleled professionalism and tenacity during multi service exercises at the Andaman & Nicobar Command.

Warriors of Battle Axe Division practised validation drills with focus on swift mobilisation at Mt. Abu. The exercise included Integrated Infantry Weapons Firing and refinement of battle procedures to achieve enhanced operational readiness.

Chinar Warriors of Chinar Corps continued to “aim for excellence in snow bound terrains” with multiple exercises throughout the past few months.

Armoured and Mechanised Centre & School presented a formidable display of mechanised warfare prowess at KK Ranges, Ahmednagar. Firepower demo witnessed by DSSC, Technical Staff Courses, Naval Tech Staff Course & Nepal Army Command Staff College Course.

‘Forging Strength For Battle’: Hardened warriors of Battle Axe Division practised and validated battle procedures to master warfare skills in deserts. The training showcased resilience, team work and unmatched grit for success in integrated operations.



EXERCISES AND VISITS

Team Porittu Velvom undertook an annual training exercise, honing combat engineering and tactical skills. The training focused on strengthening combat capabilities and enhancing operational preparedness.

'Dot on Target Sappers' underwent combat engineer training at Birdhwal, Rajasthan; tactical and engineering skills being sharpened to enhance battle preparedness and operational readiness.

Golden Arrow Gunners honed their combat skills and fostered jointmanship in an integrated training exercise and firing demonstration incorporating BSF and Vajra Corps artillery in Rajasthan to "Strike Fast Strike Deep" in enemy territory.

Rugged warriors of Battle Axe Division carried out extensive training in deserts. Validation of various battlefield drills was carried out through day and night. It tested their "unwavering resolve and skills and prepared them for future challenges".

Striking 74 conducted Exercise Teevra Prahar. Troops exhibited peak preparedness with enhanced coordination, refined battle drills, and employing diverse caliber weapons. Battle inoculation was carried out with precision and efficiency.

Black Charger Sappers underwent a rigorous Combat Engineering Training Camp and honed their skills in rendering effective engineer support for offensive operations. Troops underwent a mission oriented training regimen and validated their proficiency in executing combat engineer tasks.

GOC, Chetak Corps witnessed annual Field Firing exercise of Sand Viper Brigade. The exercise aimed at honing the skills of tank crews including Agniveers both during day and night thus strengthening combat capabilities and enhancing operational preparedness.



EXERCISES AND VISITS

Army Commander of the Western Command reviewed operational preparedness of the Tiger Division. He complimented all ranks for display of high standards of professional skills and capabilities to counter emerging threats.

Pine Warriors carried out Exercise Kilahari to hone tactics, techniques and procedures achieving combat synergy to 'Strike First Strike Deep' in the enemy territory.

Gen Manoj Pande COAS visited the White Tiger Division where he was given an update on operational readiness and briefed by the Commanders. COAS witnessed the deep strike capability of the Division during the Integrated Fire and Manoeuvre exercise at Babina Field Firing Ranges.

Bald Eagle Brigade successfully concluded Exercise Tatraksha showcasing excellent synergy between 22 multi agencies at Kutch. It included discussions and field Training at various locations culminating in 'Eviction Exercise' at Sanghi Port, Arabian Sea.

Pinnacle of Defence Forces synergy at Bhopal Airport witnessed seamless collaboration between Indian Air Force and Indian Army in a Joint Engineering Support Operation by Sudharshan Chakra Eagles; "swift and precise offloading and fitment of engine of service of the Avro".

Chhamb Knights of 'Dot On Tgt Division' demonstrated exemplary precision in gunnery and crew maneuvers throughout their field firing exercises. "The performance affirmed combat readiness through rigorous day and night dynamic engagements".

The Night Strikers of 'Sand Viper Bde' displayed their highest standards of operational excellence and precision shooting while annihilating simulated targets during day and night firing.

Sarvada Agrani Eagles validated their prowess in providing



EXERCISES AND VISITS

intimate technical support during floatation exercise. The eagles demonstrated deft technical acumen and battleworthiness.

Kharga Sky Shielders validated tactical and technical prowess in Combat Readiness Test Exercise at Mahajan Field Firing Ranges, Rajasthan by destroying aerial targets with multiple anti-aircraft weapon systems. ➡



India–Japan ‘Dharma Guardian’

The 5th edition of Joint Military Exercise ‘Dharma Guardian’ between the Indian Army and the Japan Ground Self Defence Force took place at Mahajan Field Firing Ranges in Rajasthan. The Exercise was conducted from 25 February to 9 March 2024. Exercise ‘Dharma Guardian’ is an annual exercise and conducted alternatively in India and Japan. The contingent of both sides comprised of 40 personnel each. The Japanese contingent was represented by troops from the 34th Infantry Regiment and Indian Army contingent was represented by a Battalion from the Rajputana Rifles.



India–Malaysia Exercise Samudra Laksamana

Exercise Samudra Laksamana took place from 28 February to 2 March 2024 at/off Visakhapatnam. Indian Naval Ship Kiltan and Royal Malaysian Ship KD Lekir participated in the 3rd edition of this exercise which had harbour professional interactions followed by the operational phase at sea.



USCG Bertholf visits Port Blair

The United States Coast Guard Ship Bertholf arrived at Port Blair on 7 March 2024, for a two day visit, marking a significant step in bolstering bilateral cooperation between the Indian Coast Guard (ICG) and the United States Coast Guard (USCG). The USCGC Bertholf is a

Legend-class maritime security cutter, equipped with advanced technology and weaponry, including helicopter landing pad, state of the art sensors and communication equipment.



First Training Squadron (1TS) at Port Louis

The First Training Squadron (1TS), comprising INS Tir and CGS Sarathi, concluded a visit to Port Louis, Mauritius, as part of their Long Range Training Deployment. The visit, coinciding with the 57th Mauritius National Day celebrations, highlighted the deep maritime ties between India and Mauritius. A naval contingent and a helicopter participated in the Mauritius National Day



city parade which was witnessed by Smt Droupadi Murmu, the President of India, as the Chief Guest.



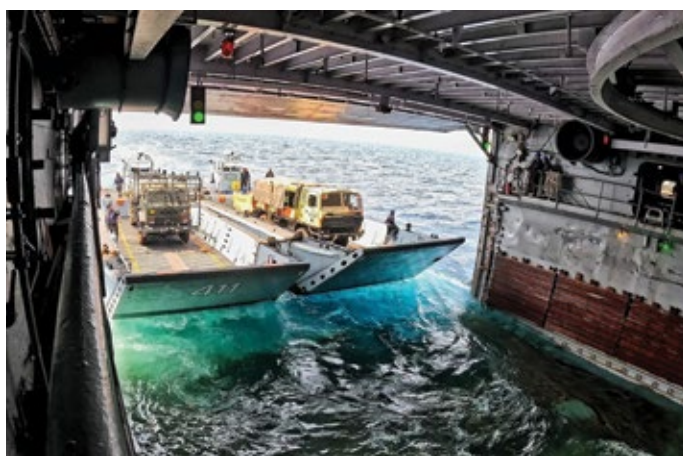
Indian Army/Seychelles “Exercise Lamitiye”

An Indian Army contingent departed for Seychelles on 17 March 2024 to participate in the Tenth edition of Joint Military Exercise “Lamitiye-2024” between the Indian Army and Seychelles Defence Forces (SDF). ‘Lamitiye’ meaning ‘Friendship’ in the Creole language is a biennial training event and has been conducted in Seychelles since 2001. 45 personnel each from the Gorkha Rifles of the Indian Army and Seychelles Defence Forces (SDF) participated in the exercise.



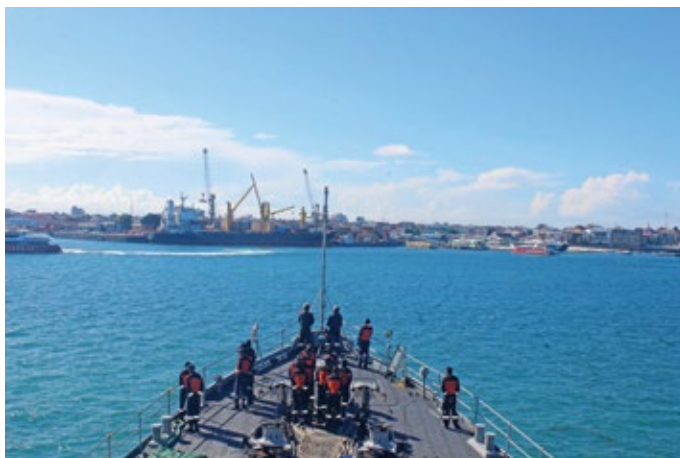
India/US Exercise Tiger Triumph-24

In consonance with the established partnership between India and the US, a bilateral tri-Service Humanitarian Assistance and Disaster Relief (HADR) Exercise between both countries, Tiger Triumph-24, was held on the Eastern Seaboard from 18 to 31 March 2024. Indian Navy Ships with integral helicopters and landing crafts embarked, Indian Navy aircraft, Indian Army personnel and vehicles and Indian Air Force aircraft and helicopters along with the Rapid Action Medical Team (RAMT) participated in the exercise. The US was represented by US Navy ships with embarked troops of the US Marine Corps and US Army.



India/Mozambique/Tanzania trilateral exercise

INS Tir and INS Sujata participated in the second edition of India Mozambique Tanzania (IMT) Tri Lateral (TRILAT) Exercise, a joint maritime exercise from 21–29 March 2024. The first edition of IMT TRILAT exercise conducted in October 2022, saw participation of INS Tarkash with the Tanzanian and Mozambique Navies. The current edition of the exercise was planned in two phases. As part of the harbour phase from 21–24 March 2024, Naval ships Tir and Sujata engaged with the respective Navies at the ports of Zanzibar (Tanzania) and Maputo (Mozambique). The sea phase of the exercise was from 24–27 March 2024 covered practical aspects of countering asymmetric threats, Visit Board Search and Seizure procedures, boat handling, manoeuvres and firing exercises.



ICG Samudra Paheredar at Manila Bay

Indian Coast Guard ship Samudra Paheredar, a specialised Pollution Control Vessel, arrived at Manila Bay, Philippines on 25 March 2024 on a three day visit. The visit of specialised Pollution Control Vessels is part of a broader initiative aimed at demonstration of ICG Marine Pollution Response capabilities and shared concern and resolve towards Marine Pollution in the ASEAN region, besides bolstering bilateral cooperation with the Philippine Coast Guard (PCG). The ICG ship is on an overseas deployment

to ASEAN countries namely the Philippines, Vietnam and Brunei from 25 March to 12 April 2024. The deployment is the third in a row by the Indian Coast Guard to ASEAN countries. Earlier in the year 2023, ICG Pollution Control Vessels visited Cambodia, Malaysia, Singapore, Thailand, and Indonesia as part of the initiative.



UK Royal Navy vessels in Chennai

The UK's Littoral Response Group (LRG) arrived in Chennai on 26 March 2024 as the first engagement of its deployment to the Indian Pacific region. The Royal Fleet



Auxiliary (RFA) Argus and RFA Lyme Bay conducted maritime exercises with the Indian Navy as they entered the Arabian Sea and will now undergo essential maintenance at the Larsen & Toubro shipyard in Kattupalli near Chennai. This is the first time a Royal Navy vessel will undergo maintenance at an Indian shipyard; a direct result of the logistics sharing agreement signed between the UK and India in 2022.



India/USA 'Tiger Triumph 2024'

The Closing Ceremony of the Bilateral Tri-Service Humanitarian Assistance and Disaster Relief (HADR) Amphibious Exercise between India and US, Tiger Triumph 2024 was held onboard USS Somerset on 30 March 2024. The Harbour Phase was conducted at Visakhapatnam from 18–25 March 2024. The Sea phase was conducted from 26 to 30 March 2024 and it included units of both countries undertaking maritime exercises at sea followed by landing of troops at Kakinada for setting up of a joint Command and Control Centre and a Joint Relief and Medical Camp for HADR operations. Cross Deck helicopter operations involving UH3H, CH53 and MH60R helicopters were also undertaken between ships of the Indian Navy and the US Navy off Kakinada and Visakhapatnam.

The participating units from the Indian Navy included a landing platform dock, landing ship tanks (large) including their integral landing crafts and helicopters, guided



missile frigate and long range maritime reconnaissance aircraft. The Indian Army was represented by one Infantry Battalion Group including mechanised forces and the Indian Air Force had deployed one medium lift aircraft, transport helicopter and the Rapid Action Medical Team (RAMT).

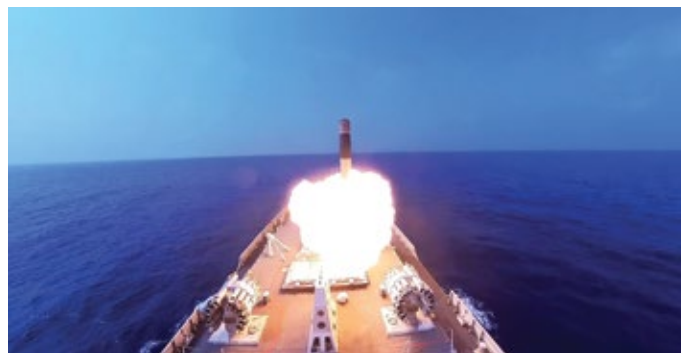
India–Uzbekistan Exercise Dustlik

The Indian Army contingent departed for the 5th edition of India–Uzbekistan joint military Exercise Dustlik. The Exercise was conducted from 15–28 April 2024 at Termez, the Republic of Uzbekistan. Exercise Dustlik is a yearly event conducted alternatively in India and Uzbekistan. Last edition was conducted at Pithoragarh (India) in February 2023. The Indian Armed Forces contingent comprising 60 personnel was represented by 45 personnel from the Indian Army, majorly from a battalion of the Jat Regiment and 15 personnel from the Indian Air Force. The Uzbekistan contingent comprised approximately 100 personnel from Uzbekistan Army and Air Force.



Indian Navy's Exercise Poorvi Lehar

The Indian Navy, on 19 April 2024, conducted Exercise Poorvi Lehar on East Coast under the Operational Control of The Flag Officer Commanding-in-Chief, Eastern Naval Command. The exercise aimed at validation of procedures towards assessment of Indian Navy's preparedness to meet Maritime Security challenges in the region. The exercise witnessed participation of ships, submarines, aircraft and Special Forces. XPOL was conducted in multiple phases including combat training in a realistic scenario during the Tactical Phase and successful conduct of various frings during the Weapon Phase towards reaffirming Indian Navy's capability to deliver ordnance on target. With operation of aircraft from diverse locations, a near continuous Maritime Domain Awareness was maintained throughout the Area of operations.



On-the-spot report

MKU Ltd: Pioneering excellence in defence manufacturing and global reach



Emerged as M Kumar Udyog in 1985, it did not take long for the company to put their boots on the ground in the defence manufacturing industry. In 20 years of existence till its rebranding as “MKU Ltd” in 2005, the company had made its reputation within the Indian Army, as it supplied critical protection systems like fibreglass helmets, from 1989 itself. In 2003, the company also secured its first international order from the Spanish Army for body armour. Heading all the way to present, MKU has so far catered to nearly 250 forces (end customer is military and law enforcement), in both the domestic and international markets, with more than 100 nations involved. Furthermore, it also has a presence beyond Indian boundaries, with two international dedicated production facilities, one in Germany and while other in UAE. Along with it, it has established contacts with approximately 50+ channel partners and empowered 3 million soldiers and 3000+ platforms with their smart solutions.

In terms of services and products offered, they have more than 25+

products in the Netro (optronics) segment only, and for other segment i.e Kavro (self-protection), they have 4 different verticals (Body armour, Armour insert, Ballistic shield, Ballistic helmet).

Vayu’s Nitin Konde and Rishav Gupta were invited for a special visit to MKU’s state-of-the-art facilities present near Kanpur, Uttar Pradesh, each with its dedicated role in the development/manufacturing process of the products offered by the firm, which are planned to be launched soon. The demonstrations also ensured the quality, feasibility and suitability as promised to customers. We closely witnessed the processes involved in processing the raw materials into a finished product, involving complex machinery and serious focus by human brains until the product becomes ready for delivery. The company has successfully manufactured key solutions at much more affordable costs than leading entities in the industry, by also maintaining the quality and finish, as proved by the international certifications it received from agencies, like NATO AQAP, ISO 9001:2015 and more. We also observed the Research & Development (R&D) activities, which aims at testing new designs as well as improving the existing ones, by fixing tweaks or introducing upgrades.

We were also briefed on certain products in the final stages of testing as well as in the development stage. The former includes Aviation Night Vision Goggles (ANVGs) for helicopter pilots, SCH-111T for protection of Sikh soldiers, while latter includes driver night sight system for T-90 tanks of the Indian Army. The ANVGs have been ordered by the Indian Air Force to equip the Mi-17 helicopter pilots. Since years, the monocular and binocular range of Night Vision Goggles are also being supplied to the Army, where they ensure 10,000 hours of life cycle before the tube gets burned, making the system ineffective. The

Sikh helmet is world’s first initiative by any company to offer protective headgear specially designed for Sikh soldiers, who haven’t been able to use the latest ballistic protection helmets being designed worldwide. This helmet has already attracted interest from foreign countries as well, where there is a presence of Sikh soldiers in the Armed forces.

The platform armouring solutions under vehicle protection department is also one of the highlights of the MKU portfolio. The company offer various forms of internal and external (depending on the platform) armour plating of vehicles, for both land, sea and air. Certain number of helicopters, armoured vehicles and naval vessels have already been deployed, with both Indian and foreign customers.

MKU has a legacy of producing and providing a wide range of state-of-the-art products, and which go through rigorous testing before the delivery itself, due to the fact that each system is designed for military applications, hence, there should be negligible room for errors in quality delivery. It consistently receives feedback from the customers, which confirms the effectiveness of the products in the hands of users, while also working on potential issues if raised. The company owns a strong presence in Western Europe, the Middle East and North African (MENA) regions, and it is looking to further expand its footprint.

As observed and described, MKU’s dedication to innovation, quality assurance, and global outreach positions it as a notable contributor in the defence manufacturing sector, promising modern military technology with high-grade quality and proven performance. ➡

Text and image: Nitin Konde and Rishav Gupta

(The full story will appear in our next edition—Issue 4 Jul/Aug 2024)

FRCV– India's future battle tank and concerns: Part 1



KF51 Panther (Rheinmetall/Wikimedia)

India's Future Ready Combat Vehicle (FRCV) is a highly ambitious project aiming to have a main battle tank (MBT) capable of withstanding emerging and future threats of the mid to late twenty first century. Since the commencement of the project, many have raised their eyebrows concerning the feasibility of the desired requirements. The technical parameters published with the RFI for the project have appeared impractical for the critic. Besides, many have expressed fear of the discontinuation of the Arjun series main battle tank in favour of a platform with yet unproven technologies, which might be a grave mistake! We will try to analyse all these main concerns. To have an in-depth yet easier understanding, we will split the series into two parts. In this issue, we will focus on what some analysts believe is the biggest concern regarding the FRCV: will the lighter platform compromise crew protection?

FRCV parameter

The FRCV requirement caps the combat weight (CW) at $55 \pm 5\%$ tons. It means the mass of the tank with all of the whistles and bells, including ammunition, fuel and fluids, equipment for optical and acoustic situational awareness, and defensive aid, should not cross 58 tonnes. Clearly, the dry weight of the platform will be even lighter.

In comparison, the current Arjun Mk.1A has an all-up weight of 68 tonnes and is likely to go further with the possible future integration of an Active Protection System (APS).

The Arjun Mk.1A has improved protection and enhanced crew safety compared to its predecessor. The criticism vis-a-vis insufficient protection for FRCV in the absence of thicker armour!

Who controls the weight?

Now, many factors can decide the dry weight: the overall transportability for rapid deployment in combat zones, the maximum protection you can achieve according to your transportability, affordability with the existing infrastructure, the feasible power pack to provide uninterrupted mobility in harsh conditions, and logistical prowess are a few to be named. Generally, it's believed that to have enhanced protection for the crew, there should be good and thick armour. With the increased thickness, the weight will automatically go up. So, the heavier the platform, the better the protection for the crew, but it slaps a penalty on transportability, which itself limits deployment. Similarly, a comparatively lighter platform would be much easier to deploy but might lack similar protection. The culminating CW during a conflict is likely to be much higher than during peacetime. This is to enhance the survivability; modifications will be needed accordingly with time amidst conflict. This could be understood with the latest example of the T-90M. According to Russian sources, the T-90M is a 48 tonne platform, but the war with Ukraine has steered an extensive modification, hulking it up to more than 52 tonnes!



MEHEL on 8x8 Stryker (US Army/Wikimedia)

How weight goes up

A platform might gain weight during its long service life. For example, in the American Abrams series, the earliest M1 was originally a 54.5-tonne-only platform, whereas the latest M1A2 SepV4 has bulked up to 70 tonnes! During the long service of a tank, newer, improved light armour material is integrated, which otherwise might decrease the weight, but for even enhanced protection, the line-of-sight (LOS) thickness of the armour package also gets increased, resulting in a higher CW. And, as we have discussed earlier, during the conflict, add-ons might further increase the AUW. All of these factors are inevitable. So, the focus should be rather on designing such a platform, which will require negligible changes to the dimensions according to the changes in weight. This will also ensure minimal to no change in the design. However, with enhanced weight, a

more powerful power pack (and, if necessary, a mobility package) will be needed.

Why Western MBTs are so heavy

While the Russian tanks (and Japanese tanks) are lighter than the 60 tonnes, the Western or west-influenced modern tanks are quite heavy. If we look at the weight, the M1A2 Abrams SepV3 is a 66.6 tonne platform; similarly, the Challenger 3 is a 66 tonne; the Merkava 4 Barak is heavier than 65 tonne; the future improved variant of K2 is more than 62 tonne; the Altay T1 is a 65 tonne; the Leopard 2A7 is a 64.3 tonne; the Leclerc XLR is a 63 tonne; and the Arjun Mk 1A is a 65.5 tonne (excluding the TWMP) platform. Western design focuses on both crew comfort and enhanced crew safety. With an improved armour package, they keep enhancing LOS thickness to withstand the latest KE (APFSDS) and HEAT (ATGM) threats. And an add-on to Western design is a regular feature. For example, enhancements to the protection of the LFP (lower front panel) of the tank for better safety against IED, integration of NERA to defeat modern heat, and use of APS to counter ATGM. With the necessary add-ons, GVW (gross vehicle weight) will go up!



KNDS EMBT– the predecessor of MGCS (KNDS France)

In search of a lighter solution

Without compromising the protection, the weight of a tank could be reduced in at least four ways: by adopting multi-layer protection, using lighter materials, modularity and design.

Multi-layer protection

All modern tanks have adopted add-on armour like ERA or NERA. Modular armour blocks might decrease the need for thicker armour in the turret or hull. Besides, with continuous improvement, a more effective APS will provide a robust solution against HEAT rounds, even a top-attack one. However, the emergence of loitering munitions and drones has made it a big challenge to have an effective C-UAS solution. In the future, there might be an integrated solution against both the anti-tank warhead

and drones. Directed energy has already taken pace in this field. High-energy lasers in the future might totally replace the traditional hard-kill APS solution. This could also reduce the weight significantly.

Lighter materials

No single material can provide the same degree of immunity against all kinds of anti-tank threats. Hence, a prudent combination of both metal and non-metal materials is used. Metal can be found in a wide range of applications, like RHA (rolled homogeneous armour), HHS (high-hardness steel), DU (depleted uranium), or titanium alloy, while ceramic, fibreglass, polymer, or any other composite forms the non-metallic part. Different components could be used for various add-on armours. So, the easiest way to reduce weight without compromising protection is to adopt newer, lighter materials. And here, the importance of different ceramic matrixes and carbon materials has increased. Besides, high nitrogen steel (HNS) could be an effective alternative to the existing RHA.

The use of aluminium instead of steel in wheels or the integration of advanced rubber composite into tracks will also be helpful. Besides, instead of traditional reactive armour, adaptation of new kinds of add-on armour (ex: electric armour) could also reduce the weight. The objective of advanced metallurgy is to decrease weight, enhance protection, reduce heat signature, minimise noise and vibration, and, at the same time, be a cost-effective solution.

Modularity

The modularity will not only enable the user to add or remove armour blocks according to the specific threat but will also allow fast replacement of the specific damaged part.

Changes in design

Instead of a manually controlled one, if an unmanned turret is adopted, it does two things. One, the turret profile could be significantly smaller, reducing the weight, and two, by shifting the entire crew to the hull, the security could be enhanced. The Abrams TTB, AbramsX, KF-51 and T-14 have already demonstrated it. Besides, many other nations also focus on unmanned turrets for their future tanks.

FRCV is not alone in the group

With the emergence of newer threats, many nations have actually initiated projects for a lighter tank with dynamic defensive aid and enhanced mobility to withstand the ever changing nature of the threat. India eyes next generation materials that could be used for light weighting the armour.

While Russia's latest T-14 is a 55-tonne platform, AbramsX is reported to be a mere and the KF-51 Panther is a 59-tonne platform. The AbramsX, however, is still a technology demonstrator, but the KF-51 has been pitched for export. Recently, two next-gen MBT programmes have taken pace. Both the M1E3 (US) and MGCS (France and Germany) aim to enhance existing capability without adding weight.

While M1E3 (future M1A3) will cap it at 55 tonnes, the MGCS eyes will be even lighter (50 tonnes)! Both of these platforms are envisioned to be realities by the 2030s, just as India's FRCV. So, India's FRCV will not be the only one in such a group.

In the next issue, we will discuss concerns related to firepower, protection, crew and feasibility vis-à-vis Arjun.



Abrams Block III TTB (US Army Armour and Cavalry Collection/Wikimedia)

Article by
Sankalan
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(Twitter/X @
vinoddx9)

Special Frontier Force: The “Two Twos”...



SFF collage by Abhinav Negi

The highly motivated men and women of the Special Frontier Force or SFF has again proved the force as a well trained and highly effective force after the 2020 Eastern–Ladakh conflict, by carrying out successful Ops and capturing strategic heights. Let’s go back in time to see the rich history of the Tibetan Ghosts, who are better known as The ‘Vikasis’.

The present Special Frontier Force (SFF) traces its roots back to when the highly motivated Mustang Rebels helped the 14th Dalai Lama to escape the brutal crackdown by the troops of the Chinese People’s Liberation Army (PLA) during the 1959 Tibetan Rebellion. The rebels successfully exfiltrated with the Dalai Lama to the Indian Territory and took asylum in the ‘Land of Unity and Diversity’, this small group of displaced rebels were going to be proved highly effective against the Chinese in the future. The shell–shocked Indian government after the teeth souring defeat in the 1962 Sino–Indo war, got an idea to raise a highly trained force comprising of the Tibetan



1 Archer CDO with 2 PARA SF (Photo by ADGPI)



SFF Mt Everest (Photo by ADGPI)

Guerillas to fight against the Chinese. On 14 November 1962, a secretive force comprising of Tibetan Rebels and commanded by Indian Army officers came to existence as the Establishment–22 (to be read as Two–Two).

The force was initially fielded by a joint–task force of IB of India and CIA of the United States and was trained by the US Army Special Forces known as the Green Berets at the Joint Base Kadena in Okinawa, Japan. The force was later renamed SFF and came under the Cabinet Secretariat working tandemly with the foreign intelligence wing, the R&AW of Cab–Sec. The SFF first went into combat during the 1967 Indo–Sino Conflict in the Nathu–La border district of Sikkim which was soon be merged with the Republic on 16 May 1975. In 1971 the force again saw immense action when Pakistan attacked India on the western front, The Tibetans were dropped in the active combat zone of Chittagong in present Bangladesh (then East Pakistan). The SFF troops did massive destruction while operating deep behind the enemy lines, ambushing



SFF paratrooper

convoys and attacking HVTs (High Value Targets) was the new normal for the ‘boiz’ during the 13 days long war. The next time the Two–Two boys saw combat was during Operation Meghdoot on 13 April 1984 in which they operated under



SFF veterans (Photo by LG Ladakh on Twitter)

the army to snatch strategic heights from the Pakistanis and take full control of the Siachen Glacier. In the Early-June of the very same year, they again were part of the force which was tasked with to clear militants from the holy Sikh shrine, The Golden Temple.

The Special Group (raised as 4 Vikas) of the SFF was the spearhead along with 1 PARA CDO (now SF) of the force which was to enter the Golden Temple, while the attacking force faced a lot of casualties due to the massive push-



3 Vikas (Photo by ADGPI)



SFF mount Everest (Photo by ADGPI)



SG photo from SFF documentary.

back by the militants, they were able to recapture the holy site by 10 June 1984. Although the credit for neutralising the militant leader is given to the SG (Special Group), it's disputed between the 1 PARA CDO and SG as to who fired the bullet which eventually took down Bhindrawale. SG along with 9SF was again called in when Mrs. Gandhi was assassinated in 1984, to protect the immediate family of the PM and the new PM himself. During the IPKF stint of the Indian SFs from 1987 to 1990, SG was given a chance to gain the much needed experience for operating in the jungles, but the results were no where near satisfactory. The SG took heavy casualties and was quickly sent back to Sarsawa (the unit's base), 9 PARA CDO (now SF) was the one who rescued the SG boys.

SFF units were also involved in CI/CT Ops in the Kashmir Valley and along the LC (Line of Control) in the CI posture. In 1999, SFF again was involved in the conflict to re-capture strategic heights from the Pakistani NLI troops and militants in the Batalik and Drass Sector. SFF troops (mostly Special Group) are seen time-to-time operating with RR and JKP SOG in the Kashmir valley.

Before going through the organisation of the force, let's first understand the type of force it is. SFF is commonly mistaken to be a Special Force which is not true, the role of the SFF is to perform certain types on roles which makes it a Special Operations Force, the difference being a SF is a versatile force and can be used in any kind of situation but

on the other hand, an SOF can only be used to do certain tasks which are the fixed operational mandate of it. SFF is more like an elite Airborne Infantry capable of carrying out Spec-Ops, on the other hand SFs like PARA SF can be used anywhere as they're mandated and trained to do so.

The SFF is commanded by a serving Maj Gen rank officer of the Indian Army acting as IG SFF with other officers attached to the HQ E22 on deputation and Colonel rank officers commanding the Airborne and SOF units, who mostly are from the elite PARA SF.

Now let's talk about the organisational structure of the Special Frontier Force, which looks something like this:

- The Est. 22 HQ in Chakrata, Uttarakhand
- The SFF academy Chakrata, Uttarakhand



SG (Photo by ADGPI)



2 Vikas (Photo by OS)



Vikasis (Photo by ADGPI)

- E22 officer's mess somewhere in Delhi NCT

The SFF PTS (Parachute Training School) in Sarsawa, Uttar Pradesh.

SFF bomb disposal and ordnance group based somewhere in Delhi NCT.

The Airborne units: 1 Vikas, SFF, 2 Vikas, SFF, 3 Vikas, SFF, 5 Vikas, SFF, 6 Vikas, SFF and 7 Vikas, SFF.

The SOF units: Special Group (formerly 4 Vikas) and 1 Archer CDO, SFF.

The Special Frontier Force works behind the curtains of secrecy but sometimes their operations are made public for the world to see the muscle power India packs in terms of operating both overtly and co-overtly. The recent example of which is the important role played by the 'Vikasis' during the 2020 India-China border conflict along the LAC, in which 3 Vikas, 5 Vikas and 7 Vikas along

with Special Group played an important role in capturing the strategic heights of Black Top, Helmet Top and other important heights while operating under the Indian Army's elite PARA SF.

Now just to conclude the article, I would say that the SFF is a very highly motivated and trained force which never fails to achieve the given objectives and always fulfils its assigned roles.

We talked about the history of E22, its role in various conflicts, the CI/CT role of the force, the organisational structure of the force and the important part it played in the recent Ladakh conflict. Looking forward to see many more successful operations by the force and at last wishing the 'E22 boys' a bright and fruitful future! ➡

Article by Abhinav Negi of Team VAYU
(Twitter: @ThatArticleGuy)

All images: X/Twitter and supporting websites



MBDA missiles for IAF Rafale fleet

MBDA is the only European group capable of designing and producing missiles and missile systems that correspond to the full range of current and future operational needs of the three armed forces (land, sea and air). To bolster the capability of Indian Air Force (IAF) Rafale Omni-role strike fighters, MBDA as of now has transferred 200 SCALP Conventional Attack Stand-Off Missile (CASOM), 350 MICA RF and MICA IR Beyond Visual Range Air-to-Air Missiles (BVRAAM) and 200 Meteor BVRAAM. This consignment is in addition to 493 MICA RF and MICA IR BVRAAM meant for upgraded IAF Mirage 2000I/TI multi-role air superiority fighters.

Omni-role Rafale's avionics and electronics are integrated through four Mil STD-1553B data buses and two Mil STD-1760 data buses operating in the ADA language to enable integration wide range of state of the art weaponry. The standard Conventional Attack Stand-Off Missile (CASOM) of Dassault Rafale fighter is the MBDA turbojet powered 5.1 metre long, 1,300 kg weight and 300 km+ ranged SCALP/Storm Shadow CASOM pack that qualifies as a mini-cruise missile, capable of successful counterforce operations against enemy high value conventional and nuclear infrastructure by conventional strikes alone, yet stays clear from anticipated heavy enemy ground-based defences. Designed to cruise at low-levels on power of a micro-turbo engine to avoid radar detection, it has inertial guidance and navigation followed

by TERrain Profile Matching (TERPROM) navigation with an integrated GPS in the terminal target approach phase of flight. During terminal phase in combination with passive Imaging Infra-Red (IIR) sensors with Autonomous Target Recognition (ATR) system, the missile retains considerable autonomous operations capability over long ranges, while its effective 450 kg Bomb Royal Ordnance Augmented Charge (BROACH) unitary penetration warhead is programmed to inflict maximum damage on impact even on buried and hardened targets including heavily protected bunkers.



Enhancement programmes of the SCALP EG include the capability to relay target information just before impact, utilisation of link-back data-link to relay back Battle Damage Assessment (BDA) and option for in-flight retargeting capability, utilising a two way data-link. Storm Shadow was successfully deployed on Tornado GR4 combat aircraft by the Royal Air Force's (RAF) 617 "Dambusters" Squadron during Operation Telic in 2003. A total of 27 missiles were fired during the conflict proving the missile's exceptional capability to accurately engage targets at extended ranges whilst avoiding collateral damage and ensuring that the launch aircraft remains safely away from the target area. Meanwhile, the Indian Air Force (IAF) has got the French manufacturer to re-calibrate the software of Rafale fighter jet's SCALP long range CASOM to ensure that the subsonic weapon hits targets up to 4,000 metres above sea level. In simple terms, it means that the IAF's Rafale can demolish targets located in mountains and high plateaus at 4,000 metres instead of the previous calibration of 2,000 metres. The tweaking of the software has been done by the missile manufacturer MBDA in consultation with the top brass of IAF.



Carried under the aircraft's fuselage or under wings, and fired by ejection or by rail, MICA is 'permitted' to be ejected from the airframe up to 4g while wings pylons can release MICA up to 9g. Products of research and development during the 1990s, both MICA RF and MICA IR have a range in excess of 60 km as the MICA IR version receives mid-course update commands from the radar to

compare target location with the location of its seeker's track for LOAL engagements. In the case of MICA RF, after the target has been designated by the host aircraft's radar, this then makes first phase of its flight in inertial guidance mode, and then homes onto the target in flight in fire-and-forget mode, using its '4A' active-radar homing head. The MICA is well reputed for its general level of sophistication and reliability in terms of 'kill percentage' even in adverse European meteorological conditions in dense electronic



New weapons under development

The Rafale's highly sophisticated Beyond Visual Range Air-to-Air Missiles (BVRAAM) will immeasurably enhance combat potential of the Indian Air Force over skies of the subcontinent. To decimate hostile airborne platforms, BVRAAM missiles load usually include six MBDA MICA RF/IR for air defence oriented missions. The Missile d'Interception, deCombat et d'Autodéfense (MICA) BVRAAM forms the standard armament of the Dassault Rafale and also presently selected for upgraded package of IAF Mirage 2000I fighters. 3.1-metre long, 112 kg weight, the MICA was originally designed as a 'multi-aircraft' missile that could easily be integrated onto any modern fighter aircraft, without significantly reducing the aircraft speed or negatively affecting its aerodynamic characteristics. MICA is capable of both BVR (60km+) and close range interception thanks to its dual active radar (as in MICA RF) and Imaging Infra-Red (as in MICA IR) seeker and Lock On Before Launch (LOBL) as well as Lock On After Launch (LOAL) capability. Minimum range is said to in the region of 500 metres.

warfare environment infested with saturation jamming as the missiles in turn sport a formidable Electronic Counter Counter Measures (ECCM) system to burn through hostile jamming. The seeker is cooled by an onboard closed-cycle system, which is electrically powered and can be operated for long periods. Complex algorithms have been developed to provide the IR seeker with an ability to track at longer range and to reject flare decoys. When fitted to aircraft with track-while-scan radars the MICA weapon system is capable of attacking several targets simultaneously with individual missiles.



Its excellent manoeuvrability is aided by combination of long chord wings, efficient tail control surfaces while at short range, thrust vector control (TVC) facilitates high off-boresight angle (HOB) engagements. Interestingly, seeker of the MICA IR may also be utilised for discrete optronics monitoring prior to launch. Again, the MICA IR with its angular resolution will be able to mount stealthy strikes on unsuspecting opponents especially if the launch platform gets well pre-positioned by friendly AEW&C platforms, the lethal 12 kg high explosive blast fragmentation warhead being triggered by a Doppler radar proximity fuse. Surprise has always been the key to successful execution in air combat, with as much as 50-percent of shot down pilots totally unaware of the fact that they were under attack in the first place.



Meanwhile the French armament directorate (DGA) has launched a development programme that will modernise the MICA BVRAAM and Surface-to-Air Missile (SAM), introducing a new generation of the weapon (MICA NG). Maintaining the size, weight and electronic interfaces of the present missile, MICA NG will be a most effective successor to the baseline MICA. With an improved seeker and new propulsion, it will have the agility and performance

to cope with modern threats and countermeasures, which includes targets with reduced infrared and electromagnetic signatures, atypical targets (Unmanned Aerial Vehicles and small aircraft), in addition to the threats normally countered by air to air missiles (combat aircraft and helicopters).

Maintaining the same MICA RF and MICA IR versions, among enhancements to the MICA NG are the addition of a new infrared seeker that uses a matrix sensor providing greater sensitivity. The radio seeker will use an AESA (Active Electronically Scanned Array) antenna, giving smart detection abilities. The reduced volume of electronic components within MICA NG will allow it to carry a larger quantity of propellant, thereby significantly extending range of the missile.

Rafale's air combat capability will increase substantially with service entry of the European MBDA Meteor active-radar homing BVRAAM with its 80+ nautical miles range to provide an ultra-long range interception capability against fighter sized targets critical in attaining 'first look-first shoot-first kill' ability alongside fulfilling the BVR role for 'outer-air battles', obligatory for IAF in response to proliferation of BVRAAMs in its neighbourhood including United States AIM-120C-5 variant of AMRAAM in Pakistan Air Force (PAF) service. A 3.65 metre long, stealthy, low drag, lightweight (185 kg) BVRAAM design from MBDA, the 80+ nautical miles range Meteor with a more linear velocity profile is in demonstration phase. Born from the multi-national Project S225X examining the future BVRAAM technologies and designed for a network-centric warfare (NCW) environment, the Meteor has a data-link capability, guided not only by the launching aircraft but also by another fighter or even by AEW&C platforms. The



Weapons of the future from MBDA

extended range is ensured by Meteor's solid Boron fuelled Variable-Flow Ducted Ramrocket (VFDR) propulsion system, also referred to as Throttle-able Ducted Rocket (TDR), along with a speed of more than Mach 4 and high terminal velocity. Thus even when launched from extreme stand-off ranges, the missile will retain the energy at the end game to defeat fast, manoeuvring targets. The control system consists of four small moving tail surfaces

Operations" or Mixed Fighter Force Concept (MFFC) that is essential for future BVR engagements and optimum performance and results. Conceptually, in IAF service, pairs of Rafale will be data-linked as one illuminates the other launches the missiles against the targets. In such engagements the 'striker' fighter will be able to impart the greatest kinetic energy to the Meteor BVRAAM by accelerating up to Mach 2 and then manoeuvring out of



but at inherent high speed, sufficient to perform sharp manoeuvres. The engine's two air intakes, positioned on the both sides of the lower part of missile's body, are shaped to reduce the missile's radar cross-section.

Meteor is capable of engaging a wide range of airborne targets autonomously, including cruise missiles with less than 1metre square Radar Cross Section (RCS). For mid-course navigation guidance Meteor utilises Inertial Navigation System (INS) combined with update commands provided by the launch, or any friendly aircraft via the two way secure microwave data-link, to adequately offset Identification Friend or Foe (IFF) complexities or challenges at long ranges. During terminal phase the Ku-band (NATO: X band) active-radar homing seeker (advanced version of the MICA RF '4A') employs advanced proportional based navigation software. Also rumours persist that the system can operate passively in the K-band given the consortiums previous research interests.

As the Meteor is designed for a NCW environment, it is compatible for the futuristic concept of "Cooperative Fighter

the engagement. The illuminator, with the powerful radar capable of performing like a mini Airborne Early Warning & Control (AEW&C) platform will remain subsonic, keeping a decent distance from the target, providing command-guidance updates alongside illuminating the target. Meteor BVRAAM may potentially get integrated with upgraded Sukhoi Su-30MKI multi-role air superiority fighters, those are receiving Indian Uttam Active Electronic Scanned Array (AESA) radars and mission computers. ➡



**Article by Sayan Majumdar
Photos: Vayu and MBDA**

F-16 Block 70s for Bahrain

Lockheed Martin marked a significant milestone with the departure of the first ferry cell of three F-16 Block 70 jets from Greenville, South Carolina, to Bahrain. This event highlights Bahrain's role as the first Gulf Cooperation Council member to operate the F-16 and now the first to integrate the F-16 Block 70 variant into its fleet.



LM to produce additional PrSMs

The US Army has awarded Lockheed Martin a \$219 million contract to produce more Early Operational Capability (EOC) Precision Strike Missiles (PrSM). The award is the fourth production contract to date for the long range surface-to-surface missile, which will allow for a significant increase in production capacity to meet Army demand.



BAE's new prototype AMPV

BAE Systems has delivered an Armoured Multi-Purpose Vehicle (AMPV) Turreted Mortar prototype

to the US Army. The prototype showcases a newly designed top plate system—the External Mission Equipment Package (ExMEP)—that allows for the easy installation of a variety of turrets. This vehicle prototype is also outfitted with the Patria NEMO remote controlled 120mm turreted mortar system.



Poland for 745 AIM-120C-8s

Poland has requested to buy up to seven hundred forty-five (745) AIM-120C-8 Advanced Medium Range Air-to-Air Missiles (AMRAAM), up to sixteen (16) AIM-120C-8 AMRAAM guidance sections and fifty (50) LAU-129 Guided Missile Launchers.



Poland for 232 AIM-9X Block IIs

Poland has requested to buy two hundred thirty-two (232) AIM-9X Sidewinder Block II Tactical Missiles and sixteen (16) AIM-9X Sidewinder Block II Tactical Missile Guidance Units.



Poland for 821 JASSM-ER's

Poland has requested to buy up to eight hundred twenty-one

(821) AGM-158B-2 Joint Air-to-Surface Standoff Missiles with Extended Range (JASSM-ER) All-Up-Rounds.



LM and Navantia in Aegis agreement

Lockheed Martin has extended its collaboration agreement with Navantia, Spain's national defence and shipbuilding company and naval Combat System Integration agent. The collaboration between the two companies equipped the Spanish Navy with the Aegis Combat System in the F-100 frigates.



MBDA agreements in Greece

MBDA signed two MoUs with Greek companies MILTECH and ALTUS as part of its "R&D Booster" initiative in Greece. Together with MILTECH and ALTUS, MBDA will collaborate on projects to develop systems based on the Akeron MP missile. The first stage of the partnership with MILTECH concerns the development of an Akeron MP launch kit, which MBDA is now offering on the global market as an option for light automatic turrets fitted with low calibre guns.

RN's Sea Viper

MBDA has received three contracts worth around £400 million to boost and sustain the Sea Viper principal area air defence system of the Royal Navy's Type 45 destroyers. Two contracts, called Sea Viper Evolution, will enable the Type 45 Destroyers to defend the Carrier Strike Group against anti-ship ballistic missiles



(ASBMs). Meanwhile, another contract will provide extended and enhanced in-service support (ISS) contract for Sea Viper for a further five years. MBDA is the prime contractor and design authority for the Sea Viper weapon system, including the sensor (radar), the command and control system, and the missile.

Sea Ceptor for Poland's Miecznik frigates

MBDA has been awarded a contract by Poland to equip the Polish Navy's three new Miecznik class frigates with MBDA's Sea Ceptor naval air defence system. Sea Ceptor is a latest generation naval air defence system that protects naval vessels and consorts from modern air and surface threats, such as supersonic anti-ship missiles and unmanned surface vessels. The contract builds upon a series of strategic agreements between MBDA and Poland around MBDA's CAMM family of air defence missiles.



Kongsberg and missile production capacity

The security policy situation in Europe has increased the need to ensure the availability and supply of ammunition and missiles. Last year, the European commission launched the ASAP programme (Act in Support of Ammunition Production) to support the industry's capability to increase the production capacity for ammunition and missiles and Kongsberg is part of this.



Kratos contract for 70 BQM-177A

Kratos Defense & Security Solutions announced that its Unmanned Systems Division has received a modification to a previously awarded firm fixed price contract. This modification exercises options to procure

full rate production Lot Five of the BQM-177A Surface Launched Aerial Targets to provide for the production and delivery of 70 BQM-177A Surface Launched Aerial Targets and 70 Rocket-Assisted Takeoff attachment kits, etc.



Morocco for 612 Javelins

Morocco has requested to buy six hundred twelve (612) Javelin FGM-148F missiles (includes twelve (12) fly-to-buy missiles) and two hundred (200) Javelin Lightweight Command Launch Units (LWCLUs).



Bahrain for 50 M1A2 Abrams

Bahrain has requested to buy fifty (50) M1A2 SEPv3 Abrams Main Battle Tanks; four (4) M88A2 Hercules Combat Recovery Vehicles; eight (8) M1110 Joint Assault Bridges; eight (8) M1150 Assault Breacher Vehicles, etc.



Big contract for Rheinmetall

The German Bundeswehr has commissioned Rheinmetall to supply the "Schwerer Waffenträger Infanterie (Heavy Weapon Carrier for the Infantry)". The German Federal Armed Forces (Bundeswehr) will procure up to 123 vehicles "Schwerer Waffenträger Infanterie". The contract is worth around €2.7 billion, which also includes service and maintenance.



Rheinmetall UGVs for Japan

Rheinmetall has paved the way for autonomous Unmanned Ground Vehicles (UGVs) in Japan after being awarded a multimillion dollar contract on behalf of the Japanese Ministry of Defence. The Rheinmetall Mission Master SP UGVs are expected to be delivered early next year for testing. These compact, low signature electric UGVs will each be equipped with different payload modules, including cargo, surveillance and a remote-controlled weapon station.



MBDA Enforcer missile production proposed

MBDA continues to ramp-up its production. The production ramp-up for Enforcer missiles – Enforcer Production Increase Campaign (EPIC) – has been proposed for funding within the European Commission's ASAP programme. The portable, shoulder launched, lightweight, high precision weapon is a fire and forget missile system with an operational range up to 2000m.



BAE and M109 SPHs

BAE Systems has been awarded a contract valued up to \$318 million from the US Army to perform technical and sustainment support services for its fleet of M109A6 and A7 Self-Propelled Howitzers (SPH) and their companion, M992A3 carrier, ammunition, tracked (CAT) vehicles.



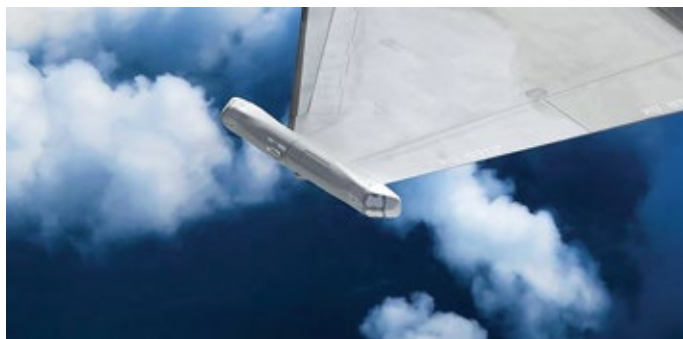
BAE and AMPV programme

BAE Systems received a \$754 million contract award to continue producing the Armoured Multi Purpose Vehicle (AMPV) family of vehicles (FoV) for the US Army. The multi-mission ready AMPV FoV replaces vehicles from the Army's Vietnam War era M113 family, modernising the force and providing critical survivability, mobility, and interoperability upgrades to the Armoured Brigade Combat Team (ABCT).



Saab Arexis for German Eurofighters

Saab has received an order from Airbus Defence and Space for the Arexis Electronic Warfare (EW) sensor suite. The contract period is 2024–2026. The German defence procurement office announced in June 2023 that it had selected Saab's Arexis sensor suite for the Eurofighter EK, an EW variant of the German Air Force's Eurofighter aircraft. This order marks the start of the first phase of Saab's delivery of Arexis within this programme.



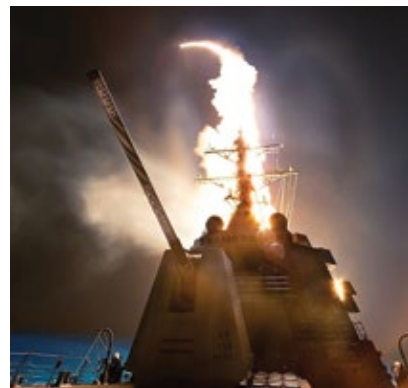
Naval Group Scorpènes for Indonesia

Indonesia has selected Naval Group and PT PAL to strengthen the capabilities of the Indonesian Navy with two Scorpène Evolved Full Lithium-Ion battery (LiB) submarines to be built in Indonesia in PT PAL shipyard, through a transfer of technology from Naval Group.



RTX's SM-6 intercepts target

A Standard Missile-6 (SM-6) built by Raytheon intercepted a medium range ballistic missile target at sea in its final seconds of flight, after being fired from the USS Preble (DDG



88). This test verified some of the missile's enhanced capabilities when launched from a Baseline 9.C2 variant of the Aegis Combat System.

LM's LRASM flight test

The US Navy in partnership with Lockheed Martin successfully conducted a historic Long Range Anti-Ship Missile (LRASM) flight test with four missiles simultaneously in flight. During the 12th Integrated Test Event (ITE-12), the US Navy was able to demonstrate the weapon's inherent high end lethality from mission planning through kill chain integration and its effects on the target.



US Army awards LM follow-on contract

The US Army awarded Lockheed Martin a follow-on production contract for Joint Air to Ground Missiles (JAGM) and Hellfire missiles with a Programme Year 3 (PY3) award total value of \$483 million. This contract will provide JAGM and Hellfire procurement and production support for the US Army, US Navy and international customers.



Saab equipment order for Gripen

Saab has received an order from the Swedish Defence Materiel Administration (FMV) for the procurement of additional Litening 5 target designator pods, including maintenance capabilities. The order is valued at SEK 390 million. Litening 5 is used in the precision designation of targets through laser targeting and target tracking.

FMV previously ordered this version of LDP for Gripen E, and are also now integrated on Gripen C/D. This order comprises the additional pods, maintenance and spare parts.



Greece for 35 UH-60M Black Hawks

Greece signed a Letter of Offer and Acceptance (LOA) making official its intent to procure 35 UH-60M Black Hawk helicopters built by Sikorsky.



NGC completes assembly of Manta Ray UUV



Northrop Grumman Corporation completed assembly of a full size uncrewed underwater vehicle (UUV) prototype known as Manta Ray. A new class of UUV, it is an extra large glider that will operate long duration, long-range and payload capable undersea missions without need for on-site human logistics.

Manta Ray was built through a Defence Advanced Research Projects Agency (DARPA) programme aimed at advancing key technologies to benefit future UUV designs.

Embraer and BAF studies for special mission platforms

Embraer and the Brazilian Air Force announced the beginning of collaborative studies to identify potential platform adaptations for Intelligence, Surveillance, and Reconnaissance missions.

The platforms to be used are already operational in the Brazilian Air Force, such as the C-390 Millennium.



IAI's radar and ESM sales

Israel Aerospace Industries (IAI) has been awarded a contract to provide a Multi-Sensor Multi-Mission Radar (MS-MMR) system for a European country's air defence system.

The MS-MMR is an ESM enhanced air defence radar sensor developed and produced by IAI's ELTA Systems.



Thales Ground Master 200 for Dutch MoD

Command Materiel and IT (COMMIT), the Dutch military procurement organisation, has signed an agreement for the acquisition of seven additional Thales Ground Master 200 Multi-Mission Compact radars (GM200 MM/C), with an option of two additional systems. The contract follows nine GM 200 MM/C radars previously ordered in 2019.



Ghost Shark debuts in Australia

Anduril, the Royal Australian Navy (RAN), the Advanced Strategic Capabilities Accelerator (ASCA) and Defence Science and Technology Group (DSTG) have unveiled the first Ghost Shark manufactured prototype and announce that the Ghost Shark programme is ahead of schedule and on budget.

It's a momentous advancement in the \$140M co-development contract between RAN, DSTG and Anduril to design and develop the three 'Ghost Shark' extra-large autonomous undersea vehicles (XL-AUV) in three years in Australia. ➡



Dassault results for 2023



Above images: Dassault

“The Group’s backlog continues to increase, driven by the commercial success of the Rafale. It stands at EUR 38.5 billion as of 31 December 2023 (295 aircraft – 141 Rafale Export, 70 Rafale France and 84 Falcon). Post-closing of the 2023 financial statements, the backlog increased with the entry into force in January 2024 of the third batch of 18 Rafale of the Indonesian contract. A total of 495 Rafale have thus been ordered since the beginning of the programme”.

Certification of the Falcon 6X by EASA and FAA (type certificate) was approved on 22 August 2023, the entry into service of the aircraft including the application of post certification upgrades happened on 30 November 2023. The first delivery took place in February 2024.

13 Rafale and 26 Falcon were delivered, versus a guidance of 15 and 35, due to supply chain issues and the delayed entry into service of Falcon 6X. Group’s Revenues for the year stood at EUR 4.8 billion, leading to an adjusted EBIT of EUR 349 million and a record breaking adjusted net result of EUR 886 million, representing 18.5% of net sales.

Other notable activities: The Paris Le Bourget Air Show was held in June 2023. This trade show allowed Dassault Aviation to once again showcase the efforts it has undertaken to decarbonise its processes and products, and those that it will continue to pursue in the years to come.

The Group is committed to its decarbonisation: the Falcon aircraft are certified to fly with Sustainable Aviation Fuel (SAF) blends with kerosene up to 50%. Today’s available alternative fuels (SAF) offer a carbon emission reduction’s rate in the range of 80% to 90% compared to conventional kerosene. All Dassault Aviation flights, including those in the United States, are using 30% SAF blends which are the only ones available on the market today. 413 flights have been operated in 2023 by Dassault Aviation with 30% SAF blends (vs. 179 in 2022). Aircraft models currently under production will be compatible with 100% SAF blends by 2030.

2024 Objectives: Deliver Rafale and Falcon; Meet our schedule and cost commitments for Falcon and military developments; Availability and support for our aircraft: maintain satisfaction levels among our military customers and regain our position as leader in business aviation support rankings; Get a contract for the F5 standard preliminary studies; FCAS/NGF: continue developing the demonstrator; Make in India: ramp up the activities transferred to India; Continue Rafale Export business development and increase Falcon sales efforts and finally, CSR: integrate new hires, continue our recruitment efforts and our action to reduce our environmental impact. ➡

Text: Dassault



Above images: Vayu Aerospace & Defence Review

Rosoboronexport offers a full range of tuning parts for small arms



sights, shooting glasses, monoculars, night vision scope attachments, thermal imagers, thermal imaging attachments and other types of optics. JSC Rosoboronexport has successful experience in promoting optics manufactured by Shvabe (a Rostec State Corporation subsidiary), Infratech and Dedal in the global market.

JSC Rosoboronexport offers various tactical devices to customise a firearm to the individual shooter: flashlights, laser designators and remote control buttons. Designed for aiming using night vision devices and illuminating space at night or in places where there is no source of light, they significantly improve fire readiness. The ergonomics and effectiveness of the weapon are also significantly enhanced by additional features such as fire selectors, safeties and operating handles.

The design of all the tuning parts has been developed in close cooperation with weapon operators, taking into account their use in real conditions. A number of them were modernised by manufacturers with regard to feedback directly from the battlefield and best meet modern requirements for ergonomics, performance and operational characteristics. ➡

Text and photos: ROE

The Joint Stock Company Rosoboronexport (part of Rostec State Corporation) has launched a global marketing campaign for a wide range of Russian-made tuning parts for civilian and service small arms.

“JSC Rosoboronexport’s export catalog includes a full range of tuning parts that can significantly improve the ergonomics, accuracy, reliability and functionality of small arms. For the most of Russian weapon models, more than 10 configurations are available to meet the specific tasks of the customers, among which may be the special units of various law enforcement agencies, private security companies, athletes and hunters”, stated Alexander Mikhhev, Director General of JSC Rosoboronexport. “The products we offer have received a positive feedback from the specialists of the National Guard, the Ministry of Defence and the Ministry of Internal Affairs of Russia.”

Among the products offered by the company are muzzle brakes, muzzle devices, forearms, bipods and grips, brackets and receiver covers with

Picatinny rails, pistol grips, butts, magazines. For the convenience of their installation, Russian companies have developed adapters, clamps and specialised tools. Their production is located in Russia and does not depend on supplies from abroad. Among the manufacturers whose products JSC Rosoboronexport offers in the foreign market are the Kalashnikov Group (part of Rostec State Corporation), as well as PUFGUN, Zenitka and Rotor-43 companies.

Tuning of legacy small arms enables the installation of all the modern optical devices on them to improve visibility in conditions of limited visibility or long distances. Russian manufacturers develop and manufacture a full range of optical devices, including red dot sights, daytime



VAYU on-the-spot report

Goa Naval Aviation Museum



Inaugurated in 1998, this museum is one of only two military museums in India. In fact, it is the only Naval aviation museum in all of Asia. The museum displays a number of aircraft that were used by the Indian Navy throughout its history. These are displayed outside in the museum's open air gallery.



Lockheed L1049G Super Constellation (IN 315)

The interior of the museum is designed to look like the interior of a naval aircraft carrier the INS Viraat and has a number of interesting galleries displaying naval equipment, prominent battles, a simulation room and an extensive granite plaque paying tribute to those brave souls who gave their lives in service of their country.



Sea Harrier FRS.51 (IN 621)

The museum of Naval Aviation in Goa is located near Bogmala, on the Vasco–Bogmalo road about 6km from the port town of Vasco da Gama, more commonly known as Vasco. The museum is built on a plateau which overlooks the popular Bogmalo beach and gives one an unimpeded look at the splendid ocean vistas.



The museum is open to public from Tuesday to Sunday from 9.30am to 5.30pm. The museum does, however, remain closed on National Holidays. A day at the museum is a pleasant outing at any time of the year.

Upon entering the museums premises, the first sentinel is the bulking form of the Super Constellation, a craft originally used as a passenger plane by the Indian Airlines. It was later handed over to the Air Force as a transport vehicle, who then gave it over to the Indian Navy. It was eventually decommissioned but has remained within the Naval purview.

The outdoor gallery has an impressive display of 13 aircraft, both planes and helicopters as well as a display of aircraft engines and parts.



The thirteen aircraft on display are:

Short Sealand Mk 2 (IN 106) – It is the only surviving aircraft of its kind in India and one of three known to be in existence in the world. The Sealand was the first aircraft type to be inducted after the establishment of the Directorate of Naval Aviation in 1953. They were phased out in the year 1965.

Fairey Firefly TT Mk1 (IN 112) – It is the sole craft of its type in India, it is also one of 12 still in existence in the World. It was one of the British WW2-era carrier-borne fighter and anti-submarine aircraft. These crafts were acquired in May 1955 for target towing purposes.

HAL HT-2 (BX 748) – The Navy used the HT-2 as primary trainers from 1956 to 1964. The aircraft which is currently on display has IAF markings.

de Havilland Vampire T-55 (IN 149) – The T55, two-seater variant of the Vampire was procured in September 1957 by the Indian Navy to train Naval airmen on Jet fighter aircrafts before the Navy inducted its Sea Hawks.

Hawker Sea Hawk FGA Mk 100 (IN 234) – The Sea Hawks entered into the naval service along with INS Vikrant, India's first Aircraft carrier and served the country for two decades before eventually being replaced by the Sea Harriers.

Breguet Alizé (IN 202) – The Alize was the Navy's first aircraft carrier based Anti-Submarine and Maritime Surveillance (ASM) aircraft and was inducted into the service in 1961.

de Havilland Dove (IN 124) – The Dove was procured by the Indian Navy from the Indian Air Force in 1965 to replace the Short Sealands that were being phased out at the time.

HAL Chetak (IN 475) – The Chetak entered the naval service along with the INS Vikrant (aircraft carrier) in 1961 primarily for use in training, transport, CASEVAC (Casualty Evacuation), communications and liaison roles. It was phased out of use by the Navy in 1986.

Hughes Hu-300 (IN 083) – The Hughes were two-seater helicopters that were inducted into Naval service 1971 for ab-initio training of helicopter pilots and were phased out in the mid 1980's.

Westland Sea King Mk 42 (IN 505) – The Sea King was procured in 1970 to engage in Anti-Submarine Warfare in the Navy, should such a condition arise. A variant of this helicopter known as the Commando was also adapted by Westland for the transportation of troops in wartime.

Lockheed L1049G Super Constellation (IN 315) – The guardian at the gates as it were, this Lockheed L-1049G was originally delivered to Air India (commercial airline) in 1955 and named "Rani of Ellora". It was transferred to the Indian Air Force in 1961; from there it went on to be lent to the Naval Aviation arm in 1976 and was finally retired in 1983.

Kamov Ka-25 (IN 573) – The Kamov helicopters were commissioned in 1980 and were essentially for use in Anti-Submarine Warfare (ASW). Their secondary role was that of surveillance and Search and Rescue (SAR) duties.

Sea Harrier FRS.51 (IN 621) – The single-seater Sea Harriers were based both on the INS Vikrant as well as the INS Viraat. These fighter jets were part of the Indian Naval Air Arm and provide reconnaissance, carrier-based strike capability, fleet air defence and anti-submarine warfare.

The interior galleries of the museum are accessed through a ship's hatch and are designed to look like the interior of the INS Viraat, a naval aircraft carrier. The two main galleries are the Viraat gallery and the Vikrant gallery. Both galleries boast wooden models of the ships that they are named for.



The outdoor engine area. There is an engine area indoors as well.

One of the first rooms displays a collection of arms and armaments including bombs, torpedoes, rockets, warheads, depth charges, etc. The Sonobouy Room has a collection of sonobouys which are sensors that are used by aircraft for detection of underwater enemy targets.

The Suraksha room has various gear and gadgets used for protection while at sea and in the air, including the floating dinghy, parachute, ejector seat, pilot's overalls etc. Perhaps the most interesting room is the Multimedia room which also houses the Jet cockpit simulator; a programme that allows visitors to simulate the experience of being in the cockpit of a fighter jet.



One of the museum walls is adorned with a granite slab known as 'Shradhanjali' which has inscribed on it the names of all those who have given their lives in the service of their country. These are the Naval Pilots from the year 1958 to 1997. Adjacent to this plaque is the Meditation room which is the heart of the museum. Decorated with cool granite and graceful art, the room exudes peace and serenity.



The museum also houses a photo gallery that commemorates all the major naval battles that have taken place since the formation of the Indian Navy. The freedom struggle of Goa, notably the 'Operation Vijay' is depicted by a stunning series of black and white photographs.

The museum also boasts a gift shop that sells a number of souvenirs fashioned along the lines of the exhibits in the museum. The museum is a great place to visit, not only for its uniqueness in subject matter, but also for an in-depth look at the glorious military history of the country. The museum is also meant to inspire people to look to the seas and the skies and their protectors. ➡

Text courtesy: goa-tourism.com
All photos: Vayu Aerospace Review



Westland Sea King Mk 42 (IN 505)



HAL HT-2 (BX 748)



The Islander



Kamov Ka-25 (IN 573)



Hawker Sea Hawk FGA Mk 100 (IN 234)



Fairey Firefly TT Mk1 (IN 112)



de Havilland Dove (IN 124)



Breguet Alizé (IN 202)



de Havilland Vampire T-55 (IN 149)



Short Sealand Mk 2 (IN 106)

Intense “Iniochos 2024” Air manoeuvres over Greece



The airspace over Greece was once again the theatre for the annual international exercise “Iniochos” which ran for 2 weeks during April 2024. With foreign participating aircraft from 9 nations and a robust Hellenic home force, the organisers at Andravida Air Base claimed the 2024 edition to be the largest in the history of the exercise. **Vayu Aerospace & Defence Review** was there to report on the annual spring exercise and see the action from close by.

INVITEX

Starting in the 80's, Iniochos was originally a pure Greek air force exercise and by 2005, when joined by navy and army units, it became the largest national defence exercise operating out of several bases. Only per 2015 Iniochos changed to its current international character, when becoming a medium scale invitation exercise (INVITEX), on a single base concept. Over the years the exercise ambition grew to become a most competitive INVITEX providing high level training, which resulted in attracting many air forces to join the yearly drills at the Greek peninsula of Peloponnese, location of Andravida Air Base.

The base is home of the 117th Combat Wing flying the F-4E Phantom II and the Hellenic Air Tactics Center (ATC) including the Fighter Weapon School (FWS) unit, which are responsible for organising the annual



Iniochos exercises. The ATC command mentioned that the development and growth, displayed the international



relevancy and need of such an exercise and choice to adapt the exercise to the general safety situation. Considerations included the need to develop the interoperability and standardisation between HAF units and joined nations air forces, also outside NATO and to improve the cooperation and integration of tactic techniques and procedures. Furthermore the development of integration of older and more modern military means, in a modern battlefield and the preparation of crews for a future battle area in a demanding and complex operational area were key to develop the current exercise syllabus.

Nevertheless the syllabus is updated continuously, to adapt to new developments like the modernisation of the Hellenic AF with the recent introduction of the Rafale, the upgrade to F-16V and, in a few years, the F-35. This modernisation process will also mean that several HAF aircraft types will cease operations in a few years, which include the F-4E's from Andravida. Other types, like the Mirage 2000 and the oldest F-16C and D models in the Greek inventory, were recently also mentioned by local sources to be taken out of service as the Greek government is looking for interested nations to sell them.



Daily rhythm

Each Iniochos day had a repetitive sequence of planning, flying several missions and offered participants rotational lead roles in briefing, planning and executing missions. The exercise battle rhythm included morning “A” missions, afternoon “B” missions and “C” night missions. The morning mission, starting air borne from 10.00L, consisted out of 2 waves, being “A1” and followed by “A2” half an hour later. ATC and FWS officials described that the whole daily rhythm lasts approximately 20 hours which meant a physically demanding situation.

Therefore all participating forces had to bring an adequate number of personnel to cover the whole exercise spectrum. Having in mind the personnel’ crew rest, the exercise is set up in such a way that each wave’s duration was planned not to exceed the 12 hour duration. Originally the exercise had a single base concept (all takes place at Andravida), however currently, with efficient and secured video connections for mission briefings and de-briefings, it is also open for participants to fly from another base. Samples for this years exercise were USAFE F-16’s and RAF Typhoons joining from other locations.

The Andravida based participants were doing face to face planning, briefing and debriefing therefore maximising training benefits and promoting cooperation and exchange of ideas in tactics. An Operations Officer of ATC Fighter Weapons School, marked the complexity of Iniochos from start on, with a developing crisis and the thresholds to be taken to determine how to respond. From the first day, the pressure is on with trying to suppress enemy air defences and obtain local air superiority and initial precision strikes for “opening the gate” for the other assets which were essential to bring the “mass” with their weaponry.



The threats for aircrew doing their mission are intense, complex and can change instantly. Offering these high pressure scenarios simulate real crisis situations, more than other international exercises, and are also mentally demanding for a crew.

“This is the way we do it in Greece and which works for us and some claim it an inheritance of our Spartan mentality” as the Iniochos representative described. About 130 sorties are flown daily with aircraft going into theatre in flows. In the daily briefings of the FWS instructors, the objectives are stated like target setting but also additional elements are given like weapon limitations. This let



commanders of Blue Forces consider what to put on their aircraft and how are we going to use our weapons.

Objectives

In order to achieve the objectives of the exercise, the scenarios oversee the planning to debriefing and cover the full spectrum of missions currently performed by the HAF. Samples are Offensive Counter Air (OCA), Defensive Counter Air (DCA), Strategic Air Operations, Air Power contribution to Counter-Land Ops (APCLO) and Air Power contribution to Counter-Maritime Ops (APCMO). Additional exercise missions included Reconnaissance



(RECCE), Combat Search and Rescue (CSAR), Time Sensitive Targets (TST) and High Value Airborne Asset (HVAA).

This year a considerable number of mission were digitally executed by using F-16 Tactical Simulators of the Operational Synthetic Training Squadron (MESE) and the FWS.

Iniochos 2024 started with the preparational Phase 1 from 1 April welcoming arriving participants at the base and have a first introduction to the exercise and learn about the procedures and rules. Part of this were several local and regional familiarisation flights, including the nearby mountainous area to conduct low level fly ops. Phase 2, the real exercise, lasted from 8–18 April, followed by Phase 3 where the participants left Andravida finally for their home bases.



Participants Iniochos 2024 (operating out of Andravida)

Air Force	Type	Unit
Hellenic AF	M2000 EG/BG	331 Sqn
Hellenic AF	Rafale EG/DG	332 Sqn
Hellenic AF	F-4E	338 Sqn
Hellenic AF	F-16C/D/V	330, 335, 336, 343, 347 Sqn
Romanian AF	F-16AM	Esc 53
Spanish AF	F/A-18A+	462 Esc
Royal Saudi AF	Typhoon F.2 / T.3	3, 10, 80 Sqn
Qatar Emirate AF	Rafale Eq/DQ	1 Sqn
French Navy	Rafale M	11, 12, 17 Flot
Montegrin AF	Bell-412EPi	Helicopter Sqn
Cyprus AF	AW-139	460 Med

Foreign participants flying from other bases included French E-3F, RAF Typhoon, USAFE F-16 and MQ-9. Non flying, as well as exercise observer, nations included Portugal, Austria and Germany. ➡

Article and photos:
Peter ten Berg

The Mirage 2000D MLU

The Dassault Mirage 2000 aircraft family is a single engined jet with a Snecma M53 turbofan engine. The early designs were made in the 1970s and during the mid 1980s it entered the French Air Force (Armée de l'Air) in the Air Defence role (Mirage 2000C) and the training role (Mirage 2000B). Later the Mirage 2000D (for conventional air to ground attack) and the Mirage 2000N (for the nuclear ground attack) were developed as 2-seater aircraft with a pilot and a Weapons System Officer (Navigateur Officier Systeme d'Armes, NOSA). The Mirage 2000D and 2000N had many communalities and after the retirement of the Mirage 2000N in 2018, many parts were reused to keep the Mirage 2000D flying.

The Mirage 2000D started flying in 1995 and the main operating base is Base Aérienne Nancy (La base aérienne 133 Nancy-Ochey "Henry Jeandet", ICAO: LFSO) in the north-east of France.



There are 2 operational squadrons in the 3rd Escadre de Chasse (Air Wing 3), based at BA Nancy: Escadron de chasse 1/3 'Navarre' and Escadron de chasse 3/3 'Ardennes'.

Upgrades: A first upgrade designated Mirage 2000D-R2 was delivered from 2001 onwards. A second upgrade





programme was started in 2009, to improve the strike role and the air to air capabilities. This provided a multirole capability that compensated for the eventual retirement of the Mirage 2000Cs.

Mid Life Update: In the military planning law ('Loi de Programmation Militaire (LPM) 2019–2025'), a Mirage 2000D upgrade was foreseen and at the moment, 55 aircraft are undergoing a mid-life upgrade known as Mirage 2000D RMV (Renovation Mi-Vie, Mid Life Update). This MLU programme has the objective of keeping the Mirage 2000D in service until the year 2035. This involves updating the avionics, providing a CC422 gun pod, replacing the Magic missiles by MICA missiles and integrating the GBU-48 and GBU-50 laser guided bombs. The MLU programmes will last until 2024 the costs are estimated around 530 million Euros.

In February 2024, the first Mirage 2000D RMV was

shown to the press, introduced by the commander the 3rd Escadre de Chasse, LtCol Julien (no lastname). He informed the audience about the deployments of the Mirage 2000D in various theaters, in Europe, Asia and Africa.

Mirage 2000B: The training version of the Mirage 2000 family is the Mirage 2000B. Until 2022 the Mirage training was performed at BA Orange (ICAO: LFMO), but with the upcoming closure due to an upgrade of the base; all Mirage 2000Bs were moved to BA Nancy in the summer of 2022. Escadron de chasse 2/3 'Champagne' (a former Mirage 2000D squadron), has taken over the role of Mirage 2000 training for the French Air Force. Major 'BASH' explained that the EC2/3 will train future Mirage 2000D pilots until the final retirement of the Mirage 2000D in 2035. 🐦

Text: Joris van Boven and Alex van Noije
Photos taken at BA Nancy in February 2024: Alex van Noije
Additional photos air-air in March 2023: Joris van Boven

Turning a new page: Hellenic 120ATW training squadron



25 Standard T-6A's and 20 T-6A-NTA's were delivered between August 2000 and May 2003. The ground attack capability of the NTA is however currently not used.

With more and more air forces introducing new 4th and 5th generation aircraft, there is also more requirements on modern ways to train future pilots. Over the past year the Hellenic Air Force (HAF) has been hard at work to prepare their main training base at Kalamata in the South of the Peloponnese for this change. With new facilities for personnel and aircraft, with a new complex for simulators and the arrival of their brand new Alenia Aermacchi M-346B trainer, the Hellenic Air Force is ready to train their student pilots and deliver higher standards than ever before.

T-6 Texan II

The Beechcraft T-6 Texan II is a single engine turboprop aircraft built by the Raytheon Aircraft Company (Textron Aviation since 2014). Based on the Pilatus PC-9, the T-6

is a more modified trainer which was initially designed for the United States Joint Primary Aircraft Training System (JPATS) and replaced the T-37 in US Service. The first flight of the T-6A was on 15 July 1998. With the T-37 having flown for many years in HAF service, they opted for the same path as the United States did for their replacement basic trainer. The delivery of the new trainer consisted of 25 standard T-6A's and 20 T-6A-NTA models.

The New Trainer Aircraft (NTA) has the possibility to be fitted with six underwing hardpoints which gives it the capability to carry rocket pods, gun pods, external fuel tanks, and bombs for a limited ground attack role.

The T-6A is powered by a Pratt & Whitney PT-6A-68 turbo-prop engine proving 1100 shaft horsepower (shp) and has a climb rate in excess of 3300ft/min (1000 m/



A close look in the office. The HUD is a big step up from flying in the T-6 and gives the pilot vital information in order to focus on the task at hand.

min). The maximum cruise speed of the aircraft is 310mph (500km/h) with an altitude ceiling of 31,000 feet (9,500m). The cockpit was designed with the digital cockpit setup, preparing the new pilots from an early stage of their training with the look and feel of modern fighter aircraft. The T-6A makes use of Smiths Aerospace multi-function active matrix LCD's. In addition to this, the cockpit is pressurised, has Martin-Baker Mk.16 zero-speed zero altitude ('zero-zero') ejection seats and a canopy fracturing system.

Currently around half of the fleet of T-6A's is operational with the two squadrons. A replacement due to the introduction of the M-346B is however out of the question as Lt. Col. Tsioumas, 364 Squadron Commander explains: "One of the main differences is that the T-6A does not have the HUD, which is a big advantage when moving onwards to the jet. The rest of the structure and what the pilot gets to use in the cockpit are very similar to each other in the way they are being used.

For what we need the T-6A for, in the second phase, the aircraft is performing very well and the tasks are all done without any problems. The intention is to have the means to fly. The more aircraft we have, the more hours we can produce for training within the syllabus. We are currently looking at bringing additional airframes back into operational service, which will give us additional capacity to perform our tasks".

M-346B Master

The Alenia Aermacchi M-346 Master is a twin-engine transonic advanced jet trainer and light combat aircraft. Originally co-developed with Yakovlev as the Yak/AEM-130, the partnership was dissolved in 2000 after which Alenia Aermacchi proceeded to separately develop the M-346 Master, while Yakovlev continued work on the Yakovlev Yak-130.

The first flight of the M-346 took place on 15 July 2004. It incorporates a full-authority quadruplex digital fly-by-wire flight control system, which was developed by a collaboration between Teleavio, Marconi Italiana and BAE



A line up of three T-2 Buckeyes on the main ramp at Kalamata. These have not flown since December 2023.



A member of the ground crew is in charge after the flight. Visual checks are done to ensure the aircraft is safe to go out for another training flight.

Systems. The M-346 uses the Honeywell F124 turbofan engine, which is a low-bypass turbofan engine and has a maximum thrust of 6250 pound of force (lbf). With the optimised aerodynamic configuration of the aircraft, it provides for full maneuverability and controllability at a very high angle of attack (in excess of 30° degrees).

This allows the M-346 to effectively mimic the flight performance of various fighter aircraft or to progressively increase difficulty levels, thus raising the effectiveness of the training, as Col (P) Faldamis, 362 Squadron Commander, explains: "As a training aircraft, performance wise, the M-346 is very close to a fighter jet. It is an amazing jet to fly. In terms of avionics, it is even better than most of the fighter jets. What we get in the training package is what we see in the fighter jets. This enables us to have students that are really early in their career being exposed to a really high-performance aircraft with a lot of additional features that will help them in preparation for after their graduation.

We can train them in utilising the performance of the aircraft, but also to enhance their skills in task



*120 Air Training
Wing badge*



*361 Air Training
Squadron badge*



*362 Air Training
Squadron badge*



*363 Air Training
Squadron badge*



*364 Air Training
Squadron badge*



A pair of Masters taxis out to the runway at Kalamata Air Base. Students are straight away prepared to fly combined missions with other aircraft.



An instructor pilot climbs out of the M-346 after a training sortie. The pilot is about to follow while ground crew performs the initial checks after the flight.

management and how they can prioritise the information they get during the mission. This will save a lot of time

later on, when they join their frontline squadrons”.

A digital avionics system, modelled on its counterparts on board the latest generation of military aircraft, makes the M-346 suitable for all stages of advanced flight training. The aircraft's glass cockpit is representative of the latest generation cockpits and is compatible with Night Vision Goggles. It has three color LCD multifunctional displays, a head-up display (HUD) for both front and rear pilots and an optional Helmet-Mounted Display (HMD). A voice command system is also present, which is integrated with functions such as the navigation system. The communication systems include VHF/UHF transceivers, IFF transponder, and Mid-air Collision Avoidance System (MIDCAS) as well as Ground Proximity Warning System (GPWS).



Five M-346B's are currently in operation with 362 Air Training Squadron for the advanced training phase of the Hellenic Air Force.



Flightline activity at 362 squadron is high with the first student pilots only flying the M-346 for a couple of weeks.

A total of ten M-346B's are on order with a total of five delivered as of April 2024 under a Government-to-Government agreement between the Hellenic and Israeli Defence Ministries, with Elbit Systems undertaking the creation of an International Flight Training Centre



With 30 – 40 pilots divided over 361 and 364 Air Training Squadron, the number of flights on a day are high with multiple aircraft flying around Kalamata at any given time.

at 120 ATW Kalamata. The aircraft are equipped with Elbit Systems' integrated virtual avionics that simulate combat and flight scenarios, in order to bring the training experience of the pilots to the highest level.

In cooperation with Elbit Systems, new training facilities have been completed at Kalamata and within the first half of 2023, the advanced flight simulators as well as ground and fleet control and communication systems were established.

Col (P) Faldamis continues: "At the moment we are looking at new aircraft arriving at a rate of two every six months. For us we see it as a huge opportunity to shift the training and move forward. We have just started our first class with most of our facilities ready.

The Syllabus is ready for the next step to take the squadron to an even higher level and prepare our pilots in the best way. Currently we do not train any foreign pilots, but that is something we are looking into for the future. We are in a really good position to succeed in that. We have the expertise and the knowledge to provide training that will be preferred by other air forces".

Text and Photos: Erik Bruijns, Lex de Kort, Fred van Peursem and Gijs ten Velde

Helocast at Raamsdonk



On 10 April 2024, a helocast training was carried out near Raamsdonk (The Netherlands).

Divers from the Commando Troops of the Royal Netherlands Army practiced landing in the water from a DHC helicopter. A Chinook CH-47 from 298 squadron based at Gilze-Rijen air base (ICAO: EHGR) was deployed for this purpose. This Chinook landed several times to take a number of commandos on board.

After a short flight, the Chinook slowly flew over a side arm of the 'Bergsche Maas' near Raamsdonk, after which the soldiers jumped into the water.

Then the soldiers swam to shore for another round. This was repeated six times in total, the last two times another boat was thrown out.

The Commando Troops Corps (Korps Commandotroepen, KCT) is the Special Forces (SFO) corps of the Royal Netherlands Army whose task is to prepare and carry out





Special Operations in the context of allied defence and crisis management tasks.

The KCT is ready for operational deployment 365 days a year, 24 hours a day, anywhere in the world. The Dutch Defence has a separate command Defence Helicopter Command (Defensie Helikopter Commando, DHC) for all helicopter operations.

The Boeing AH-64 Apaches, the Boeing CH-47 Chinooks, the Airbus Cougar and the naval NHIndustries NH90 are all united in DHC.

The 298 squadron flies the Boeing CH-47FMYII CAAS (Common Avionics Architecture System 9.4), which is nearly in the same configuration as the standard US Army CH-47 helicopters. 14 new Chinook helicopters were purchased while 6 existing Dutch CH-47F helicopters were modernised to the same standard. The last CH-47 helicopter was delivered to 298 squadron in November 2023. ➡

Photos and text:
Joris van Boven and
Alex van Noije

Italian Air Force Phase out VELIVOLO AMX



On 5 April 2024, the Air Force officially said goodbye with an official ceremony to the AMX aircraft which had reached the end of its operational life after 35 years of intense activity. This aircraft operated both in Italy and abroad, becoming among other things the aero-tactical jet aircraft most used by the Air Force in

missions outside national borders and its last flight was the transfer from the airport of Istrana, home of the 51st Wing at Piacenza airport, where it seems that at least two examples will be kept in flight conditions, or at least will not be definitively decommissioned.

After the technical intervention of Updating Operational and Logistics Capabilities (ACOL), the aircraft was now designated A-11B for the single-seat version and TA-11B for the two-seat version.

The AMX is an aircraft whose main use was reconnaissance and tactical support (CAS Close Air Support), better known as “GHIBLI” or affectionately called “TOPONE” by pilots and specialists, it entered the forces of ‘Aeronautica Militare’ in 1989, replacing the elderly G.91Y, and was initially highly criticised both for the limited avionics suite and for the engine which had always been considered too old and underperforming. After a troubled operational start which saw the fleet grounded twice (in 1991 and 1996), the AMX underwent a real operational turning point after the ACOL update implemented only for part of the line, most precisely for 43 A-11A and 10 TA-11B.





The ACOL upgrade eliminated what was the main problem of the AMX, namely the limited operational capacity of the weapon system.

We intervened with a programme started in 2003 and concluded in 2012, (the first AMX ACOL was delivered to the operational departments in August 2007) focused on the introduction of an inertial navigation/GPS system, the updating of the communication systems and Friend/Foe identification like NGIFF (New Generation Identification Friend or Foe); all cockpit panels on single-seat aircraft have been made compatible with the pilot's use of night vision systems (NVG) and, to allow the pilot to effectively manage the new operational capabilities, the cockpit has been updated with a modern multifunction color LCD display, supported by a powerful Computer Symbol Generator (CSG) with Digital Map functions.

The upgrade also included the integration of precision armaments, and two interventions in particular have enormously expanded operational reconnaissance and air-to-surface attack capabilities.

As regards the first, the very high performance RecceLite digital pod was introduced, capable of acquiring and transmitting photographs and videos in real time via broadband digital datalink.

For the second capacity, the Litening pod was implemented for the use of high precision ammunition with both inertial and laser guidance and with a double capacity in both cases, i.e. being able to transmit what is seen on the ground to show troops supported what is happening around the area of interest thus significantly increasing Situational Awareness (A definition of Situational Awareness is "possession of a clear and correct perception of what has happened, what is happening and what may happen in the immediate future"). All this information is or can be provided in real time to a ROVER located on the ground connected via data link.

The ACOL upgrade brought the AMX to a fully mature operational standard, greatly expanding the aircraft's operational capability, a standard that continued until its decommissioning.

Over the years the Air Force in its rationalisation programme has concentrated all the AMXs on the Istrana base, and in July 2014 the 101st OCU Group was also transferred from Amendola to the Istrana base which operated with three flight groups of AMX (the 103rd, the 101st and the 132nd); this until 2016, when the 103rd Group and the 101st Group OCU were placed in the "Quadro" position (deactivated).





The aircraft, thanks to its effectiveness and reliability, combined with the great autonomy which allows long stays on targets both day and night, developed 6 thousand hours of flight during the entire duration of the operations with the coverage of approximately 17 thousand points of interest by providing valuable intelligence products with its reconnaissance system which have been added to those collected since 2014 by the other components of the Air Force deployed in Kuwait under the Italian National Contingent Command AIR (IT NCC Air) Task Force Kuwait .

The use in Afghanistan deserves special mention, where on 7 November 2009, four AMXs deployed in Herat replaced the same number of Tornados based

Moving on to the main operational scenarios in which it was the protagonist, the AMX was used in a limited manner in the Balkans, in Operation Deliberate Force in 1995 (not yet in the ACOL version), and in Bosnia and Kosovo in 1999. Subsequently, the aircraft participated in Unified Protector in Libya, with the Air Task Group “Birgi” established on the airport grounds of the 37th Wing of Trapani, with flight, technical, specialist and maintenance personnel, totaling a total of over 500 hours of flight and a few hundred missions, with excellent results in all respects.

For the mission in Kuwait, “Inerent Resolve” and “Prima Parthica”, in June 2016 the AMXs of the “Task Group Black Cats” replaced the Tornados of the “Devil” Task Group of the 6th Wing and operated in surveillance and of aerial reconnaissance.

The “Task Group Black Cats” was reconstituted on the basis of Al Jaber in June 2016, and operated in close synergy with the other coalition structures; the effectiveness of this asset, equipped with the RecceLite reconnaissance pod equipped with electro-optical and infrared sensors, provided a decisive contribution to the operations.



in Mazar and Sharif as part of the ISAF (International Security Assistance Force) mission. The initial task was tactical reconnaissance and support for ground troops limited to the sole use of the 20 mm cannon, a rule of engagement which was then gradually modified.

The use of the cannon was a possibility to be seen in the context of self-defence, therefore immediate air support if troops on the ground had had problems and had been subjected to enemy fire, the so-called TIC (Troops In Contact). Shortly afterwards, on government mandate, the green light was given to the use of the bomb attack capability, even if this remained limited by all NATO assets. The result was that the missions in which armament was dropped within the ISAF operation were numerically very few; most of the missions were in direct support of the ground troops with the possibility of dropping armament if the need was identified. In reality, we generally limited ourselves to making ourselves “heard” for the purpose of deterrence, and to give immediate feedback on the ground of what was happening. In technical terms, this behavior is called “Escalation”: not going directly from nothing to the release of armament, but following some steps to verify whether the counterparty, simply in the presence of the planes, desists from the disturbance action. One thing that is always noticed in this type of asymmetric theater is that the use of the fighter aircraft has an excellent deterrent effect; in the vast majority of cases the mere presence or even the mere threat of air intervention is enough to dissuade a poorly organised ground force which knows well that from the moment fire is opened on a patrol or on a ground unit, in a few minutes an airplane arrives on the scene which then never “gives up” them, in the sense that it can follow the attackers, can see where they are going, can continue to monitor them while also coordinating the intervention of troops on the ground. The result is that attackers try to end an action as quickly as possible or even give up on starting it and this already represents the achievement of an important objective.



In this Operational Theater the AMX proved to be excellent from all points of view, despite the context in which it operated (silica sand, extreme weather conditions) it achieved great successes with cost/effectiveness at the highest levels. It was only during 2012 that the Air Force AMXs deployed in Afghanistan received authorisation to attack military targets, specialising in the destruction of communications antennas installed by the Taliban, with the use of intelligent laser-guided bombs of the GBU16 and Lizard.

There are three areas that made the AMX a perfectly suitable airplane for this type of mission, the first is precisely the ease with which the AMX could be supported even outside the area, therefore a low cost due to the modest logistical support needed by the airplane both in terms of material and men.

The second area is the robustness of the aircraft; in Herat the temperatures fluctuated throughout the year from +50 to -20° and the AMX never stopped maintaining a very high efficiency, close to 100%; no sorties were missed for reasons related to the efficiency of the airplane, sorties were canceled because the weather conditions did not allow flying or did not allow the possibility of carrying out the mission, or because it was no longer necessary to carry out the mission, but not due to machine efficiency problems.

The third area is what the AMX was able to do, in this Afghan scenario where you need to have as much persistence as possible, as much maneuverability as possible, agility, transmit information to the ground in real time, be able to change the mission from reconnaissance to bombing and vice versa easily, even when the airplane is already in the air, therefore being “retasked” as they say in the technical term. The AMX did this whole series of things in what I would call a “normal” way to trivialise, day after day, confirming the aircraft’s compliance with this type of scenario. It should be underlined the ability of the AMX to respond to different tasks in such an efficient and effective manner with leaps in quality that are far superior to the investment made on the machine, with a notable return, well above expectations, which would deserve recognition for those who designed it and for the crews and technical personnel of the Air Force who used it.

The AMX was not created to have targeting and reconnaissance pods and the update work was done in later



periods, with the various pieces integrated at different times and not with an initial design. In this context, the ability of an AMX pilot to manage a complex mission that could include both reconnaissance and armed intervention during the same mission with two inflight refuelings, six hours of mission, retasking and here I firm although I could continue, with a standardisation I would say at the top of the line.

The last AMXs returned to Italy on 20 June 2014, reaching almost 10,000 flight hours and over 3,000 supported missions and it is the first time that an Air Force line has reached this volume of hours and missions carrying out its task with precision and respect for the rules of engagement, reaching over 7,500 objectives assigned in attack and reconnaissance missions without any collateral damage. The AMX aircraft has proven to be an important asset for the Armed Forces and has taken part in the main training campaigns. Among these, the “Red Flag” in 2003 and the “Green Flag” and the “Red Flag” in Nellis in 2009, the latter flown with the ACOL version and “Night and Day” missions.

After 35 years this plane leaves us, we will no longer see our “TOPONE” sailing the skies and we are sure that we will miss it. ➡

Bye Bye “Topone”.

Text: Gian Carlo Vecchi

Images: Gian Carlo Vecchi/Pier Paolo Lazzarin



Nordic Response 2024



In March 2024, the Nordic Response exercise was held in nordic Europe. Nordic Response 2024 is one of the exercises that are part of the larger NATO Steadfast Defender exercise, which focuses on the NATO Article-5 situation. In an Article-5 situation, one of the NATO countries is under attack and other NATO countries help the attacked NATO country.

For Nordic Response, Norway is the lead nation with the nordic areas of Norway, Sweden and Finland as the exercise area. Since the Russian invasion of Ukraine, NATO has been extended with Finland in 2023 and Sweden in 2024 as full members. During the last two decades, both countries started to train together with NATO countries in the Partnership for Peace (PfP) programme, adjusting policies, procedures and planning. One of the larger exercises where the Swedish and Finnish air forces participated were the Dutch Air Force led 'Frisian Flag' exercises at Leeuwarden AB.

Over 20,000 soldiers from 13 allied nations took part in the exercise. Of these, approximately 10,000 exercised on land and were the most visible during the exercise. The participating nations were: Belgium, Canada, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the USA. The exercise had its focal point in northern Norway, Sweden and Finland – as well as in the corresponding airspace and sea areas. There was particularly high activity at sea with over 50 submarines, frigates, corvettes, aircraft carriers, and various amphibious vessels.

In the air, more than 100 fighter jets, transport aircraft, maritime surveillance aircraft, as well as allied CH43 Super Stallion, Merlin, Cobra and Osprey participated. On the ground, thousands of soldiers trained on defending and protecting Nordic territory with various artillery systems, tanks, tracked vehicles and other land vehicles.

The main part of the Nordic Response exercise activities took place in the northern Nordic region from 3–14 March 2024, with some preliminary actions that started in the weeks before. At Bodo AB in northern Norway (ICAO: ENBO), a temporary Joint Nordic Air Operations Centre was established, named Camp Bodin. In Camp Bodin, more than 100 flights per day were planned and coordinated.



While the daily exercise flights were controlled via the Air Force's Control and Reporting Center in Sørreisa (inside the Norwegian mountain Høggumpen).

Participants

Next to the Norwegian Air Force, many foreign aviation assets were deployed during the exercise.

US Marines: F/A-18 based at Andoya AB (NO), F-35B based at Evenes AB (NO), KC-130 based at Andoya AB (NO).

Sweden: JAS Gripen based at Bardufoss (NO).

NATO: E-3A based at Rygge AB (NO).

Finland: F/A-18s based at Andoya (NO) and Kallax (SE), instead of Rovaniemi AB due to runway issues.

United Kingdom: F-35B based onboard aircraft carrier HMS Prince of Wales.

Germany: A400m at Rovaniemi AB (FI).

Tanker support was flown with various USAF(E) tankers from Norway and the United Kingdom. And with British A330 Voyagers and NATO's Multinational MRTT Unit A330 MRTTs.

Finland

On 7 March 2024, a media-morning was held at Rovaniemi AB (ICAO: EFRO). For Finland, it was the very first time the country participated as an official NATO partner in an NATO Article-5 exercise. Some 4000 Finnish soldiers participated in this exercise. Finnish Air Force Commander Major-General Juha-Pekka Keranen gave a short presentation at Rovaniemi AB, where he expressed his pride about this first participation as a full NATO exercise. A lot of standardisation with NATO procedures and communication has been achieved during



the years for the Finnish Air Force. And with the arrival of the Lockheed Martin F-35 in a few years, the Finnish Air Force will make an upgrade to the 5th Generation fighters. Rovaniemi AB will be the first airbase to receive the F-35s.

Later the Finnish Air Chief visited the German A400M at Rovaniemi AB, while sitting in the cockpit, he got an explanation from the German pilot.

The commander of the Lapland Airwing, Colonel Saku Joukas (callsign SHAKE), explained why there were no KC-135s and F/A-18s based at Rovaniemi. Due to the



unexpected high temperatures, thaw had set in earlier than expected and the top layer of the runway started to deteriorate. And to protect the participating aircraft, the Finnish F/A-18s were transferred just before the exercise to nearby Luleå/Kallax airbase in Sweden (ICAO: ESPA), with the help of the German Airbus A400M based at Rovaniemi AB.

Two Maine Air National Guard Boeing KC-135s of the 101 Air Refueling Wing were also scheduled to fly from Rovaniemi AB, but these tankers were redeployed





to RAF Mildenhall in the United Kingdom, due to the runway problems. Colonel Joukas explained that the Finnish F/A-18s were flying both air-air and air-ground missions during the exercise. And it depends on the Air Tasking Order (ATO), which defines the mission and the configuration of the aircraft.

German participation

The German military command has Quadriga 2024 as their main exercise this year. It consists of various sub-exercises of which Quadriga Grand North would deploy a German Air Force (Luftwaffe) Airbus A400M to Rovaniemi Air Base to support the Nordic Response



exercise. The main task for the A400 detachment was to train in arctic situations, during winter it can become -20 to -30 in northern Finland. One of the tasks of the A400M of Lufttransport Geschwader 62 (Air Transport Wing 62) based at Wunstorf AB (ICAO:ETNW), was to drop various Special Forces (SOF) and their equipment in the Arctic environment, these SOF para droppings started two weeks before the official start of the Nordic Response exercise. In order for the SOF soldiers to take their positions and to perform reconnaissance missions. Also low level flights and night flights were performed during the exercise. 14 missions were flown during the Nordic Response exercise, which ended for the Germans on 8 March.

The German detachment was extended with a German Security Forces detachment of the German Air Mobile Protection Team 'Friesland', located at Schortens. This detachment had the task to protect the A400 and its crew, during the media day the protection forces were fully dressed and armed around the A400M on the platform.



Rovaniemi AB visitors

At Rovaniemi AB, the planned media flight in a 101st Air National Guard KC-135 was cancelled because the KC-135s were redeployed to RAF Mildenhall due to runway problems. And as also the Finnish F/A-18s were redeployed to Swedish and Norwegian airbases, there were not many flying activities. During the media-day, there were some activities. Some local Finnish F/A-18s flew missions, a Swedish Sikorsky UH-60M BlackHawk and a USAF Lockheed Martin MC-130J Commando II came in for a fuelstop. During the afternoon, the German A400 took off followed by a low-pass.

Major General Juha-Pekka Keranen

Major General Juha-Pekka Keranen was born in 1968 and he joined the Finnish Air Force as conscript in 1987. He flew the BAE Hawk, MiG-21BIS and the F/A-18; and after many roles in the Finnish Aircraft he became commander of the Finnish Air Force in 2022. He is still an active F/A-18 pilot and during the Finnish road-exercise 'HANKI' (end

of February 2024), he flew an F/A-18D with his Dutch colleague Lieutenant-General André Steur (commander of the Dutch Air Force) in the backseat. ➡

Text by: Alex van Noye & Joris van Boven

Photos: Joris van Boven



Força Aérea Portuguesa/ Portuguese Air Force – Part 2



Base Aérea No. 11 – Beja

Base Aérea de Beja officially designated as Base Aérea No. 11 (BA11) was established on 21 October 1964 and it occupies an area of approximately 800 hectares and was originally built to serve as a training facility for the German Air Force due to airspace limitations within West-Germany. The German Air Force operated from Beja until 1993 and it was used particularly for weapons training. In 1987 the FAP relocated 103 squadron, flying the Lockheed T-33 and Northrop T-38, from Montijo to Beja. Between 1993 and 2018 the Portuguese Air Force has operated the Dassault/Dornier Alpha Jet which were donated by Germany as compensation for leaving the air base in 1993. Construction of a civilian terminal was undertaken in 2009, with this facility being aimed at low-cost carriers. Beja's runway is the only mainland Portugal runway capable of accommodating an Airbus A-380. Now the base is modern and well equipped and one of the most important training facilities of the Portuguese Air Force.

Colonel Carlos Lourenco, Base Commander stated, "I obtained a military pilot-aviator certificate in 1994 being selected to take the Complementary Piloting Combat Course which was concluded in 1995 and got assigned to Esq201



"Falcões" as a F-16 pilot. In August 2005, I was assigned to Esq301 "Jaguares", operating the F-16M aircraft, where I served as Operations Officer and Squadron Commander until June 2010, having made around 3.000 flight hours on the F-16. In June 2010, I was placed in the Air Command as Head of the Exercises Division until 2016. In 2016, I was posted in the Deployable Air Command and Control Center (DACCC), in Poggio Renatico, Italy, where I served as Combat Operations Division Head until 2019. In 2019,

I was reassigned to Air Command as Chief of Staff and in 2021 I became Base Commander of Base Aérea No. 11 Beja. Currently I'm not flying because Base Commander is a full-time job and I want to do it properly".

He further continued, "Since 2010 the Portuguese Air Force has gone throughout a well-chosen path of organising events and exercises with dimension and complexity. This was driven by the operational capacities, but also by the logistical knowhow and some geographical aspect, being the available airspace and metrological conditions. However, the human factor who drives this all is the most important, the attitude, the motivation and commitment of our personnel is exceptional and it's this, combined with our cultural hospitality, who determines the success and outcome of these events. That's why a lot of exercises have been and will be held here at Beja, like Real Thaw, Hot Blade and European Tactical Airlift Programme – Training (Etap–T). It takes a lot of work to run these exercises. The Portuguese Air Force strives to deliver an operational product/event of excellence, so the flying units can obtain new knowledge, experiences and skills in a safe and sound manner. In this context, we want to promote the image of Portugal as a security producer in the international scene and to be recognised for the capacity, quality and knowhow in organising this type of exercises. We can and are ready to make the difference and set up an European Red Flag exercise in Beja".

Esq101 – Roncos (Roars)

Captain João Teixeira, Operations Officer staed, "New student pilots start their flight training at Sintra air base and when they've completed the academic part of their

training and perform around 40 hours on the DHC–1 Chipmunk, they are ready to start Phase 2 here at Esq101 on the Aerospatiale TB–30 Epsilon. The TB–30 is a basic training aircraft, fully aerobatic, tandem–seat single engine with a two–blade propellor. The TB–30s are in service since 1989 when eighteen aircraft were delivered to the Portuguese Air Force. Between heavy overhauls and small maintenance procedures, we keep fourteen TB–30s available. The TB–30s are undergoing a small avionics upgrade with the MVP–50 and, therefore, will gain glass cockpits and new sensors for the engine instrumentation. While a dedicated group is working on a Mid Life Update (MLU) to extend their service life to 2030, there is also undergoing work being done to plan the retirement and replace the TB30 in the near future".

He further stated, "Regarding the training syllabus, the course lasts around ten months and it's divided in three distinct phases: Elementary, Fundamental and Mission. The students start the Elementary phase in the classroom for approximately one month and when they pass their exams they start the simulator missions. We have two operational flight training simulators which have a 180–degree field of view. On these devices, the instructor pilot has a console to manage and follow the flight but is also able to interact with the student, prompting him with different weather conditions or an inflight emergency. In addition to the simulators, we are currently studying the implementation of a new training device, which incorporates virtual reality glasses into the simulation. Around 40% of the course is executed in the simulator, and the implementation of a solid and robust pre–flight phase, with heavy simulator dependency, allows us to work earlier





on particular student difficulties, enabling them to go on their first solo flight much earlier on their training timeline. On the Fundamental Phase, there are three elements: Transition, Navigation on Visual Flight Rules (VFR) and on Instrument Flight Rules (IFR) and Formation. The course totals approximately 110 flight hours and 60 hours on the simulator and at this moment we have thirteen students and ten instructor pilots. When the student successfully completes the Phase 2 Flight Training, they receive their wings, and they will proceed on their follow-on-training on to fighters, transport airplanes or helicopters, on to a squadron within the Portuguese Air Force. That decision is based on students' final classification, individual skills and overall airmanship."

Esq552 – Zangões (Bumblebees)

Captain Luís Dias, Tactical Planning Officer stated, "The Portuguese Air Force was flying the Sud Aviation Alouette IIIs for many years and were searching for years for a replacement. In December 2017 the Portuguese Ministry of Defence announced the procurement of five Augusta Westland AW-119Kx Koalas for Esquadra 552 with an option for another two. The AW-119s were delivered between February 2019 and September 2020. At the end of 2019 the squadron was fully operational with

the first helicopters and the Alouette IIIs were withdrawn from use in June 2020 after almost 60 years of service. The AW-119 is a single-engine helicopter with a top speed of 280 kph which makes it one of the fastest single-engine helicopter. It has a glass cockpit which integrates virtually all avionics in easy view enhancing situational awareness, fully compatible with night-vision goggles (NVG), five communication radios which covers almost all frequencies, a searchlight, a rescue hoist which can hoist up to 204 kilogrammes and a removable emergency flotation system. The AW-119 has the ability to have a Bambi Bucket filled with 900 liters of water as underslung and carry a team up to 6 firefighters. It can also place tactical guns in both doors or attach fast rope and rappel gear for troops. Normally the AW-119 is flown by one pilot and one systems operator and is able to transport six or four fully equipped persons. It's also possible to transport a person on a stretcher and four persons".

Continuing the conversation he stated, "In 2018 the first two Instructor pilots started their ten-week type course and four groundcrew started their five-month course in the United States of America. When they successfully completed their course and the first AW-119s were delivered they were tasked with converting the rest of the squadron with the help of Leonardo which gave training for the remaining groundcrew. In the summer of 2019 we started with firefighting command and reconnaissance duties. In Portugal firefighting has been done by civilian companies with help from Greece, Italy and Spain while the AW-119 is monitoring the airspace and is telling which aircraft or helicopter needs to go where. A new squadron will be set up especially for firefighting and six UH-60 Blackhawk helicopters have been bought with the delivery of the first two helicopters scheduled at the end of 2023. Then we have the equipment and knowledge but no experience while firefighting is becoming more intense".

"At this moment we have five helicopters which is too less because one or two should be on maintenance, in order to regenerate flight potential and at least one should be used for maintaining the pilot's qualifications. From May till October one or two are detached in central and one is permanently detached in north Portugal for Search and Rescue (SAR) missions. We would like to participate in many exercises to get more experience but at this moment it is difficult. We've participated in the Tactical Leadership Programme (TLP) for experiencing the Combat Search and Rescue (CSAR) theoretical and hopefully also practical in the future. We participate in exercises like Real Thaw and Hot Blade because they are being held here at Beja. Luckily the option for another two helicopters has been approved and they will be delivered in October 2023 which gives us more space to enhance our tasks".

Esq601 – Lobos (Wolves)

Navigator Lieutenant Luís Xarepe stated, "The 601SQN was officially formed in March 1986, with the acquisition of six former-Royal Australian Air Force





P-3B Orion aircraft by Portugal. In August 1988, the first P-3P was delivered at Air Base No. 6 (Portuguese: Base Aérea Nº 6, BA6), at Montijo, Portugal, where the squadron was based. In 2004 we realised that the onboard equipment of the P-3s no longer met the needs of the Portuguese Air Force due to new and more modern threats so the Government started a programme to substitute the ageing P-3Ps. The Dutch Government were offering their P-3Cs to the German Navy and we purchased five P-3Cs with the expectation that all five have been modernised to the Capability Upkeep Programme Plus (CUP+). Two were already modernised and the other three were modernised by Lockheed Martin between 2007 and 2012. The CUP+ variant includes modern avionics and software. The Alverca-based company OGMA is responsible for modification and deep maintenance of the P-3s. The smaller maintenance is being done here at Beja itself. In 2008 the squadron moved from Montijo to Beja Air Force base”.

Continuing the conversation, “In total the squadron has performed more than 38.000 flight hours, 25.000 flight hours in the P-3P and 13.000 flight hours in the P-3C CUP+. The squadron performs Search and Rescue (SAR), Intelligence Surveillance and Reconnaissance (ISR), Maritime Patrol and Anti-submarine warfare missions. For the SAR operations we have a Quick Reaction Alert (QRA) which means we have one aircraft and one crew available around the clock all year. A crew consist of two pilots, one engineer and ten crew stations, each with a

separate task like pilot, co-pilot, flight engineer, tactical coordinator, navigator for three sensor stations, ordnance operator and the in-flight technician. The missions we’re flying can last around 9 hours and a few of the main missions are sea pollution, illegal migration, transportation of illegal substances and monitoring military activities. During the summer months we’re also responsible for the early detection of forest fires to start up the fire-fighting. We also take part in border management missions like EU Frontex, NATO Baltic Assurance Measures (BAM) and the Mediterranean Sea Guardian”.

“The P-3C CUP+ is a diverse aircraft built with 18 armament stations, eight in the bomb bay and five stations in each wing. Depending on the mission the aircraft can be loaded with up to four AGM-65 Maverick air to ground missiles, up to six AGM-84 Harpoon anti-ship missiles, up to eight Mark 46 Torpedoes, Mark 82 general purpose bombs and Mark 62 quick strike mines. The sonobuoys system can store 36 sonar devices, with three pressurised chutes and one free-fall chute inside and 48 unpressurised chutes from the outside, so in total 84 various sonobuoys can be loaded”.

Esq506 – Rinocerontes (Rhinos)

Major Miguel Pousa, Squadron Commander stated, “In 2019 the Portuguese Government ordered five Embraer C-390 and one simulator. The C-390 fill all the requirements we need to comply our mission and the other competitors did not fill the requirements that we



expect and also the technology is incomparable when we compare it with the C-390. The first KC-390 arrived here at Beja Air Force base in October 2022 for its presentation and then returned to Brazil. In March 2023 the KC-390 arrived back at Beja to do some “NATO certifications” and in July 2023 it returned again to Brazil to finish all types of certifications that a new aircraft needs prior to delivery. The delivery of the first KC-390 to the Portuguese Air Force is set for October 2023. We expect the second aircraft to arrive in March 2024 and the simulator in December 2024. In November 2021 the first crew successfully completed their qualification course at Base Aérea de Anápolis, Brazil. At the moment we have five pilots and six loadmasters

who are finishing their qualification courses. We’ll be the first European squadron and the second country in the world to operate the Embraer C-390. Our tasks will be air transport, fire-fighting and aerial refueling. As you can see all our squadron buildings are brand new and will contain multiple offices, briefing rooms, preparation rooms as well as all other needed squadron facilities. In this building we also have the simulator, a Rheinmetall Defense Electronics simulator which comprises of three types of simulation: cockpit procedures, full flight motion and cargo hold station for the training of our loadmasters. Still a lot of work have to been done but we are looking forward to operate the C-390 within the Portuguese Air Force”.

Base Aérea No. 6 – Montijo

Base Aérea de Montijo was established in 1952 as the Scadura Cabral Naval Aviation Centre and was officially re-designated as Base Aérea No. 6 (BA6) on 3 March 1953. The Naval Aviation units known as ForçasAeronavals continued to operate from BA6. In early 1957 the integration of the units of Portuguese Air Force at BA6 was complete. In 2018 it was announced that BA6 would also become a civil airport, serving Lisbon, for low-cost carriers by 2022 but at the moment nothing is happening at BA6.

Base Commander Colonel Diná Azevedo stated, “I joined the Air Force Academy (AFA) in 1990, and after 4 years I started my pilot training on the Epsilon TB-30 aircraft. On my first operational assignment I flew the



Casa C-212 Aviocar transport aircraft for several years. From 2000 until 2002 I was appointed as Flight Instructor at the AFA. In 2002 I was stationed at Geilenkirchen, Germany for 3.5 years flying the NATO Boeing E-3A Sentry (AWACS), logged 1,200 flying hours as Pilot, Pilot in Command, Instructor Pilot and Pilot Evaluator (the first NATO European woman to become an evaluator in this aircraft”).

“The Portuguese Air Force decided to replace the Casa C-212 Aviocar by the C-295M and in 2007. At that time, I was qualified as Pilot in Command of the new C-295M, a transport and surveillance aircraft. Between 2007 and 2010, I was stationed at Seville, Spain, being the Portuguese Air Force pilot responsible for the flight testing and approval of this aircraft by the Air Force. From 2012 till 2014 I was 502 Squadron Commander here at Montijo, and afterwards I joined the Staff Headquarters in Lisbon as chief transport and helicopter adviser. From 2016 till 2022 I served as military advisor to the President of the Portuguese Republic and in October that year I became Montijo Air Force Base Commander, of which I’m very proud, leading more than 650 people and 32 aircraft”.

Esq751 – Pumas (Pumas)

Captain André Maia, Co-pilot stated, “In the 1960s Portugal was involved in wars in Africa and there was a need for a larger helicopter to transport troops and infantry and the Portuguese Air Force decided to buy twelve SA-330 Puma Helicopters. After the wars ended the Puma Helicopters were mainly used for Search and



Rescue (SAR) on the mainland and also at the Azores and Madeira. In 1999 a replacement programme for the SA-330s started and it took till 2003 when the contract for twelve EH101 Merlins was signed. The first delivery was in the beginning of 2005 and the last one was delivered at the end of 2006. Due to major maintenance issues the squadron had very low availability on the Merlin and the Puma’s were brought back in service again! It took till 2010 before the Merlins could take over all the tasks and the Puma’s were withdrawn from use after 40 years of active service with over 70,000 flight hours”.

“The Merlin has a clean weight of 9,600 kilogrammes and a maximum take-off weight of 15,600 kilogrammes.



We have three variants of the EH101 Merlin, six have the standard configuration (Mk514) and are mostly used for Search and Rescue (SAR) and troop transportation, two are for fisheries surveillance and enforcement (Mk515) and four are for Combat Search and Rescue (CSAR) (Mk516). The Mk514 and Mk516 have the availability of carrying an extra fuel tank to add 1,100 liters of fuel for longer missions. It's also able to transport 25 troops fully equipped, but the more persons and or cargo less range the helicopter has. When we fly a SAR mission the crew exists of five people, two pilots, one system operator, one rescue swimmer and one flight nurse. We have the rescue litter and basket with us. The winch can carry a maximum weight of 272 kilogrammes and we have two stretchers inside the helicopter which we can expand to a maximum capability of 16 stretchers. This helicopter has emergency floatation systems but due to the weight on top (engines and main gearbox) it's possible that it can capsize and for that we undergo the Helicopter Underwater Escape Training (HUET). It's also equipped with a Forward Looking InfraRed (FLIR) device including colour image and a capable Galileo radar. The Mk515 is fitted with a console for the surveillance operator to control illegal fishery and due to that it is unable to carry the extra fuel tank and has the shortest range of the three variants. The Mk516 is the tactical variant and equipped with an electronic warfare self-protection suite. It also has a foldable main rotor and tail to be stowed on warships. One Merlin is 24/7 on alert in Montijo airbase so we can act fast if we're needed. We also have two SAR deployments, two Merlins are based at Lajes, Azores and one Merlin is based at Porto Santo, Madeira, both deployments also perform medical evacuations. The crews of those detachments are changed every two weeks. All the maintenance of the helicopters is been done here at Montijo in a shared effort between squadron mechanics and employees of OGMA. When the helicopters which are detached at the Azores or Madeira islands needs maintenance we switch the helicopters but to Madeira it's four hours and to Lajes it's five hours flying. At the moment Esq752 will be re-activated at Lajes, Azores, which was de-activated when the Puma's were withdrawn".

Esq502 – Elefantes (Elephants)

Captain Dionísio Matias stated, "In the past our squadron was based at Base Aerea No. 1 Sintra with the Casa 212 but in 2009, with the arrival of the first Casa 295s, the squadron was moved to here, Base Aerea No. 6 Montijo. We have a total of twelve Casa 295Ms in four variants; tactical transport, maritime patrol, medical evacuation and Search and Rescue (SAR). All the Casa 295Ms are based here but we have detachments at Montijo, Lajes (Azores) and Porto Santo (Madeira). Each has one aircraft on a 24/7 duty for Search and Rescue (SAR), Medical Evacuation or donor transport. Other tasks of the squadron are Intelligence, Surveillance and Reconnaissance (ISR), transporting paratroops and air cargo. We can carry up to 48 paratroopers fully equipped and up to 69 soldiers not fully equipped. The Casa 295M can also carry out the same missions of the C-130s and burns less fuel and has a shorter crew making it a lot cheaper to operate than the C-130".

"At this moment one Casa 295M Maritime Patrol aircraft is at Malaga, Spain for Frontex which is the European Union's border control agency and we are monitoring the flow of illegal migration and smuggling from Africa to Europe. In the past we participated multiple times in Frontex but also in the United Nations (UN) Multidimensional Integrated Stabilization Mission (MINUSMA) in Mali. We also participate in the European Tactical Airlift Programme – Training (ETAP-T) course to work with other countries and learn from them to increase our knowledge. For the maintenance the A and B checks are done here at Montijo but the C checks are being done by Airbus Defence and Space, Spain. We still don't know when but probably the Casa 295s will get an Mid-Life Update (MLU) by Airbus Defence and Space, Spain in the future. It is great to work with the Casa 295 so we are very happy with it and it is a perfect aircraft for the Portuguese Air Force because it's very versatile".

Esq501 – Bisontes (Bisons)

Lieutenant Eurialo Viana stated, "The C-130 entered service in 1977 and a total of six aircraft were delivered to the Portuguese Air Force until 1991. Unfortunately, one of these aircraft was lost, and another is currently non-operational, resulting in a fleet of four currently active C-130s. Out of these, two are currently undergoing modernisation at OGMA, Alverca. These enhancements are designed to extend their serviceability until 2028, at which point the C-130H is anticipated to be phased out.

This modernisation, encompasses structural changes and a significant modification to the aircraft's avionics systems, integrating a highly substantial set of new equipment, navigation systems, and communication systems. In preparation for the future, the Portuguese Air Force has made an investment in the KC-390, which is scheduled to join the Air Force in the upcoming years as a replacement for the C-130H. The transition to the new platform is already underway, with some crews undergoing training and conversion. The 501 Squadron has been doing a variety of different operations, missions and treaties around the globe, including search and rescue, tactical airlift, humanitarian aid, and special transport like Open Skies, Desert Storm, Provide Comfort, Blue Beam, Operation Turquoise, IFOR, SFOR, KFOR, UNTAET, ISAF, EUFOR BiH, UNHCR, UN WFP Lebanon, EUFOR Congo, EUFOR Chad, ISAF/ESAF, Haiti and multiple times MINUSMA. We also took part in Tactical Airlift exercises like Volant Rodeo, Advanced Airlift Tactics Training Course (AATTC), Polygone, NATO Tiger Meet, Hot Blade, ETAP-C, ETAP-T, Lusitano and Loyal Arrow and also in Search and Rescue exercise like ASAREX. In the past we've been detached to Zaire, Rwanda, Australia (East Timor), Mozambique, Afghanistan, Gabon (Congo), Chad, Mali and Pakistan. As the primary transport asset of the Portuguese Air Force, the 501 Squadron remains prepared to respond to a wide array of challenges, reaffirming its motto: "Anytime, Anywhere".

Article and photos: Lowpass Aviation – Rene Sleepers and Bram Marijnissen

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Iniochos 2024



The Mirage 2000 is still going strong in the Hellenic Air Force. With more and more Rafales getting delivered their retirement is getting closer.

Exercise Iniochos is an annual medium scale exercise in the form of an Invitation Exercise (INVITEX), with invitations being sent to other air forces asking if they want to participate in the event. The exercise takes place each year in spring, using the facilities of the Air Tactics Center at Andravida Air Base, located in the Northwest Peloponnese. The duration of the exercise is 15 calendar days and operations make use of the majority of Athinai Flight Information Region (FIR), covering Greek national air space plus some areas of international air space. The exercise scenario adopts a Single Base Concept (execution of operations from a single Air Base), with the participation of all branches of the Armed Forces in Greece. With the current situation in the region, this concept has been adjusted as some participants did not fly their missions directly from Andravida Air Base.

The Iniochos exercise was first conducted in the late 1980s, as a small scale tactical level exercise, tailored to the contemporary necessity for training in combined air operations. Over the years that followed, the success of the exercise led to the decision on establishing it as an annual event. The exercise objective was to train personnel in planning and execution of Combined Air Operations (COMAO) in accordance with the Hellenic Air Force (HAF) doctrine and national



Iniochos 2024 badge



A Qatari Rafale EQ lands back after a morning mission with three Romanian F-16AM's getting ready for the next mission.

plans in a realistic environment, in order to test and evaluate operational plans and tactics. For the execution and conduction of the exercise, the Hellenic Fighter Weapons School was deployed to Larissa Air Base, so as to form the White Cell in the facilities of the National Center for Air Operations.

The White Cell was responsible for the optimal coordination and planning of the operations, while participating aircraft were also deployed to Larissa Air Base, at 110CW, from where they launched for their missions.

In 2005, the exercise was decentralised, thus the participating aircraft were operating from their home bases, while the White Cell started to execute their planning and coordination activities from the Air Tactics Centre and the Fighter Weapons School facilities, in Andravida Air Force Base, implementing newly acquired means of Command and Control. In November 2013, the decision was made to adopt a Single Base Concept, upgrading the exercise scale to medium and expanding the spectrum of operations with the objective to create a more realistic and demanding environment, with an intensive and prolonged 24/7 battle rhythm, significantly increasing the level of training.

In April 2015, the exercise was held for the first time in the form of INVITEX, with the participation of the Israeli

Defence Force and the United States Air Force Europe Special Forces (USAFE SOF) as Joint Terminal Attack Controller (JTAC).

Exercise Objectives

While running for almost 10 years in its current form the exercise has been developed further and with all the experience gained it has become one of the more diverse exercises in the region. The main objectives of the exercise are:

Provide realistic training, which is achieved by creating a realistic battle environment:

Iniochos provides participating personnel with the exposure to an intensive battle rhythm with realistic attrition rates, as well as challenging scenarios which include multiple modern threats and real time live injects. The exercise is tailored to produce the fog of war and the friction effect, which is expected to dominate the modern battlefield and test both the physical and psychological endurance of the modern fighter.

Accurate Shot/Event Assessment: This is achieved with the use of onboard and off board tracking data, sensors and specialised debriefing software, which is leveraged for the reconstruction of the mission by experienced Fighter Weapons School instructors, who oversee the debriefing process.



A Romanian Air Force F-16AM seen during a low level flying mission as part of the missions during Iniochos.



A Souda based F-16V from 343 Mira takes off during the morning mission. This was one of 20 F-16's participating during the exercise.



A total of 16 Rafales from three nations participated in this years Iniochos. This French Navy Rafale M takes off from Andravida.

Running for two weeks, the exercise is divided into four phases: Phase 1: Preparation; Phase 2: Force Transfer; Phase 3: Operation and Phase 4: Folding/Wrap up.

Tactical Command of the participating air forces is assumed by the Chief of the Hellenic Tactical Air Force (HTAF) and it is exercised through a cell established at

the Air Tactics Centre (ATC) specifically for the exercise. Tactical Control during the exercise is being delegated to the ATC Commander.

Missions

In order to achieve the objectives of the exercise, the



Hellenic Fighter Weapons School (HFWS) oversees the missions from scenario planning to debriefing and makes certain that they cover the full spectrum of missions currently performed by the HAF.

These missions include: Air operations versus Integrated Air Defense System (IADS), Offensive Counter Air / Airfield Attack, Air Interdiction / Special Targets (bridges, power stations, vehicles, etc), Anti-Surface Warfare, Slow Mover Protection (SLOMO), Combat Search and Rescue (CSAR), Dynamic Targeting (DT) / Strike Coordination and Reconnaissance (SCAR) / Close Air Support (CAS)/ Time Sensitive Targets (TST) and High Value Airborne Asset (HVAA) Protect/Attack.

Iniochos is a true international exercise with units from Europe, the Middle East and the United States working side by side.



One of the older F-16C's, this block 30 from Mira 330 based at Nea Anchialos was one of 20 F-16's that participated during Iniochos 24.



Qatar participated for the first time at Iniochos. Their four Rafale EQ's and one DQ added more weight to the exercise.



Ala 46 FA-18A flying through the Vouraikos Canyon in the North of Peloponnese.



Based at Andravida, four F-4E AUP's of 338 MDV flew missions during Iniochos 2024.



The F-4E AUP is still going strong. Still a valuable asset for the Hellenic Air Force and a welcome participant during Iniochos.

Given the high level of knowledge and skills of the HAF personnel and their capability to conduct exercises, involving a variety of weapon systems within one of the largest exercise areas in Europe, the Iniochos exercise aspires to become the most competitive exercise in Europe and the Mediterranean region, and provide participants with a high level of training and unique experience of participation.

International cooperation

Since the first INVITEX in 2015, Iniochos has attracted participation from air forces outside of Europe like different United States Air Force units, the Indian Air Force, Israeli Defense Forces, the United Arab Emirates Air Force. Many countries inside Europe have also participated over the years and there is an increased interest from new armed forces that would like to participate.

The 2024 edition was held from 8 April and ran through to 18 April. The week leading up to the exercise saw familiarisation flights of the different participating aircraft, both foreign and domestic. This year's edition saw most participating aircraft operate from Andravida Air Base as in previous editions.

A total of nine foreign countries participated in this year's exercise providing aircraft and aircrew. This was



The Royal Saudi Air Force participated for the second time. Their Typhoons had their debut for this year's edition.

the largest number of foreign participating countries since the exercise was established as INVITEX. ➡

Text and photos: Erik Bruijns, Fred van Peursem, Lex de Kort and Gijs ten Velde

World Defense Show 2024

“The biggest in the region and aiming for more”

In February 2024, the World Defense Show (WDS) was held at Riyadh, Saudi Arabia. In 2022 a purpose built event location of some 800.000 m2 was constructed North of Riyadh especially for the first edition of the WDS, a trade show that is not only aiming to be the largest in the region but also one of the largest worldwide. It is organised by the Saudi General Authority for Military Industries (GAMI) under the patronage of King Salman bin Abdulaziz Al Saud. The second edition, held from 4–8 February 2024, was very successful, with EUR 6.3 billion worth of orders. It didn't take actual presence of aircraft to conclude deals obviously. For example, Saab had a scale model of the GlobalEye airborne early warning and control aircraft on show, and announced a deal worth EUR 175 million for in service support of the United Arab Emirates fleet. This fleet currently consists of three aircraft, with two more expected to be delivered later this year.

Some 106,000 visitors could see 773 exhibitors from 76 countries, ranging from small local companies to international heavyweights like British Aerospace and Boeing. The items on show ranged from aircraft and vehicles to guns and ammunition, from inflatable decoys to control room furniture and from boots and uniforms to submarines. Andrew Pearcey, Chief Executive Officer of the WDS, commented, “The 2024 edition of the World Defense Show has provided international exhibitors with access to Saudi Arabia's ever-growing defence and security market. I look forward to welcoming the global defence community back to Riyadh in 2026.”



During the five show days multiple live air and ground displays were held. Next to that there was a large static display of aircraft and vehicles, a part of which is seen here. It is dominated by the Airbus A.330 tanker and transport aircraft and A.400 Grizzly.



Unveiled on the second day of the show was this British Aerospace Hawk Mk.165 in the new Saudi Hawks colour scheme. This demonstration team is currently flying its last season with the Hawk Mk.65A, after the summer the type will be phased out and be replaced by the Mk.165. It is expected the team needs a year to do the conversion to the Mk.165, and will do their first display again in 2026. The new look is still very recognisable, in the green and white colours of the Saudi flag, but has some nice changes including the large Hawk silhouette on the side underneath the cockpit. Plan is to repaint 10 Hawks in total.



Flying a very impressive display almost daily was the Eurofighter Typhoon of the Royal Saudi Air Force (RSAF). This example is operated by 80 squadron, based at Taif/ King Fahd Air Base. Saudi Arabia ordered 72 Typhoons that were delivered between 2009 and 2017. A follow up order of up to 96 aircraft however never materialised because of an arms embargo imposed in 2018 by the German government, one of four countries that form the Eurofighter consortium (together with the UK, Italy and Spain). According to well informed British sources there was another factor that halted the follow on order, being the wish of the RSAF to wait for a Typhoon with the cutting edge ECRS Mk.2 Active Electronically Scanned Array (AESA) radar. After some delays this new radar was finally

implemented in a trials aircraft by BAe at Warton, UK last November, giving the aircraft more or less a 5th generation sensor. Together with the lifting of the arms embargo in January this could well open up the road for that long awaited follow up order.



The Royal Saudi Land Forces (RSLF) showed three of their helicopter types at the WDS, including this AH-64E Apache Guardian. This example is one of the first batch of the newly built Echo versions of which the Saudi Land Forces have ordered 34, and that are operated next to some dozen former AH-64As that have been upgraded to the AH-64D Longbow version. The other RSLF helicopters on show were a UH-60M Black Hawk and a brand new CH-47F Chinook. Of that last type 36 have been ordered, so far the first 6 have been delivered to the 3rd Aviation Group based at Tabuk. Also operated by the RSLF, but not present at the show, are the Schweizer 333 training helicopter and the Bell 406 Combat Scout, although unconfirmed reports say this last one has been retired after the delivery of the AH-64Es.



The Saudi national day is celebrated on 23 September, and since five years the RSAF contributes to the festivities with flypasts over the main cities. For this very year, some fighter aircraft are painted in a special livery. Four of the ones that did the flypasts a few months back were present in the static display, showing a beautiful all over green colour scheme with golden eagles on the nose, wings and

fuel tanks. They were a Eurofighter Typhoon, a Panavia Tornado IDS, a Boeing F-15C Eagle and this F-15S Strike Eagle leading the line-up.



As mentioned the Saudi Hawks will convert to the new Hawk mk.165 at the end of the 2024 season, as part of the 25th anniversary of the display team. But before then, they will do their last international performances with the 'old' Hawk at Air Power 2024 in Zeltweg, Austria and the famous Royal International Air Tattoo at RAF Fairford, UK.



Also very rarely appearing in public are the helicopters of the Saudi Arabian National Guard (SANG). Parked in between its larger brothers AH-64E Apache Guardian and UH-60M Black Hawk, that are also operated by the SANG, this Boeing AH-6i Little Bird stole the show. With an order of 36 the SANG was the light attack helicopter's launch customer in 2010. The 'Little Apache', as the helicopter is also called, can be armed with laser-guided Hellfire missiles, 70 mm guided or unguided rockets, 7.62mm Miniguns and/or GAU-19B Gatling machine guns.

Just like the Apache it has a digital cockpit and under the nose is an L3 Wescam MX-15Di electro-optical/infrared (EO/IR) turret, which can point Hellfires onto targets up to some 13 miles or 20 km away. Video can be down-linked from the MX-15 turret and the AH-6i can also receive video from other assets including UAVs, other helicopters or ground-based command stations.



Not what you expect, in the middle of the desert: a naval forces MH-60R Sea Hawk! But that's exactly what this is, one of 10 examples that the Royal Saudi Naval Forces acquired in 2018 and that are mainly used for anti-submarine warfare. If not deployed on one of the four multi-mission surface combatant (MMSC) ships of the Eastern Fleet, the MH-60s are based at Jubail/King Abdulaziz Naval Base. The Western Fleet is equipped with AS.332 Super Puma, AS.365 Dauphin and AS.565 Panther helicopters.



A Saudi marching band was present at the World Defense Show and performed every day, adding to the atmosphere.



These Airbus H.215M (formerly designated as AS.532U2) Cougar helicopters of 66 squadron are used in the Combat Search and Rescue (CSAR) role. But apart from that, they can also be used for regular transport, as happened during the WDS. The one in front arrived with a V.I.P. on board, while the second one appeared to have acted as a decoy aircraft to confuse potential terrorists. A third example was part of the static display and could be admired close up. In total 7 examples have been delivered to the RSAF.



Already purchased in 1983, the RSAF has five Boeing E-3A Sentry Airborne Warning and Control System (AWACS) aircraft on strength. But although being some 40 years old, these aircraft have been upgraded multiple times and are still top of the bill. Currently running is the RSAF AWACS Modernisation Programme Phase 2, which should help keep the aircraft up in the air until around 2040. The upgrades are done by original manufacturer Boeing, both in Oklahoma in the United States of America and Al-Harj in Saudi Arabia, and should be finished in 2026. After the programme has finished, the fleet should be fully interoperable again with the fleet of the US Air Force. Apart from upgrading the existing fleet of E-3A, Boeing is already hoping to sell their E-7 Wedgetail aircraft to Saudi Arabia to replace the feet of aging E-3A AWACS in the future.



The RSAF ordered 44 British Aerospace Hawk mk.165 aircraft to replace the fleet of the older Hawk mk.65 training aircraft. The second batch of 22 of these, ordered in 2015,

was to be completed in Saudi Arabia. For this the Hawk In Kingdom Final Assembly (Hawk IKFA) line was set up in Dahrhan, in the facility where in the past Tornado upgrades were performed. The 22 aircraft were delivered here as a kit, to be put together, test flown and painted before delivery to the RSAF. The final one of this batch was handed over to the RSAF during WDS under the watchful eyes of HRH Prince Khalid bin Salman bi Abdulaziz, the Saudi minister of defence. Although all locally assembled examples have originally been delivered to 21 and 79 squadrons, in this grey camouflage, 10 of them will be repainted and handed over to 88 squadron to be flown by the Saudi Hawks.



Because of the earlier mentioned embargo on the Eurofighter Typhoon, at the end of 2023 the Saudi government allegedly inquired about the Rafale with Dassault Aviation. According to the French minister of defence, Sebastien Lecornu, talks have been held about a potential sale of up to 54 Rafales. With that in mind it was no surprise the Rafale made an appearance during WDS, but strangely enough that only lasted the first day. One example was part of the static display, but already left the second day of WDS, while another one did two fly-by's during the opening day only. Both were part of Escadre de Chasse EC01.007 'Provence', currently based at Al Dhafra in Abu Dhabi, and didn't carry any unit markings.



The presence of dozens of different UAVs and drones shows the changing landscape of defence. They ranged from small

drones for reconnaissance to larger armed combat UAVs and even a life size one designed for transport from and to the battlefield, including the extraction of wounded personnel. One of the combat ones is this Chinese built Wing Loong WL-10B (the B denoting an export version), for which the Saudi defence forces placed an order of unknown quantity during WDS. This will become the successor of the Wing Loong I and II that are already in service with the Royal Saudi Air Force since 2017. Also recently ordered by the RSAF is the Bayraktar Akinci drone, which is built by the Turkish Baykar company that thanks to its claim of fame to the Bayraktar drones that are used in the war between Russia and the Ukraine. The first of these should be delivered in 2026. Comparing both UAV, the WL-10B has a higher ceiling and speed, while the Akinci is bigger and can carry a more compatible payload.



The Chinese demonstration team Ba Yi (August 1st) made their debut at the WDS. Although more than 500 displays have been flown by the team over the years, this was only their tenth performance abroad, making their rare appearance more than welcome. They were accompanied by no less than three Xiang Y-20 transport and tanker aircraft, that unfortunately didn't stay around during the show. The team flies a spirited display and uses smoke in multiple colours, with allegedly red and yellow representing China, blue for the sky and green for peace.



The Ba Yi team, that was already founded in 1962, is named after the date the People's Liberation Army (PLA) which was founded: August 1, 1927. The team originally flew the JJ-5, a Chinese copy of the Russian MiG-17, and later the J-7, again a copy of the Russian MiG-21. In 2009 however these were replaced by the indigenously designed J-10A which was followed up by the more modern J-10C version as recently as 2023. This multirole combat aircraft looks a lot like the Israel Aerospace Industries (IAI) Lavi, but although rumours are China and Israel worked together here, this has always been denied by both parties.



The NHIndustries NH-90 helicopter is plagued by problems in some countries, with Australia having just scrapped their whole fleet while Norway has terminated its NH-90 programme, demanding a full refund and Sweden is planning to do the same. Other operators of the NH-90 helicopter are putting their helicopters to good use though. One of those operators is the Qatar Emiri Air Force, that has both the TTH (troop transport helicopter) and the NFH (NATO frigate helicopter) on strength. One of the latter was on show at the WDS, marking the first outing abroad of the type since delivery of the first examples in 2022. The aircraft serves with 8 (anti surface vessel) squadron, based at Doha.



Although rumour has it Airbus is hoping to sell the A.400M Grizzly transport aircraft to the Kingdom of Saudi Arabia, at WDS Airbus officials declined to discuss any ongoing negotiations. A spokesperson said: "We are in constant discussion with actual and future customers in the region and we have several campaigns in the region for the A.400M, A.330 and C-295". Either way a Royal Air Force Atlas (as the A.400 is called in the RAF) was present as part of the static display, at the same time bringing an Agusta-Westland (Leonardo) Wildcat helicopter to the show. Furthermore a French and this Turkish example visited during the show as support aircraft for the Rafale that was mentioned before and the Turkish Stars demonstration team respectively.



The odd one out in the American delegation was the venerable Fairchild A-10C Thunderbolt II, the tank killer that was already designed in the seventies and earmarked for retirement, but is still going strong. At WDS one was in the static display while another one was flown during the aerial display on the second day. Both belong to the 355 Wg at Davis-Monthan AFB but are currently deployed to Al Dhafra AB in the UAE as part of the 332 Air Expeditionary Wing. Major Lindsay 'Mad' Johnson of the A-10C Thunderbolt Demonstration Team gave a spirited display, showing all sides of the A-10C.



No less than three Pakistani Chengdu JF-17C 'Thunder' jets were present in Saudi Arabia. On static display was the brand new Block III version, of which the biggest upgrade is the Nanjing KLJ-7A Active Electronically Scanned Array (AESA) radar. Two older block II aircraft alternated in the flying display. These two, one of which is portrayed here, are flown by 18 squadron 'Sharp Shooters', the Operational Conversion Unit based at Bholari air force base in Southern Pakistan. Fourth Pakistani aircraft present at WDS was an MFI-395 Super Mushshak in the static display, a type that is already operated by the RSAF in the elementary flying training role.



The Royal Saudi Air Force is currently the largest operator of the famous Lockheed C-130H Hercules after the USA. For the upcoming replacement however the RSAF is seriously looking at the Embraer (K)C.390 Millennium instead of the C-130J Super Hercules.

Embraer is doing surprisingly well, with firm orders of Brazil, Portugal, Hungary, Czech Republic, The Netherlands and recently also South Korea. Talks are underway not only about acquisition of 33 aircraft but also about setting up a repair and overhaul centre and a final assembly line in Saudi Arabia.

It was no wonder the KC-390 made a presence at WDS, while the journey from Brazil was used well by Embraer as the aircraft was also shown to Nigeria on the way.



During the last show day, the Saudi Hawks and the Turkish Stars demonstration teams did a photoshoot over the desert together. When finished a few flypasts in different formations were made in front of the crowds, which gave the opportunity for this unique photograph.

The Turkish Stars fly the venerable Northrop NF-5 Freedom Fighter, that started life with the Royal Netherlands Air Force but were sold to the Turkish Air Force around 1990. 30 years later they are still flying, although their end is near with only the Turkish Stars still operating them.

**Text and photographs by
Patrick Dirksen & Frank Mink of Tristar Aviation**

Italian Air Force Eurofighter anniversary



On 18 March 2024, the commemorative ceremony of the twentieth anniversary of the delivery of the first Eurofighter Typhoon F-2000 took place in Grosseto, home of the 4th Wing of the Italian Air Force, the aircraft which represents a valuable asset with over 200,000 hours flown, surveillance and defends the skies of Italy and the Atlantic Alliance.

It was 16 March 2004 when the Eurofighter Typhoon was delivered to the 4th Wing of Grosseto, the first operational department of the Air Force to receive the aircraft which today represents the backbone of the national Air Defence. The first aircraft were assigned to the IX Fighter Group. After a period of transition from the F-104 to the F-2000 and related works for the adaptation of the infrastructure, on 16 December 2005 the 4th Wing resumed the Space Surveillance Service Italian plane.

In operational contexts, in the last three years alone, the F-2000s of the four Wings of the Air Force have taken to the skies to carry out real interceptions to safeguard the national skies as many as 50 times. In the latest Air

Policing activities for NATO, in Lithuania and Poland, the scrambles in 2023 to defend the eastern flank of the Atlantic Alliance were approximately 40.

Since 21 February 2024, the F-2000s have been redeployed in Malbork, Poland, with the newly established Task Force Air 4th Wing employed as part of "Enhanced





Air Policing” (eAP) operations until July 2024. The Task Force Air 4th Wing, made up of approximately 150 men and women of the Air Force, is placed under the direct national dependency of COVI with the task of ensuring the control and safeguard of NATO’s north-eastern flank. The TFA is equipped with Eurofighter Typhoon aircraft from the 4th Wing of Grosseto, 36th Wing of Gioia del Colle, 37th Wing of Trapani and 51st Wing of Istrana.

There are 5 Wings of the Air Force that ensure national air defence and NATO Quick Reaction Alert service: four equipped with Eurofighter assets (the 4th Wing of Grosseto, the 36th Wing of Gioia del Colle, the 37th Wing of Trapani and the 51st Wing of Istrana) and one of F-35A aircraft (32nd Wing of Amendola). ➡

Article and photos: Gian Carlo Vecchi/Sergio Lanna



First AH-64E Apache Guardian for 301 Squadron in The Netherlands



On 14 March 2024 the first Boeing AH-64E Apache Guardian was delivered to 301 Squadron at Gilze Rijen air force base in The Netherlands. This is the first of twenty Apache's that 301 Squadron is planned to receive.

The Royal Netherlands Air Force (RNLAf) has ordered 28 AH-64E's of which the first six, serials Q-31 till Q-36, have already been delivered to 302 Squadron. This squadron is based at Fort Cavazos in Texas, USA where they use these Apaches for training of pilots and technicians. The newly delivered AH-64E with serial Q-37 is therefore the first one to be operated in The Netherlands.

In December 2023 the first AH-64E's for 301 Squadron were airlifted to Europe from the USA by C-17s of the

USAF. They were delivered to Woensdrecht air force base where they are being checked, reassembled, made ready to fly and test flown before delivery to their future home base. This work is being performed by the Logistiek Centrum Woensdrecht (LCW, RNLAf logistics centre).

The Dutch AH-64Es are based on a newly build airframe with both new and overhauled parts of former RNLAf AH-64DN's that were decommissioned earlier. These old Apache's were transported by ship from the LCW to Boeing at Mesa Field, USA. Amongst others new higher power engines, new gearboxes and new rotor blades have been installed. Inside the cockpit the old AH-64DN monochrome displays have been replaced by colour displays that give a better depth perception for the crew.

Apart from these changes, two major improvements over the old RNLAf AH-64DN are the FCR (Fire Control Radar) and the Link 16 capability. The Dutch air force will get ten FCR's and these will give the crew a much improved search capability. The FCR is housed in a radome on top of the main rotor. The Link 16 system will give the Apache the capability to share and receive real life information with other platforms during a mission.

With this new AH-64E 301 Squadron 'Redskins' have set a step into the future. ➡

Text and photos by Frank Mink & Patrick Dirksen of Tristar Aviation



Richard Gardner reports that...

Dragonfire tests break cover



The UK government's in-house advanced military research and development organisation, DSTL, has released further information on progress on the Dragonfire Laser Directed Weapon (LDW). Although detailed still images are not yet released, a de-classified video was shown in mid-March 2024 following the successful firing trials in Scotland on a remote range where the test firing unit destroyed small airborne targets for the first time.

DSTL's Senior Programme Partner, Ben Maddison, explained how the laser unit test proved that it could direct an intense beam of light with pin-point precision. It was so accurate, he said, that it could hit a £1 coin at a distance of 1 kilometre. Although a coloured beam was shown in the video this was for illustrative purposes only and DSTL pointed



out that in use it would not create a tell-tale trail seen by the human eye. The tests involved firings at drones and a variety of different materials, as would be used in the construction of a UAV or conventional military aircraft. Examples were shown of components that has been melted, with holes torn into the structural material in such a way as to make it very clear that this would cause catastrophic damage in an operational situation. A typical small surveillance drone, targeted by the laser weapon was melted into a single burnt shape.

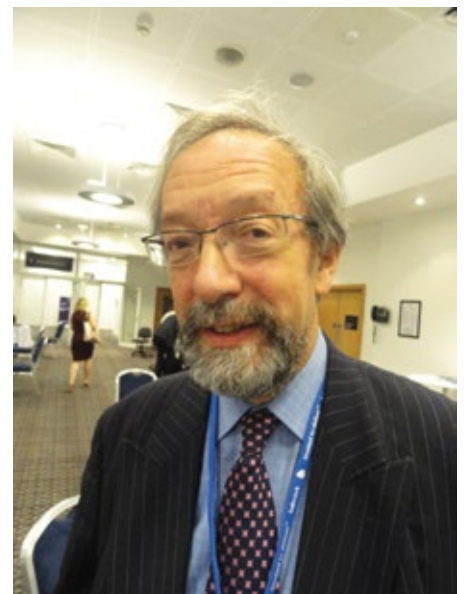
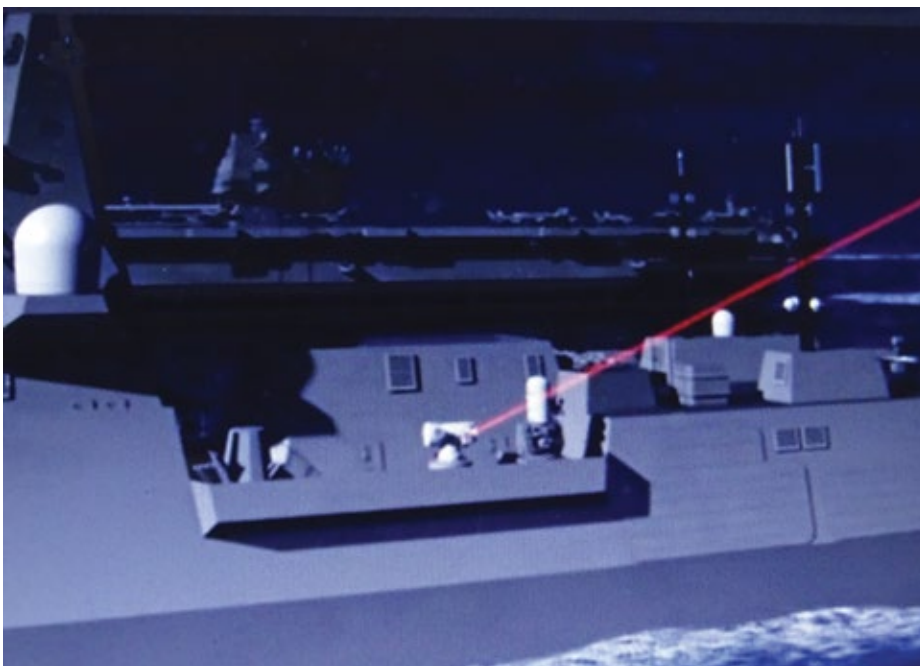
Following the initial test, work is continuing to take this future capability forward, and it was suggested that it could be operational in UK service within five years. A particularly memorable admission

was that a LDW could reduce a single shot cost to as little as £10, compared to many thousands of pounds for even small missiles, which require more complex launchers, preparation and storage space. And even the fastest reacting missile launch systems cannot match the potential capability of a multi-axis ranging laser weapon mounting. It was confirmed that the UK believes that this new weapon could become a real transformative air defence technology, allowing near instantaneous engagement with multiple and fast flying targets.

With threats to naval ships and high-value land targets increasing from a mix of hypersonic missiles, precision glide bombs, and swarming armed drones, the bringing into service in due course of a new

generation of laser weapons offers a counter that is realistic, affordable and a practical solution with wide applications. Having shown that Dragonfire is proving to live up to high expectations even at this early demonstration stage, the continuing development effort is looking into all the associated equipment and support needs, including those relating to the generation of the energy to power up and sustain the capability of laser directed weapons.

Appropriately one of the short video scenes depicted a Dragonfire LDW unit on a frigate accompanying an aircraft carrier. Protection of key surface assets could also be greatly enhanced by ground-based lasers added to and integrated with other layered AD weapons. ➡



The author of this piece, Richard Gardner, seen in the photo above.

Air Marshal (R) Harish Masand says...

I learnt more than flying from them: Alan Mascarenhas



with a large contingent of the Army in the Cantonment area, NDA at Khadakvasla and CME at Kirkee. The last had an annual river dance event which was much sought after by all but restricted to a few select outside folks, especially those with the better looking daughters, only by invitation. Somehow, by various crooked means, I managed to get in that year and had a memorable evening that I haven't forgotten yet. My coursemate Mohan Dikshit's brother was settled in Poona and we also spent many enjoyable evenings with Ashok and Suman Dikshit, either in the Mess, or in the Club as their guests. There were also plenty of great restaurants in the city, including Greenfields, where we dashed across many a times in the mornings in my Ambassador for "Keema Parathas" as breakfast before anyone in the Squadron even realised that some of us were missing. Those days, from the Air Force in Lohegaon to Main Street in Poona took less than 15 minutes. In addition, Bombay was next door with all its glitzy attractions and I also spent a few good weekends there with my roommate, Hufriid Mullaferoze.

To be honest, with all these distractions and sporadic flying without much of an objective, it was difficult to concentrate on professional aspects till we were introduced to a new phase of air to ground armament. It was then that I first met Flt Lt Alan Maurice Mascarenhas who was

Immediately after commissioning in 198th GD(P) course on 31 December 1967, all of us in the fighter stream were posted to the two Vampire squadrons in Pune (then spelt as Poona), 220 and 221 squadrons, more for marking time, or "Kadam Taal" as the term in drill and marching signified. This was essentially to while away some six months since the Air Force had a surfeit of pilots, after the large inductions following the 1962 debacle against the Chinese with an aim to expand the Air Force, but didn't have the aircraft or squadrons where we could be accommodated. Even the Operational Training Unit (OTU) in Jamnagar to convert us on Hunters was running a backlog and didn't have any place for us. I have already written a piece on my OTU days with a focus on the Commander, Cecil Parker, which many of you may have already read.

So, here we were in a city like Poona as young and energetic budding fighter pilots with just 20 hours to do on Vampires in six months and a

little flying with the local 6 Squadron, operating the L-1049G Super Constellation, to accumulate what was then popularly known as bounty hours.

The distractions in Poona were plenty so we didn't really mind since such distractions kept us occupied and entertained in more ways than one, particularly after the hard grind in Hakimpet. Poona those days was a nice clean city with a cosmopolitan outlook and a forward-looking gentry led by the Parsis and



an instructor in NDA at that time in early 1968. 'Mascy', as he was known by those close to him but 'Sir' to us, was a reputed Pilot Attack Instructor (PAI) who had been on the staff of PAI school in Jamnagar as a Flying Officer, as per what we heard on the grapevine. We were also told that he was a Sword of Honour winner from his course and had also performed brilliantly in the PAI school. That was the reason why our CO of 220 Sqn, then Sqn Ldr MV Kashikar, had invited Mascy over to introduce us raw pilots to the brief armament phase and give us dual checks on rockets and guns at the local Lohegaon Range which was active then. Sadly, by the time I went back to Poona 20 years later to command 28 Squadron, the Lohegaon range had been crowded in by construction all around with some portions of it also encroached on, making the range unusable. It was thereafter used essentially to house the SAM squadron.

Quite frankly, Mascy was tall and skinny and, if I may say so, not very personable at first sight. Also, what really worried me was that his hands noticeably shook when he tried to light his cigarette while briefing us on the theoretical aspects of the armament training on a small black board on a stand with 3-4 of us standing in front. I remember reaching out and lighting his cigarettes since Mascy was almost a chain smoker. Be that as it may, he was there briefing us. The thought of flying with him also crossed my mind



and the visualisation of that was not too pleasant and, perhaps, a little daunting. Amazingly, however, the moment Mascy took the chalk and drew a diagram on the board and wrote something or drew a diagram, the drawing was accurate and like a beautiful painting which had been taken straight out of a book. So was his handwriting which was like it had been printed in one of the font choices you get on the computer these days. Also, the way he explained the gyro gunsight and its peculiarities, in brief that time, was truly amazing. That comforted me somewhat and we went on for the dual check.



TACDE Graduation with Mascy and Deshu

As per my log book, I did the dual check with Mascy for Front Guns in the vampire trainer BY-424 on 22 April 1968. Mascy let me do the take-off and proceed to the range, guided me along for the safety height run at 100 ft AGL to get the perspective of the target and the pull-out height and then onto a circuit before the dummy dive. On base-leg, just before we had to roll into the dive and attack, he took over controls and asked me to follow him on the controls while keeping my eye on the Gyro Gun Sight in the gun mode. To my surprise, I now found not a trace of a tremor in his hand on the controls and the 'pipper', or the aiming index, on the gunsight followed a smooth curved path to the target and stayed glued on the target

throughout the attack with very minor and smooth movements of the controls which were barely noticeable. He then let me do a few practice dummy dives and said he would demonstrate a rocket attack even though the Rocket Projectile (R/P) attack dual check was to be done later. Once again, when he rolled into the R/P attack, the bottom of the bottom diamond, which was the aiming index, smoothly came on to the target and didn't move from there throughout the attack even though the gyro was far more sensitive after unlocking the sight for R/Ps in the dive. The bank to cater for wind came on so smoothly that it was hardly noticeable with the arc joining the bottom of the diamonds in the sight intersecting the target almost like the sight had been glued on to the target. I just couldn't help but glance inside and look at his hand on the stick to see if there was any tremor but found it rock-steady. On the ground, during the debrief, I again offered to light Mascy's cigarette but this time he politely declined and managed to light his own with much less tremor in his hands as if the sortie had given him a big boost.

That was the only time I saw or flew with Mascy in Poona. In late 1969, Mascy was posted to 37 Squadron in Hasimara wherein I had already spent about a year by then. Wg Cdr PJ 'Jackie' Jakatdar was now the CO after 'Rusty' Sinha left us and Jackie Sir had made me the adjutant almost immediately after taking over and was teaching me the nuances of administration when Mascy came in as a Sqn Ldr with Sqn Ldr AB Samanta as the senior Flight Commander. For some strange reason that he never spoke about, Mascy took a liking towards me after he flew a couple of sorties with me. He showed this by bringing across a few files almost every other evening to his room, which was just 20-30 yards from my room and within hearing range, and then call me over with a yell as soon as it got dark, "Khappe, come over I want to discuss so-and-so issue". Mascy was a very intelligent person with a great reading habit which made him very knowledgeable on almost every subject under the sun.

Over a drink, we would quickly resolve the official issues which were on file and then spend the rest of the evening talking about various other issues. He did most of the talking while I just listened since there was not much I could contribute to a discussion on subjects like astronomy or space or even philosophical issues which were way beyond my level. I later figured out that Mascy, while being very intelligent, was also very sensitive and perhaps a little lonely so the excuse of getting official work done between the Flight Commander and the Adjutant was essentially to have some company and someone to talk to. Frankly, after a few such sessions, I really didn't mind in the end because of all the knowledge I gained, in what was almost like a "shishya" listening to his Guru. Once again, I found that while his hands shook while pouring a drink or lighting a cigarette, the moment he started writing on files or making a draft for the CO, his handwriting was truly like it was printed. What impressed me most, however, was that Mascy kept a clear head and would start a conversation on topics ranging from carpentry to astronomy after the formality of office files was over and his knowledge on all such subjects was absolutely amazing. I learnt a lot of stuff from Mascy on such wide-ranging conversations on various non-professional subjects, as also tried to improving my GK by reading a lot more than just while away my time on mundane things. In Hasimara, apart from partying amongst ourselves or with newly acquired friends in the tea plantations, there was not much to do and plenty of time to read.

In the squadron, Mascy soon started taking detailed lectures on professional subjects, particularly related to armament work which included about a dozen sessions on the Gyro Gun Sight (GGS). While many of my colleagues found these sessions boring and, sometimes, too technical to follow, I was truly fascinated by the way Mascy explained the whole GGS theory in detail, including gimbals and precession, and tried to absorb most of it. Much later, while doing the FCL course, I was asked to speak on the

GGS theory and thanked Mascy for what he had taught me. In addition, even though I was still U/T Ops, Mascy started letting me make the flying programme regularly and help out in the running of the flight office.

Assessing the GGS recorder films in both air combat manoeuvres and air to ground attacks also became a part of my job and I soon became pretty good at debriefing folks on their films, all due to Mascy's guidance and prodding. He also pushed and quickly had me cleared for lead even before I had obtained Ops Day status in October 1970. Because his speech was sometimes more of a sputter and came in short bursts, a lot of folks used to make fun of him but I became protective of him because I somehow sympathised with him and understood the loneliness he felt. In September 1971, Mascy finally got married to a lovely person by the name of Corinne and the whole squadron celebrated and received the newly weds in a cycle-rickshaw when they arrived in Hasimara just after the 1971 War in January 1972. Corinne and Mascy initially settled down in the MES Inspection Bungalow next to the Officers' Mess till they got a house in the newly built married accommodation close to Jaldapara sanctuary across the runways, where they were regularly 'bounced' mainly due to Corinne's warmth and hospitality.



However, I did once make Mascy very angry with me when I rejoined circuit at low level and high speed with an inverted pass at the ATC as the leader of a 2 aircraft formation. Mascy immediately called me to the office and fired me for such indiscipline, something I truly deserved, and grounded me for three days. While Mascy was absolutely right in taking such action, I took these three days as time off from my hectic schedule as

the adjutant and caught up with my professional reading.

I must admit that Mascy didn't carry forward his displeasure with me after this incident and I remained his trusted lieutenant through the rest of my tenure in 37 Squadron including during the 1971 War. As a matter of fact, I was supposed to fly as his wingman in the very first mission of the War on 4 December 1971. Unfortunately, his aircraft developed a hydraulic leak after start-up and I had to take his place as Number 3 in the formation led by the CO, 'Suppi' Kaul. When I got back from that mission after downing a Sabre, Mascy was perhaps the most elated person and kept patting me on the back even at the end of the day. Next day, I did fly as his wingman in the same 4-aircraft formation to try and lure the Pakistani Sabres to engage us in air combat. Unfortunately, the Pakistani Sabres wisely declined this challenge and we flew unopposed all the way to Dacca and back. Later, on 10 December, when I was coaxing Rajesh 'Laloolee' Lal back from Lal Munir Hat and asked him to put the aircraft down at Cooch Behar, Squadron Leader AA 'Bozo' Bose had come up on the radio and asked Laloolee to eject but Mascy intervened with, "Khappe" is handling it, let him do it", showing full confidence in my abilities to guide Laloolee's stricken aircraft to safety. I had published that story in the Vayu Aerospace & Defence Review magazine in 2014.

Mascy also taught me some basics of Air Force customs and traditions in this tenure. When 'Suppi' Kaul took over command of 37 Squadron on 1 April 1971, he was the fourth CO most of us youngsters were seeing. So, after the usual greetings on arrival of the CO and Mrs Nita Kaul to the Mess for the Air Force Day party, remember 1 April those days was the Air Force Day, all of us had drifted to the bar leaving Suppi and Mrs Kaul with all the senior lot of the station. Mascy came to the bar after a short while and sailed into all of us with a few choice words for leaving the new CO and his wife in that manner, particularly pushing me to go and give Mrs Kaul some company. Reluctantly, I had

gone over and after a few pleasantries, asked Mrs Kaul whether she would like a drink since she didn't have a glass in her hand. The idea was that once she asked for a soft drink, I would disappear again after making sure a waiter took the drink to her. As it happened, Mrs Kaul sweetly said that she was waiting for someone to ask her and to get her a Gin-n-Lime. Mascy soon joined us in what turned out to be a lot of Gin-n-Limes and a fun evening. But then, that is another story and I am drifting off from my subject today.

Even after I got posted out to Sukhoi-7s and 101 Squadron in December 1972, and Mascy moved to 'P' Staff in Air HQ, he kept me and my career in mind though we didn't ever talk because of the poor communications those days. In early December 1973 when the signal came for me to go for the Flying Instructors' course in FIS Tambaram, Mascy called me and said to be sure to see him when I passed through Delhi. I did so and had a wonderful evening with Corinne and Mascy during which he also cautioned me that I was not doing too well in my annual reports and if I wanted to pursue a good career in the Air Force, I had better do well in FIS. When I really did do well in FIS, in June 1974, Mascy was on the phone with his compliments and abuses flowing in a very effusive manner. Soon, I caught up with Mascy and Corinne in Jamnagar when I went to do the FCL course in TACDE in March 1978. He was then a Wing Commander posted as the O i/c Flying cum Flight Safety Officer, I think. Once again, when I did well on the course, Mascy's happiness seemed to have no limits and we celebrated together in the graduation dinner, as the picture with 'Deshu' Sir and Mascy would show. Corinne and Mascy were still there in Jamnagar when I came back on staff of TACDE in September 1978. Corinne and Malini also got along like a house on fire and we spent many enjoyable evenings together.

Unfortunately, we left for Iraq from there in June 1979 and Mascy drifted out of the Air Force as a Wing Commander in 1980. I next met them while driving through Bangalore to



Wellington for the Staff College in January 1982 and again when the Staff College Special train was parked at Bangalore Cantt Railway Station for a few days while on the industrial tour. Mascy was staying a stone's throw away from Bangalore Cantt. Railway station in his ancestral house on Kemp Road and I saw them almost every other evening when free. This is the time when I got to know the two lovely daughters, Priya and Maya, that they had. We kept in touch like this whenever I passed through Bangalore, and even with Corinne after Mascy passed away. Last I saw Corinne was in October 2021 while in Bangalore for the Golden Jubilee of

1971 war. In between, both of their daughters, Priya and Maya, settled down in the US and Priya even came to see Malini and all of us in San Francisco in 2012 with her husband from San Jose a few months before Malini passed. Maya is in the East Coast in New York but we haven't seen her there yet.

Mascy was a true mentor for me and guided me from the time I first met him in Poona in 1968. I owe him a great deal because if he hadn't pushed me hard, I may not have achieved what little I did in the Air Force. A very intelligent and capable pilot and also a brilliant officer who unfortunately got way laid by a quirk of fate. ➡



The author of this series, Air Marshal (R) Harish Masand, seen above 3rd from the left.

The Death Followed

1962 War Series



General area Phobrang

It was a bitterly cold morning on 10 November 1962. As Major Sangram Singh, who would soon become a Lieutenant Colonel, drove his Jeep into Chang Chenmo Valley, he thought of his gallant troops who had fought so valiantly against the powerful enemy during the start of the Sino-Indian War in 1962.

The Chang Chenmo valley, also known as the Middle Sector, is situated east of Shyok and south of DBO. This section was under the 1/8 Gorkha Rifles until the Jats arrived. Posts at Phobrang, Hot Springs, and Galwan were part of this sector. Three of 5 Jat's companies, A, B, and D, were in charge of safeguarding the area, while C company was manning posts in DBO.

Dauntless Delta

Major Sangram had joined the fighting force of 114 Brigade as OC Delta Company, 5 Jat on 11 May. He along with his company had moved from Srinagar to Leh via air. On 10 June, D Company marched out for Shakti Camp under the command of Captain AK Anand, Lt Harji Ram, and Company Senior JCO Ram Mehar, having spent a month at Leh acclimating to the high altitude. On 1 July,



the column arrived in Phobrang from Shakti and relieved a platoon of 1/8 GR. Prior to this, CO Lt Col Bakhtawar personally conducted a reconnaissance mission to the area and on 1 July, he established a post at Ane La with a small party. Days went by, and patrols to locate enemy locations were conducted on a regular basis.

2/Lt HC Gujral was given instructions on 25 July to set up a section position at Barma with 12 ORs and 1 JCO. Following their overnight stay at Barma, they were instructed to withdraw the post. July 26th saw the withdrawal of Kongma in addition to Barma. However, Kongma was again established on 27 July, this time the enemy without interfering followed the party establishing the post. At 1000 hours on the same day, the enemy surrounded Ane La in force and opened fire; fortunately, no one was killed in the ensuing brawl. Bn HQs intended to strengthen Kongma following these events. 2/Lt. Gujral was assigned on 29 July to set up a helipad and dropping zone close to Kongma so that regular supplies could be dropped in the event that the enemy besieged the post. The enemy also set up a post in front of Kongma the very following day after observing all the activity. There were no reports of enemy activity for a month following this occurrence, until four enemy troops approached Kongma, remained for 1.5 hours, and then left.

Jats at Phobrang

Delta Company had Major Sangram Singh, Subedar Ram Mehar, at its HQs in Phobrang, and the rest of the company was divided into two posts:

1. 1 Platoon at Ane La under Jemadar Jai Lal
2. 1 Platoon at Kongma under Subedar Surjit Singh
3. 1 Platoon at Phobrang with Coy HQs/Map of Chang Chenmo valley



In order to obtain firsthand information about the development, CO and the SM visited D Coy HQs on 26 September. It was during this visit that Major Sangram was granted permission to take his annual leave, which was scheduled to begin on 10 October. Major Sangram left Phobrang to proceed for his leave, but the very next day he was called back because of enemy activities and developments that indicated a forthcoming war between the two countries.

All posts were alerted and in the next ten days, on 20 October, the enemy attacked our posts in DBO, Galwan, and Sirjap. D Company was waiting for the enemy to arrive, and Major Sangram had warned his post-commanders that the enemy could attack at any time and that everyone should be ready.

Kongma

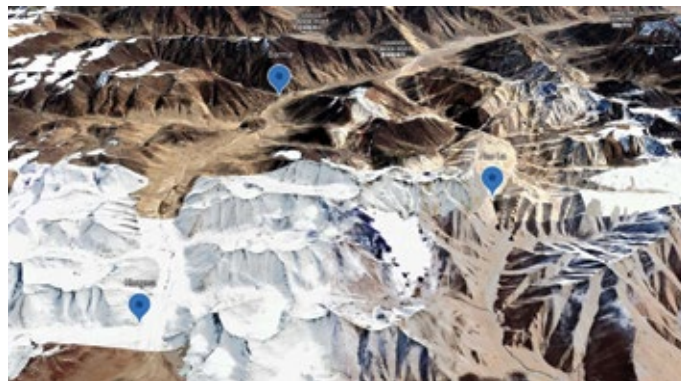
Subedar Surjit Singh commanded a platoon post that was positioned strategically. On 22 October, throughout the day, the Chinese moved closer to Kongma. Suddenly, artillery fire began over the position, causing our defenses to become brittle. The enemy launched an attack on the post at 14:45 with 300 soldiers. MMGs and mortars provided excellent assistance for this onslaught. Subedar Surjit handled the situation and continued to inspire his troops. At Kongma, Naik Munshi Ram, section commander of the left forward section, encountered the main assault of the first wave from the left. His LMGs fired nonstop for two hours until running out of ammunition. Nk Munshi Ram jumped from the firing trench, unconcerned for his personal safety, and fetched ammunition from the reserve for his LMG. While going back to his trench, a direct hit from the mortar killed him.

As Subedar Surjit moved from trench to trench, he inspired his soldiers to fight back against the assault. He was struck by a burst of MMG fire when emerging from a trench, but he didn't let that break him and he carried on moving and battling.

The adversary was now in the centre and depth section, having outnumbered the left forward section. Sepoy Ram Kumar engaged the enemy here with his LMG, and even though he had been wounded, he continued to fire until his ammunition ran out. By 2200 hours, the enemy had seized control of the section, and Sepoy Ram Kumar had also been killed.

The final section to come under attack was L/Nk Zile Singh's right-forward section. The LMGs were the objective of the enemy and they eliminated LMGs 1 and 2. When L/Nk Zile Singh saw this, he grabbed the LMG and fired till he ran out of ammunition. He learned that Subedar Surjit,

the platoon commander, had succumbed to his wounds. L/Nk Zile Singh is now aware that the entire post has been taken over and that fighting is not viable. He gave the order for the surviving men to fallback in the dark to the Coy HQs at Phobrang at about 2300 hours. After walking for hours over the snow-covered hills during the whole night, L/Nk Zile Singh and his troops managed to arrive in Tsogetsalu about 1600 hours on 23 October.



Map of Kongma – Ane La

Ane La

Jemadar Jai Lal was now in charge of the station, which the CO had personally established. Before the battle started, the enemy shelled this post heavily. The bombardment was followed by an infantry offensive. The waves continued coming, one after the other. The Jats were in possession of the lead at first, but as the night wore on and their ammo ran out, it appeared like the position had slipped through our hands. Even so, they managed to hold onto the position, but Jemadar Jai Lal issued the order for his soldiers to withdraw as the number of adversaries increased. The soldiers withdrew to Chartse where they received orders to rejoin the Coy HQs in Phobrang on 26 October.

Aftermath

The conflict claimed a great deal of Jats' lives. Of the 33 that fought at Kongma, just 7 made it out alive. The enemy had taken over D Company posts, which presented a major risk to B Company positions in Hot Springs. Following the end of events in the Chang Chenmo valley, the Jats strengthened their defenses, extending from Phobrang to Shyok, and they also had control over Tsogetsalu. After the 24th, the enemy made no attempt to advance, and the Jats retained complete control of the region. Major Sangram Singh, who had been relieved as OC Delta Company, moved to Jat Regimental Centre, Bareilly and raised 7 Jat on 15 November. In recognition of his valiant deeds, Naik Munshi Ram was awarded the Vir Chakra posthumously.

The valley is still defended by Subedar Surjit and the soldiers, who battled to the very end, continue to safeguard the valley, and the valorous actions of the Delta Company are still unsung. In Phobrang, a memorial was erected by Lt Col YS Sheoran on 22 October 2023 in the memory of the courageous troops of 5 Jat who fought in fierce battles of the 1962 War. ➡

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

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

“One–Zero, Overhead”

The R/T in Air Traffic Control crackled, “Blackjack Tower; One–Zero, Two Minutes”. And there was panic! The Senior Air Traffic Control Officer (SATCO) grabbed his telephone and called up the Station Commander. In minutes, the news went round the Station. The Air Officer Commanding (AOC), Operational Command was descending (literally) on us for an inspection.

This was Air Force Station Adampur in 1957, an airfield in the heart of the Punjab, where our fighter squadron, flying Vampires, was based. There was only one operational Command then, covering the whole of India, and it was commanded by an Air Commodore; the legendary 38 year–old Air Cmde Arjan Singh DFC. He was a typical “operational” officer who believed in absolute professionalism. He was not impressed with the usual superficial spit–and–polish carried out in preparation for an inspection. All he wanted was smartly turned out personnel who knew their job and went about it efficiently. He did not like any fuss made over him and insisted that everyone went about their duties in their normal way.

He would visit an operational base without any warning, flying in by himself, in a single seat fighter aircraft (Vampire 52). His unique callsign was “One–Zero”. And his R/T call to the local ATC was the first indication to anyone that he was on his way and that he was just two minutes away.

His next call was “One–Zero, Thirty Seconds”, indicating that he was only that much time away, to which ATC responded, “Clear Downwind”. And then, as we looked up at the sky, we could see his aircraft running in to join circuit. Another crisp R/T call, “One–Zero, Overhead”, a smart peel off, and

he could be seen on downwind, lowering his undercarriage and calling, “One–Zero, Downwind, Three–Green”. ATC would call “Clear Finals”. He would make a typical old time fighter pilot curved approach, call, “One–Zero Finals”, ATC would respond, “Clear to Land” and he would touch down on the dumbbell.

During this time, there was a flurry of activity all over the Station. Everybody trying to get everything as ship–shape as possible, in the very limited time available.

The AOC Ops Command would taxi into the squadron dispersal, undo his straps and ease his impressive silver overall–clad frame out of the cockpit, to be met by the Station Commander and Squadron Commander. An open jeep would pull up close by, the AOC would politely tell the Cpl driver to go back to the MT Section, he would himself get behind the wheel and drive off all alone.

For the next few hours the AOC would drive himself all over the Station, still in his flying overalls, visiting every nook and corner, from Airmen’s Mess to Bomb Dump, from Squadron Dispersals to Air Traffic Control, from Orderly Room to MI Room, from Ops Room to Guard Room, observing the routine functioning of the various sections and stopping to have an informal word with officers and airmen in each of the places. He even visited the DLTs (Deep Trench Latrines), there was only “dry sanitation” those days!

He would then drive back to the squadron dispersal, have a few words with the Station Commander and Squadron Commander, in the latter’s office, and then join the officers in the Crew Room, for an informal chat and a glass of tea. He would then climb back into his

single seat Vampire and fly back to Delhi.

There was no ceremonial reception, no guard of honour, no fancy car, no silver tea service, no cups and saucers, no formal dinner, no unnecessary fuss, nothing. He did not bring a Staff Officer with him, or even an ADC, to take notes. All he wanted was to personally check on the operational preparedness of the Station.

Those were the days, my friends!

We knew we had a Boss who meant business. And we did our very best to never let him down. He nurtured our Air Force for the next 12 years, till he retired as the Chief of the Air Staff in the rank of Air Chief Marshal in Aug 1969. Later, after he was awarded the lifetime serving rank of Marshal of the Indian Air Force (MIAF) on 26 January 2002, he continued to keep a benign watch on us.

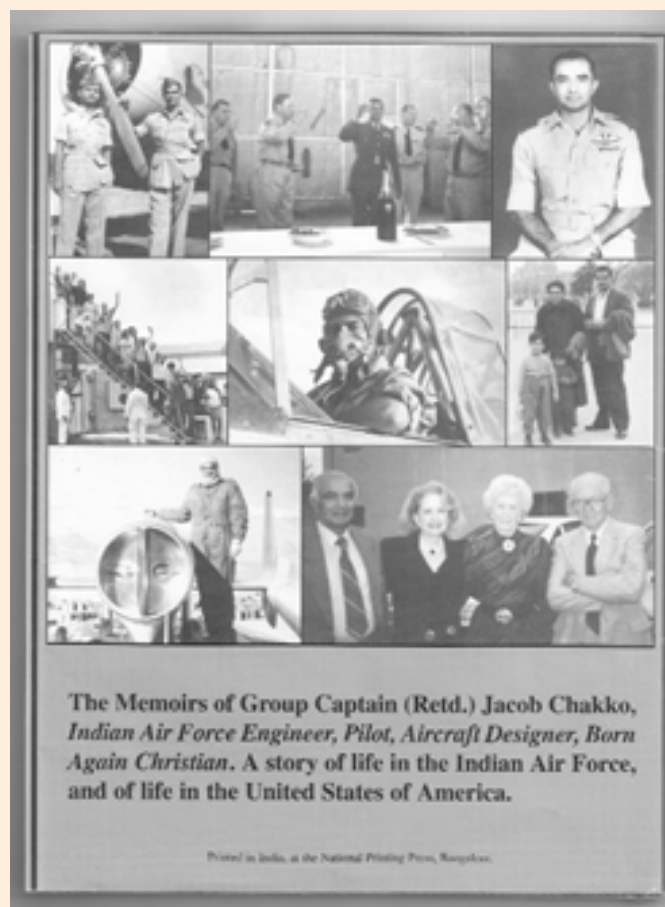
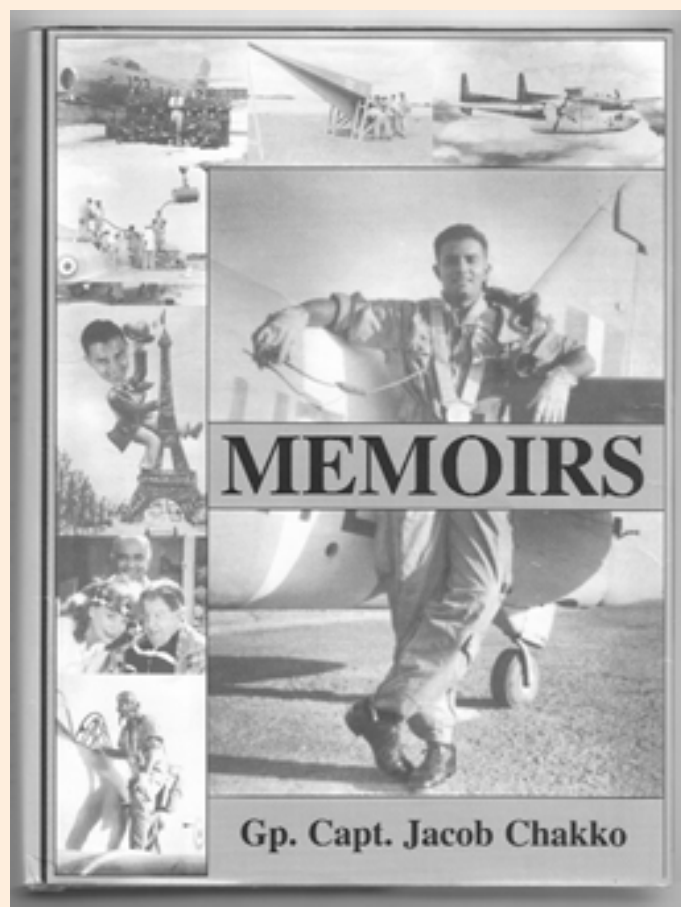
And even now, he is, and always will remain with us, “One–Zero, Overhead”. ➡



Air Marshal (Retd) Shashi Ramdas

Nostalgia!

Letter to Gp Capt Jacob Chakko by AVM Ranjan Dutt, sent on 8 August 2007



Memoirs by Gp. Capt. Jacob Chakko. Printed in India in 1999 by National Printing Press, Bangalore, Memoirs is 507 pages long along with photos. Jacob Chakko was born in Madras in 1924. He joined the Indian Air Force as a Technical Engineer. He retired from the Indian Air Force as a Group Captain in 1969 and moved to the USA. The author was one of only two IAF engineers selected for special flying training. He was part of the Aircraft Selection Team that was instrumental in selecting the Mystere, Hunter, Canberra and Gnat aircraft for the IAF.

"Take a look at the photographs. From the dust jacket flap—in these pages you will find a kaleidoscope mosaic of the varied experiences of Jacob Chakko: with his family and friends, in his Air Force career, and his business. This autobiography is remarkable not just for the interesting episodes that Jacob Chakko recounts, but also for the sheer variety of the experiences described herein", according to an online reader and reviewer.

My dear Jacob,

I was at last able to collect your book from the Post Office and have been able to skip read through to get an overall impression before getting down to reading it again in detail. First of all I give you my sincere thanks for including me in your select list of privileged persons who have received complimentary copies. It gave me a great deal of pleasure going back to the past and bringing so many nostalgic memories into sharp focus. I would like to congratulate you in the excellent way you have written bringing out your family and friends, the Air Force life and

then your life after retirement. These episodes have been depicted with humour and eloquence. Your personal role as a technical Air Force officer has been a most notable factor in the shaping of our Air Force and you have succeeded well in relating your own considerable contribution with commendable restraint and without rancour. I feel you can be proud of yourself for doing a difficult job in such an easy going and readable style.

Now coming back to some of your views on subjects and events you have described. I feel they deserve further elucidation and a more complete understanding of events

before one can draw any reasonable and worthwhile picture. It is from this aspect that I would like to make a comment or two to clear some of the cobwebs that may have crept in over the years. I shall therefore try and draw a more complete picture by looking at it from the “other side of the hill” and brush aside some of those cobwebs. Prima facie I have picked on three subjects. These are the engine selection for the HF 24, the selection of the Hunter and Canberra and the Dashpot modification for the Mystere IV. I would like to emphasise that the views and comments I have expressed are based entirely on my personal experience and first-hand knowledge and are in no way speculative or second hand. The background narrative is therefore important and relevant to the subject discussed but should you, on the other hand, find it all rather a bore I would have to ask your forbearance.

HF 24 Powerplant

In 1944 I was in Tangmere flying Spitfires. My Station Commander was the legendary Gp. Capt. Bader. There were a number of captured German aircraft in airworthy condition on the base for evaluation purposes by selected RAF pilots. I was asked by Bader to fly the Me 109 and FW 190 and give my impressions. This I did and I had no hesitation in extolling the extraordinary performance of the FW 190, particularly in the rolling plane, that made this aircraft such a scourge for the B 17 Fortresses and the B24 Liberators on their daylight offensive against Germany. It was the FW 190 that brought the name of Prof Tank to the limelight and I felt privileged to meet him in Germany after the war, just before Mr. Tyagi invited him to India. Incidentally it was also in Tangmere that I flew the Meteor III, the first jet aircraft to be flown by an Indian pilot.



The HF 24 was designed from the outset to take the Orpheus 12 that was under development in the UK by Bristol's to power the second-generation of NATO fighters. This project was suddenly cancelled because of a change in NATO policy and we were left in the lurch with no other suitable power plant for the HF24. We were, however, offered the choice of developing the Orpheus 12 jointly with Bristol by bearing the major development costs since we were the only customer in the market. The Orpheus 12 was of course the only power plant available at that time for the HF 24 and I was therefore sent, as the MD of HAL, to the UK to salvage the project. I met Sir Arnold Hall, Chairman SBAC, and had various talks with him

and other senior officers from Rolls Royce (Sir Richard Pierce) and Hawker Siddley (Sir Roy Dobson) and others. I remember being invited by Sir Arnold to the Coq d'Or for lunch and thereafter to his club in St. James for coffee and brandy and see if any reasonable terms could be reached. I think both Bristol and Sir Arnold were convinced that we had no other option but to agree to their terms since so much was at stake for India with its commitment to the HF 24 and the German experts in Bangalore led by Tank.

The Bristol terms cited, called for us to bear the development costs amounting to about 13 million pounds with no pay back guarantees should the engine fail to meet the standards prescribed. 13 million doesn't sound much by today's values but those days with tight foreign exchange reserves and the poor state of the Country's economy it was a very different matter. The no guarantee clause was also unacceptable and was the main obstacle to any agreement. At any rate, on my return to India, I placed the whole matter before my Board of Directors who considered the various pros and cons and in the end decided to drop the Orpheus 12 project. The Government of India was advised accordingly. The Board of Directors however approved the proposal made by us at HAL to proceed with the Orpheus 703 as an interim measure and for the GTRE to develop a suitable afterburner with a 50% thrust augmentation to give the HF 24 a Mach 1.4 capability. The aircraft would of course still have a very high sub-sonic speed in the ground attack role.



The RD9F power plant from the Soviet Union was very seriously considered about this time as a suitable alternative to the Orpheus 12 having similar thrust, weight and other performance criteria. A crucial factor in favour of the RD9F was that the intake design of the aircraft closely matched the requirements of the power plant and no major changes were envisaged. The one big problem was the location of the engine accessories. The RD9F had these accessories mounted on top of the engine whereas the engine bay of the HF 24 was designed to have these accessories underneath the engine in accordance with the Orpheus 12 around which Tank had designed the HF24. It was deemed that to redesign the airframe of the aircraft would not be a practical undertaking and the only solution rested on the Soviets relocating the accessories underneath the engine for successful fit in the engine bay of the HF24. This was a very major task for the RD9F design engineers and they were unwilling to take this responsibility. There

was thus a total impasse at the technical level. The only solution was to raise the issue to a much higher political level if this was considered necessary.

Although the installation of the 703 was proceeding satisfactorily it was nevertheless accepted by all that without the RD9F the HF24 would never fulfill its true potential. The RD9F in fact had the total support of Tank and the Ministry. Getting the support of Tank was imperative since he was not only the Chief Designer but his willingness to work with Russian engineers had to be established. The converse was equally true, for the Russians still felt strongly about the Nazi invasion of their country and the 20 million lives they had lost. Finally, it was recognised and understood by all the interested parties that there simply was no other suitable power plant available in France or UK to meet the dimensional requirements of the HF24 and other vital parameters. Later, the Egyptian E300 was considered but largely for political reasons because of the Nehru/Nasser connection and the non-aligned movement. I had personally been given instructions before my departure for Cairo, to view the E300 project in this light. In Cairo I met again my old friend Air Marshal Sidqui Manhood and even Nasser saw me regarding the project. Naturally I spent time mostly with the German and Egyptian engineers at Helwan and the results of my discussions were submitted in the normal way to the Ministry of Defence and the Board of Directors. This option, however, was never thought to be a front burner since the successful development and flight clearance of the E300 were far into the future and could never enter into current options of finding a fully developed engine for a Mach 2, HF 24.



It was with these factors in the background of my thoughts that I once again found myself in Moscow. I remember that our Ambassador Subimal Dutt was away in India on compassionate leave but I had the excellent guidance of our acting Ambassador Mr. Than. He spoke Russian fluently and was responsible for arranging a meeting at the Kremlin with the First Deputy Premier Mr. Kosygin. I had not heard this name before but was told that he had the power and influence to help the RD9F project if he could be convinced. The name Kosygin would later be known the world over. During this meeting at the Kremlin there were just the three of us plus the Russian interpreter for Mr. Kosygin. After some friendly remarks

and general discussion on the importance of the RD9F project Mr. Kosygin proposed to me, quite out of the blue, that the Soviets were prepared to offer the MiG-21 with all its missiles and avionics for complete manufacture in India. He suggested that I meet with the Soviet Marshal of the Air (their equivalent of CAS) and see the aircraft for myself. He further assured me that the RD9F would be modified as requested by the Government of India and that we could count on their engineers successfully carrying out this major task and working closely with our German design engineers. I had met the "Soviet CAS" before when I was a member of a delegation led by Air Marshal Mukherjee. I had then flown the MiG-15 and the MiG-17 and the Soviet Air Marshal remembered me from those days. Suffice for me to say that as suggested by Mr. Kosygin, I first met the Soviet Air Marshal and then was allowed to examine and fly the MiG-21. All these events were fully reported to Delhi by Mr. Than and by me. As far as the HF24 was concerned the green light to proceed with the RD9F was at last obtained at the highest political level and it was now up to India to proceed ahead and fulfill the great promise in which this aircraft was always held. The failure to capitalise on this great opportunity and exploit the full potential of the HF24 is a very sad story and may perhaps come to light one day when spin and personal politics are set aside and only the paramount interest of the Air Force is made the aim. Soon after the above events I relinquished my job as MD of HAL and returned to the Air Force as AOC-in-C Eastern Air Command.

Hunter and Canberra

Pratap Lal had flown both the Hunter IV and the Swift as possible future fighter aircraft for the Indian Air Force. The Swift had serious problems of flameouts every time the guns were fired. However the final choice was left for AVM Aspy Engineer and his delegation, of which I was a member, to assess and advise. My assessment of the Hunter IV, after flight evaluation, was that while it was suitable in the ground attack role it fell far short in the air-to-air role at high mach numbers. The Hunter IV was therefore firmly rejected by Aspy Engineer. The Hunter IV had a simple variable incidence tail (V/I tail) with the tail plane fixed and only the elevators were available for manoeuvre. This severely restricted the amount of "G" that one could pull at altitude and the aircraft had no dog fight capabilities against an aircraft like the F86 with the Pakistan Air Force. I remember only too well the limitations of the MiG-15, which had a v/I tail, when I flew this aircraft in Russia. I also remember the accounts of the F86 achieving a 10 to 1 kill ratio against the MiG-15 during the Korean War. The F86 was the first combat aircraft, which had a slab tail, i.e. there were no elevators and the whole surface of the tail plane was utilised as one unit for manoeuvring in dog fights etc thus enabling high G forces to be pulled.

Hawker Siddley was accordingly informed of the decision to reject the Hunter IV and as a result there was a great deal of consternation all around. Eventually Aspy Engineer was told that we could evaluate the Hunter VI, which was just being inducted into the RAF. The Hunter VI had what was called a follow-up tail with a ratio of 1/3rd between the tail plane and the elevator. In other words it did not have a pure slab tail but only a partial one with the tail plane moving 1/3rd the distance the

elevator moved when the stick bottomed out and pulled fully back in a dogfight. For the evaluation of the Hunter VI, I had to fly from Dunsfold in the company of Neville Duke, Duncan Simpson, Frank Murphy, Lockspeiser and other brilliant Hawker test pilots. After many flights and frank discussions with the Hawker team they accepted our criticism on the limitations of the follow up tail. Nevertheless, I recommended to Aspy Engineer to accept the Hunter VI. It was not of course the ideal answer in the air-to-air combat role but it was, however, superior to the Hunter IV and in our opinion a reasonable balance between ground attack and air to air roles. The RAF had to agree, under great political pressure, to delay their own re-equipment programme by diverting their initial orders of the Hunter VI to the IAF. I remember our requirements were for 160 aircraft and our insistence on the Hunter VI irked many of our friends in the RAF.



The Canberra story revolved mainly over its bombing ability by night. The Russian Il-28 had a radar for night bombing but the Canberra had none. The Il-28 radar was the next generation from the H2S which proved successful in World War 2 provided the target was located near prominent landmarks like river estuaries which would



For representational purposes only, the IAF Canberra seen here during phase out in 2007 at Agra. Photos: Vayu Aerospace and Defence Review.

show up on the radar screen. The Il28 radar was an improvement but still below par. The Canberra was offered with a “Cat and Mouse” bombing device dependent on two ground stations which limited its range and operational utility. This device was based on the older “Oboe and Gee” systems operated by the RAF. It was therefore clear that neither the Il28 nor the Canberra was fully satisfactory for night bombing. The importance of bombing by night arose because it was considered that both the Il28 and the Canberra would be vulnerable by daylight to enemy fighters of the F86 class. The Canberra was a good aircraft in the low-level night intruder role but with the sophistication taking place over the last few years both in airborne and ground based defences it would be reckless for a pilot to penetrate any organised air defence system flying such vintage aircraft. The whole concept of operating aircraft of the Canberra class by day or night in today’s context must therefore be ruled out.

The Dashpot Modification

I had just finished doing my RAF Staff College course in the UK when I was instructed to report to Air Marshal Engineer in Paris. He was holding discussions with Marcel Dassault to finalise the Mystere IV deal. The Mystere IV flight clearance was being held up because of serious oscillation problems experienced in the pitching plane when flying the aircraft at high indicated air speeds. A very experienced RAF test pilot called Wg. Cdr Bird, who was a fellow student at the Staff College with me, had test flown the Mystere IV and warned me that at low altitudes and high indicated air speeds the aircraft was very dangerous since oscillations in the pitching plane could be induced inadvertently by the pilot and any corrective measures taken would become out of phase and exacerbate further the oscillations leading to structural failure.



He claimed that some serious accidents had taken place. Since our intention was to use this aircraft primarily in the ground attack role this flight characteristic was therefore unacceptable. After meeting with Aspy Engineer in Paris I went to Melun-Villaroche to fly the Mystere. Dasu was a member of the delegation and as a test pilot his presence and opinion were invaluable to me. After a few familiarisation flights in the Mystere I carried out the “oscillation” tests to see for myself the effects of this phenomena. I was of course armed with the knowledge that the cure lay in removing my hands quickly from the stick and NOT fight the oscillations. The aircraft we flew were fitted with Huessner recorders (I think I have the spelling right) and after the flight we read the print out and saw that I had achieved G forces of nearly +8 G and -4 G. It was, I can assure you a very frightening experience. Dasu had also experienced similar G forces. Aspy Engineer was accordingly advised of what had happened and the whole Mystere project was put on hold. We were then told by Marcel Dassault that they had developed a modification to damp out the oscillations without sacrificing the excellent high mach number characteristics of the slab tail. This was the “Dashpot” modification operated by a switch in the cockpit and used for the ground attack role. Before carrying out our air tests both Dasu and I had to sign a document undertaking to do the flight at our own risk since the modification had not been fully cleared by the French. So with tongue in cheek we signed the document and I remember well that I undertook, rather foolishly, to do the first test flight myself since I was senior to Dasu and therefore it fell upon me to lead the way! Thankfully, however, at the end of the day there were no problems. Dasu confirmed my own opinion that the Mystere IV was acceptable with the “Dashpot” modification. I thereupon phoned Aspy Engineer in Paris and the aircraft was cleared for acceptance and the formalities were duly completed. At this point in time we had no idea at all that you had played

such a significant part in the Dashpot modification. Had I known I would have insisted on your presence at Melun-Villaroche and made you counter sign the document and spared us the galloping heartbeats that both Dasu and I had before the flight test!!

I hope you have not been too bored with the above dissertation and that you may now wish to look from “the other side of the hill” and view the whole canvas again. You can at least rest assured on how your book has stirred my responses and the high esteem in which I hold your book.

With regards and best wishes,

Yours sincerely,

Ranjan Dutt

**All photos are from the archives of
Vayu Aerospace & Defence Review**

AVM Ranjan Dutt was born in 1922 and passed away at Chennai on 13 August 2009 at the age of 87. Besides his stellar career with the Indian Air Force, under his leadership, Hindustan Aircraft metamorphosed into Hindustan Aeronautics Limited, and established a major licensed manufacturing programme, building over 450 MiG-21s in India.



Remembering Air Vice Marshal Ranjan Dutt, VrC



At Prestwick, Dutt second from right in front row holding a map

Air Vice Marshal Ranjan Dutt, one of the small number of Indian pilots to have operationally flown in the European theatre during World War II, passed away in Chennai on 13 August 2009. He was 87.

A swashbuckling archetypal fighter pilot, AVM Dutt flew a number of iconic World War II aircraft types, from a number of equally iconic RAF bases, and went on to senior positions in the post Independence Indian Air Force. He is one of very few Indians to have flown Hurricanes and Spitfires in action from famous RAF airfields such as Manston and Tangmere. During his career, he encountered and worked with aviation legends such as Douglas Bader, Roland Beamont, and much later Kurt Tank, and with public figures such as Jawaharlal Nehru, VK Krishna Menon and Alexei Kosygin. He was almost certainly the first Indian to fly a jet, and one of the first to break the sound barrier.

Ranjan Dutt was born in 1922, in Dacca in then undivided Bengal. He schooled at the Prince of Wales's Royal Indian Military College, the alma mater of numerous distinguished Indian and Pakistani military figures. He learned flying privately while still a schoolboy, and received his licence at the age of 16.

He was commissioned into the Indian Air Force on 1 August 1940 (he had overstated his age by a year to join up), in a special draft of Indian volunteers, all qualified pilots. At that early stage of the War, before the Americans and Russians had joined, and while the Battle of Britain was raging over England, this small draft of Indian pilots was seconded to the Royal Air Force in Britain, the 'X' Squad.

Ranjan Dutt was one of three Indian pilots from this batch to serve with No. 32 Squadron RAF (now The Royal Squadron), a particularly prestigious RAF fighter unit, home to aces such as Pete Brothers and Bob Stanford Tuck. He also served for a period in North Africa. He then returned to India, and served as one of the first Indian instructors at the Operational Training Unit in Risalpur, passing on his experience from Europe and North Africa.

He served for the rest of World War II in operational fighter squadrons, both RAF and IAF, in the North-West Frontier Province and in Burma. He flew during the decisive 1944 Battle of Imphal, with No 1 Squadron of the IAF, commanded at the time by Squadron Leader (now Marshal of the Indian Air Force) Arjan Singh.



Ranjan Dutt is seen nearest the camera. Others are (standing) Shiv Dev Singh (VCAS during 71 War) and MM Ghosh. Sitting: Ranjan Dutt, Erlic Pinto (later C-in-C WAC), Trilochan Singh.

In 1945 Ranjan Dutt was the first Indian selected for the prestigious Day Fighter Leaders Course, similar to modern-day Top Gun courses, in England. During the course, he worked with Douglas Bader, the RAF ace, and had the opportunity to fly the Gloster Meteor, the first British jet fighter, as well as captured German fighters, including the Focke Wulf FW-190.

He described the FW-190 as a “wonderful aircraft” and twenty years later, in a fly-on-the-wall moment for aviation historians, he would discuss its design in detail with Dr Kurt Tank, its designer, in Bangalore.

In March 1946, promoted as Squadron Leader, Ranjan Dutt took command of No.1 Squadron, in Quetta. He commanded it through a difficult period, that of the RIN mutiny, and other strains between the departing British and the Indians. Dutt stood up for the Indian point of view in a number of controversies of the time, and was subjected to some trials by a vindictive British officer. However, he remained unembittered, and personally was friendly with many British officers, though with his nationalism undiminished.

On Independence, No.1 Squadron was allocated to Pakistan and Dutt was left to find his way back to India. He chose to drive himself, in his own open top sports car. It was a risky drive; there were “dead bodies everywhere” he recalled, but through confidence, bluff, and the happenstance that his RIAF uniform was identical to the RPAF’s, he made it safely to India; although not without driving through a police barrier and shooting his way through a mob at the border.

Almost immediately, he was asked to return to Pakistan and escort a group of Indian airmen and their families back to India on a special train. Trains had been a frequent target for massacres, and Dutt was warned by an RAF officer that his train was to be attacked. He used his old RIMC connections to have the men issued with sten guns, and spent the entire journey in the engine cab, encouraging the clearly hostile driver and fireman along

by a judicious display of his personal sidearm, a 9mm Luger acquired in North Africa.

During the Kashmir operations of 1947–48, Ranjan Dutt served in a staff position but personally flew several vital missions on Hawker Tempest fighter bombers. On one such mission he scored a direct hit on an enemy bridge over the Kishenganga river. His aircraft was heavily shot up, but he nursed it back to Jammu. When he landed, Lt Col (later Maj Gen) Zorawar “Zoru” Singh, MC (another RIMC alumnus), is said to have taken one look at the damage, burst out, “My God!!” and authorised the immediate issue of a round of brandy. Dutt was decorated with the Vir Chakra for his services during these operations.

In 1959, at the age of 37, Ranjan Dutt achieved the rank of Air Vice Marshal, at a time when there were only about six posts of that rank in the entire Indian Air Force. He was probably the youngest holder of this rank in the Commonwealth, if not the world.

In 1961, he went on deputation to Hindustan Aircraft (as it was then) as Managing Director. Probably unique among HAL MDs, he personally flew HAL’s flagship product of the time, the Kurt Tank designed, Orpheus engined HF-24 Marut fighter.

During the IAF’s search for a supersonic interceptor, Dutt helped evaluate, and personally flew, the English Electric Lightning, the French Dassault Mirage III and the Russian Mikoyan-Gurevich MiG-21. Despite its limitations (and despite his strong “free market” political views) in India’s circumstances of the time, he assessed the MiG-21 as the best option for the country. Under his leadership Hindustan Aircraft metamorphosed into Hindustan Aeronautics Limited, and established a major licensed-manufacturing programme, building over 450 MiG-21s in India.

After leaving the IAF, Ranjan Dutt chose to withdraw from public view. He spent some years in retirement in Europe and returned to India around two years ago, to live out his time with his son in Chennai. ➡

Text: The Vayu Aerospace Review Team
(All photos Wikipedia)



Indian pilots arrival in London, 1940

HISTORY: FROM VAYU ISSUE-II MAR/APR 1993

THE SPRINGING TIGER

NO. 1 SQUADRON IAF IN WORLD WAR TWO

The blitzkrieg war in Europe had pushed Britain and its Allies to the wall and things were very grim during the last months of 1940. On 1 April 1941, the Indian Air Force's No.2 Squadron was formed and No.1 Squadron parted with many of its most experienced pilots and men to help get it airborne. No.1 Squadron carried out operations in the Tochi valley through till August 1941 when it was decided to exchange the Squadron's Harts with Lysander army co-operation high-wing monoplanes. Twelve Lysanders had been purchased for the Indian Air Force from funds subscribed by the citizens of Bombay and these were allotted to No.1 Squadron at Drigh Road. Conversion training was completed efficiently and swiftly and in September, No.1 Squadron flew north to Peshawar with their new aircraft. On 7 November, Sir Roger Lumley, the Governor of Bombay, formally presented the Lysanders. [Hereafter, No.1 Squadron and the city of Bombay were to retain a special relationship].



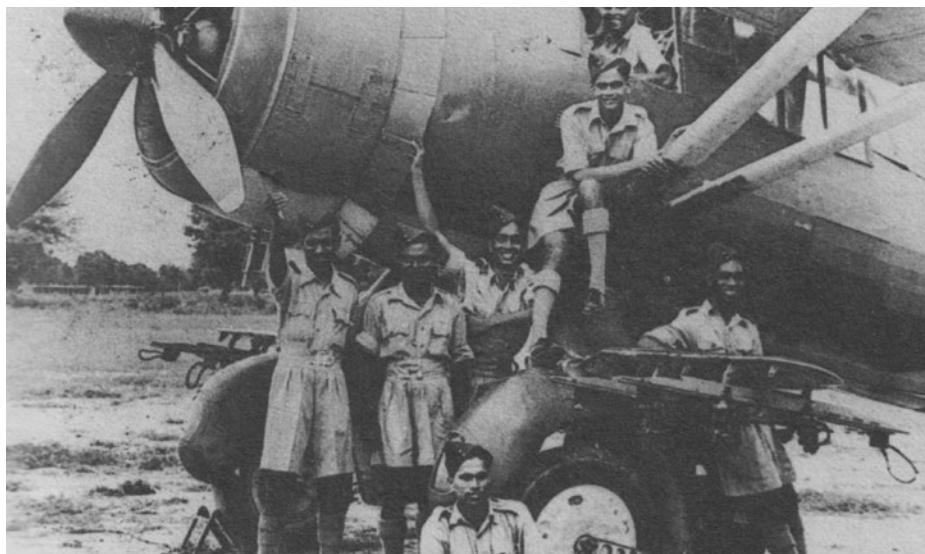
*Hurricane IIB of No. 1 Squadron at Imphal, 1944
[note Tiger's head painted below cockpit].*

On 7 December 1941, the Japanese fleet attacked the U.S. bases in Hawaii and launched a general offensive in S.E. Asia.

The World War had come to the East. Burma was in imminent danger of invasion and all available forces were mobilised to meet the threat.

The First Burma Campaign

No.1 Squadron, led by Sqn. Ldr. 'Jumbo' Majumdar started its move to the east, reaching Toungoo in Burma on 1st February 1942, and prepared to face the mighty Japanese forces with their handful of Lysanders, along with those of No. 28 Squadron, RAF. On the very first night itself, the Japanese air force raided Toungoo and Jumbo decided to reciprocate the very next day. Although meant only for tactical reconnaissance, No. 1 Squadron's personnel fixed pairs of 250 lb bombs on the Lysander wheel spats and No. 1 Squadron launched raids against the Japanese airfields at Mae-Haugswan, Cheingmai and Chiangrai in Siam, missions flown at low level without escort and evoking great praise from



During the first Burma campaign: Lysander army co-operation aircraft with ground crew (note bomb racks improvised on wheel spats).



Sqn. Ldr. Arjan Singh DFC (later Air Chief Marshal), commanding No.1 Squadron during the Second Burma Campaign.

the American Volunteer Group (AVG) and New Zealander pilots.

On 5 February 1942, No.1 Squadron was moved to Mingaladon, just outside Rangoon and the next day, Jumbo led Nos.1 and 28 Squadrons on a combined raid against Japanese – held dockyards and the railway junction at Moulmein. The ground troops were heartened by the display of Lysanders in flight echelon formation, staggering along with their bomb loads and direct hits were scored on the targets, the dockyard erupting in flames which could be seen from 60 miles away. The Lysanders flew back at almost ground level over the Martaban and General Wavell, the Commander-in-Chief, sent a personal signal congratulating Majumdar and the two Squadrons.



Hurricanes of No. 1 Squadron under improvised camouflage nets in Assam, 1944.

Mingaladon was frequently raided by the Japanese air force, the American Volunteer Group P-40s quick off the ground to engage the raiders and many furious dog fights were witnessed. At night, the allied fighters were dispersed to a number of satellite airstrips, two nicknamed Johnny Walker and John Haig after the famous brands of Scotch whisky! On 18 February, the RAF and AVG tore into 40 Japanese bombers and shot down 12 of them.

From Mingaladon, No.1 Squadron essentially carried out tactical and photo reconnaissance and operated important staff communication flights. During the second week of February, the Squadron was split, as the Chinese 5th Army in northern Burma urgently needed reconnaissance aircraft for army co-operation.

Sqn. Ldr. Majumdar and Flt.Lt. Prithipal Singh took several pilots and Lysanders north to Lashio, Flt. Lt. Prasad remained at Mingaladon with his flight while Flt. Lt. Raza went to Toungoo with his flight to carry out tactical recce. Thereafter, the various detachments were cut off from each other as the Japanese advanced and as communications steadily worsened, pilots and air gunners often improvised maintenance on their own. At Mingaladon, Flt. Lt. Prasad and his flight were busy bombing in the Pegu area and along the Siam border. The main body of No.1 Squadron kept the Japanese airstrip near Ywathit in Siam under check and to convince the doubting Chinese of the imminent danger, Sqn. Ldr. Majumdar had to once actually do a “touch and go” with his Lysander on the enemy airstrip!

Throughout the second half of February, Flt. Lt. Raza operated his sole Lysander from Toungoo, which was raided every day by the Japanese. Raza carried out daily recce of all approaches from the Sittang river along the Siam borders.

The Japanese hit Toungoo with ten bombers on 27 February, escorted by nine fighters but the next evening, Raza hit back at the Japanese airfield at Mehongson, strafing the enemy aircraft at dispersal and bombing the wireless cabin. On the 1st March, Raza flew the last Lysander out to Lashio, with Sgt. Cabinetmaker (the technician) driving away a steam engine loaded with refugees, the last



Flg. Offr. A.R. Pandit, (later Air Marshal), with DFC awarded for his part with No. 1 Squadron 1944–45.

one out of Toungoo before the Japanese occupation.

At Lashio, on 7 March, Flt. Lts. Raza and Rajinder Singh flew RAF pilots in their Lysanders to Mingaladon to recover two abandoned Hurricanes and all four aircraft then flew back to Magwe. For five days (7–11 March) the last six Lysanders of No.1 Squadron carried out continuous patrol as they retreated from Burma. On 12 March, the Lysanders were handed over to the Burmese Communication Flight and No.1 Squadron's pilots flew back to India in a USAAF Flying Fortress.

For his exceptional courage, leadership and fighting spirit, Sqn. Ldr. K. K. Majumdar was awarded the DFC, the first Indian to be so honoured, while WHO Harjinder Singh was awarded the MBE for his imaginative improvisation and keeping the Squadron at high serviceability in almost impossible conditions.

Hurricanes Received

After withdrawal from Burma, No. 1 Squadron re-assembled at Secundrabad, once more under command of Sqn. Ldr. S. Mukerjee, and then moved to Trichinopoly in May. In June, 14 pilots and 45 NCOs proceeded to No. 151 Operational Training Unit at Risalpur for conversion to the Hurricane IIB fighter, collecting their allotted aircraft at the Drigh Road

Depot and then, under brief command of Sqn. Ldr. Henry Runganadhan, went back to Trichinopoly. In October 1942, the Squadron's crest was officially approved, being a full Tiger profile enclosed in two concentric circles, officially approved, with the motto "Ittehad men shakti hai", later modified to "Ekta men shakti" (or "In unity there is strength"). Henry was succeeded by Sqn. Ldr. S.N. Goyal and the Squadron changed its location several times in the next year, being moved to Bairagarh then Chhara, and back to Risalpur. In May, a detachment went to Miranshah for bombing trials and then the Tigers moved to Kohat where command was assumed by Sqn. Ldr. Arjan Singh on 3rd September 1943. During the next few months, No. 1 Squadron detachments moved to Miranshah and carried out army co-operation exercises at Adampur, in the Punjab.

In early December 1943, Field Marshal Sir Claude Auchinleck visited the RAF Station at Kohat and inspected No.1 Squadron. Sqn. Ldr. Arjan Singh advocated the intense desire of No.1 Squadron to go back into battle. This was supported by the RAF Station Commander. Within a week of this request, No.1 Squadron (now with Hurricane IIBs) was ordered to move immediately to Imphal on the Manipur front where massive buildups were taking place on both sides of the Assam–Burma border. The next year was to be breathless with action and epoch marking in the already great history of the Tiger Squadron.

Back To War–And Glory

No.1 Squadron reached Imphal (Main) on 3 February 1944 and were to remain in action for a record period of 14 months, taking vital part in the fateful siege of Imphal followed by the trans–Chindwin and trans–Irrawaddy offenses. Once again, No.1 Squadron IAF shared the base with their old colleagues–in–arms No.28 Squadron RAF, both being Tactical Reconnaissance Units (Tac/R), co-operating closely with the Army.

The Tigers under Sqn. Ldr. Arjan Singh commenced operational flying immediately, with sector reconnaissances flown on the 5th February, carrying out offensive, tactical and photographic reconnaissances to

observe Japanese movements on the Chindwin, beyond Tiddim, and as far east as the Myitkyina–Mandalay railway, much valuable information being obtained by the Squadron.

The Japanese offensive against Imphal started on 8 March, attempting to cut off the 17th Indian Division as it retreated. No.1 Squadron's task was to locate the position of the retreating troops day to day and to keep the tracks leading from the Tiddim road under observation for Japanese movements. Fighting in the thick jungle–hills was confused. On 29 March, during a late evening reconnaissance flown by the C.O., Japanese troops were seen clambering down the hills. Landing back at Imphal Main to refuel, the entire Squadron was led back by Arjan Singh into the area before sunset and the Hurricanes hammered the enemy with machine guns and bombs, decimating the Japanese advance battalion, with 14 officers and 217 men killed and wounded.

During March, the Squadron had flown 366 sorties and no Japanese fighters were encountered yet but April 1944 was to be a crucial month when the siege of Imphal tightened and the Japanese came so close that the Imphal airfields were within range of enemy artillery fire. Maximum air effort was put in by No.1 Squadron, flying 412 sorties in April, tactical reconnaissance mostly over the Tiddim road, Palel–Tamu Sittaung road, Imphal–Kohima road and the Ukhrul road. The Tigers strafed bashas, mechanical transport, gun positions and troops. In turn, Japanese Kawasaki Ki48 and Mitsubishi Ki21 bombers raided Imphal on 15 April, damaging two of No.1 Squadron's Hurricanes.

During May 1944, the weather deteriorated with early monsoon rains which curtailed flying yet No.1 Squadron flew 372 sorties, including

32 by night, that month, which also had the loss of a long range reconnaissance Hurricane to prowling Japanese Nakajima Ki 43 ("Oscar") fighters. No.1 Squadron's aircraft ranged over almost the entire battlefield, carrying out continuous tactical reconnaissance as in the area north–east of Imphal the Japanese were being gradually pushed back.

June 1944 was an even more trying month, the runways waterlogged while rain storms made flying hazardous. No. 28 Squadron RAF had been pulled out of Imphal, leaving No. 1 Squadron IAF solely responsible for tactical reconnaissance in the area, flying 327 sorties that month. The Tiger's Hurricane IIBs (with machine guns) were replaced by Hurricane IICs (with cannon), for greater effect in ground attack missions. The siege of Imphal was broken by the month–end and the Squadron was tasked to keep harrassing the retreating Japanese, mainly in the Ukhrul area and south of Imphal. Reconnaissance was carried out over the roads and tracks from Palel to Sittaung on the Chindwin, from Tamu to Kamjong, from Htinzin to Yazagyo, the Chindwin river and so on, a total of 307 sorties being flown in July.

During the ensuing battle for Central Burma, the British–Indian forces mounted relentless pressure



Armed, fuelled and ready to go: Hurricanes of No. 1 Squadron at Imphal

on the retreating Japanese beyond the Chindwin and No.1 Squadron, as part of the 221 Group, operated from forward bases covering a front of some 200 miles to the limits of their endurance and range. In August, No.1 Squadron flew 354 sorties, with targets of opportunity being attacked, but deteriorating weather in September reduced sorties to 292, but these were longer in duration, the Hurricanes fitted with extra fuel tanks. On 17 September, the Tigers attacked bunkers on a hill feature in the Yazagyo area and Taukkyan airfield south-west of Kalemyo. And so into October, with the Squadron flying a record 439 operational missions totalling 780 hours, the Tigers operating to as far as the Mandalay–Myitkyina railway. The value of No.1 Squadron's tactical reconnaissance was gratefully acknowledged by XXXIII Corps, the Squadron commended "for the skill and speed with which air photographs have been produced and dropped on forward troops".

"One" Are Second To None

The Japanese continued to fall back and in November, No.1 Squadron were discovering their lines of retreat. With an average strength of 17 pilots, the Tigers flew 524 operational sorties, totaling just over 1000 flying hours, a most remarkable effort! On the night of 3 November, Sqn. Ldr. Arjan Singh had carried out a vital low level tac-recce of the bridge at Hpaungzeik, enabling the allies to move across and No.1 Squadron received a notable appreciation of its efforts from GOC 20th Indian Division who presented them with a Japanese sword of honour captured in the battle of Imphal in recognition of "assistance readily and courageously given by its pilots and ground crews". Reinforced by their old colleagues from No.28 Squadron RAF, the Tiger's flew 335 sorties for the XIV Army in December 1944, which saw beginning of the trans-Chindwin offensive.

In January 1945, now under command of Sqn. Ldr. Raja Ram, and given the task of tac/recce for IV Corps which had been secretly moved to the south for the advance towards the Irrawaddy and the strategic airfield and communication centre of Meiktila,

No.1 Squadron moved from Imphal to an airstrip at Kan, north of Gangaw and the Tigers entered a new phase of intensive activity. The Irrawaddy was crossed on 14 February 1945 and the Squadron covered the deception movements southwards, up to Sale, Mondaing and Tanaunggyin, north of the Myingyan Meiktila road. A detachment of No.1 Squadron was moved to Sinthe, north of Pyinchaung, to cover the Irrawaddy crossing and in two days, the detachment flew 60 sorties. As the offensive made progress, the Squadron also extended the area of its activity but intense Japanese ack ack fire claimed four aircraft damaged and one shot down in February 1945.

Meiktila fell in March and fierce Japanese counter attacks were held with the aid of fighter-bombers. No.1 Squadron was constantly in the air and flew 618 hours in March 1945, inspite of the fact that nine aircraft had been damaged by a sneak Japanese air raid on the airfield early in the month. By the month-end, No.1 Squadron started to shepherd No.7 Squadron into the Sinthe area, the "Battle Axes" tasked to relieve the veteran "Tigers" as the Japanese retreated further.

This brought to a close a fantastic operational tour of 14 months in the course of which No.1 Squadron flew

4813 operational sorties totalling 7220 hours. The value and reliability of the Squadron's vital work was recognised time and again and in his farewell message, the AOC 221 Group said "the reliability of their Tac/R and photographic work has remained at a high level throughout and ground crews have set a record of serviceability of aircraft which is second to none in any Air Force in the World". No.1 Squadron's Hurricanes were kept at a 99% serviceability, the highest in the 3rd Tactical Air Force. The Squadron Commander had been awarded an immediate DFC in the field, Lord Louis Mountbatten pinning the coveted medal personally on Sqn. Ldr. Arjan Singh and on completion of its operational tour, another 6 DFCs were awarded to No.1 Squadron, plus innumerable other awards including that to the SEO, Flt. Lt. Ram Singh.

No.1 Squadron of the now Royal Indian Air Force returned to India and were posted back to Kohat in April–May 1945 from where they had set out for war in late 1943. ➡

Extract from "Tigers in the Sky", published on occasion of the Diamond Jubilee of No. 1 Squadron by Pushpinder Singh.



At Imphal, May 1944 : (left to right) Flg Offr. Rao, Flt. Lt. Herbert P. Gnanolivu (the M.O.) and Flt. Lt. Raja Ram, with 'Banzo', No.1 Squadron's mascot.

HISTORY: FROM VAYU ISSUE-II MAR/APR 1995

Raj Mahindra

Raj Mahindra, Scientist Emeritus, had a most brilliant career spanning 45 years in aeronautics, from 1950 when he was an aerodynamics engineer with de Havilland at Hatfield to his stewardship of the Saras light transport aircraft joint project between NAL and MDB. Raj literally died with his boots on, in the midst of crucial Joint Project Management Board meetings with the Russians.

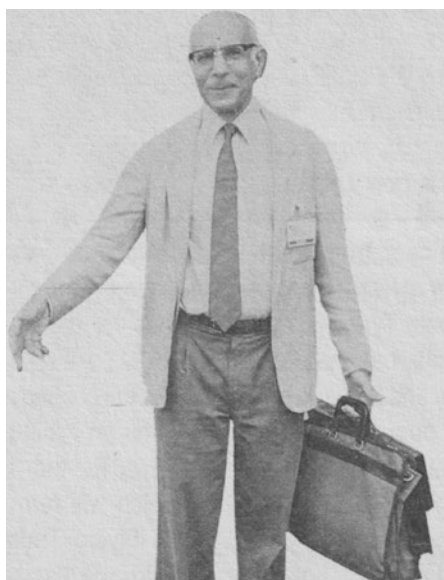
Raj Mahindra joined HAL in 1959 and rose to become Managing Director, Design & Development in 1977, a position where he distinguished himself till retirement in 1983. Earlier, in 1961, Raj was the Senior Designer in-charge of the HJT-16 Kiran basic jet trainer programme as also all the advanced combat aircraft projects in the '60s and '70s.

Raj Mahindra was on the Editorial Panel of the Vayu Aerospace Review for many decades.

The nation, the aerospace community, and this Journal has lost one of its most brilliant scientists, guide and friend.

Raj Mahindra, the distinguished aircraft designer, born on 15 September 1925, died in his sleep in Delhi on the night of 15 February 1995 following a cardiac arrest. He leaves behind his wife Peggy whom he married in the United Kingdom in March 1952 and three brothers and two sisters. He was in Delhi with a team from the National Aerospace Laboratories (NAL) and the Russian Myasishchev Design Bureau for a meeting with the Director General, CSIR to discuss the future course of action on the Light Transport Aircraft (LTA) programme proposed by NAL and a visit to Kanpur. Mistaking an incipient heart attack that afternoon for stomach upset while the discussions were going on, he continued with the meetings till about 9.30 p.m. He thus literally gave his life to a cause which he ardently believed in all his life: self-reliance in aeronautics; a cause which brought him back from UK in 1959, when he was hired by HAL.

Raj, as he was affectionately called, went to UK just at the time of partition to study aeronautics at Imperial College of Science and Technology in London, after taking his M.Sc. in Physics from Punjab University, Lahore. In school he was in good company; Abdus Salam, the future Nobel Laureate was his classmate. Raj, Salam and two others formed a close team of competing school boys. In Imperial College, he did so well that his Professor, Sir Arnold Hall, suggested that he should drop his D.I.C. programme and instead go directly for his Master's degree from London University. While he was working for it, the De Havilland



Raj Mahindra: 1925-95.

Aircraft Company approached Sir Arnold to recommend a person who had the potential to become a good designer. On Sir Arnold's recommendation, Raj

who was keen to get involved in design, left his studies and joined De Havilland and later D. Napiers and Sons and subsequently Sir George Godfrey and Partners. During this phase of his life, he was involved in various aspects of design of aircraft and missiles; an invaluable training for someone who was to go on to become a future aircraft designer in his own right.

It is a truism that aircraft designers are born and not made and that one requires about a decade or more of rigorous training after formal education to become a good designer. Raj was the stuff of which such people were made.

Raj was restless in HAL to have his own aircraft programme. Dr. V.M. Ghatage, the then Chief Designer of HAL, who laid the foundations for self-reliance in aeronautics initiated the design and development of the jet trainer HJT 16 (Kiran). He spotted the potential of Raj and invited him to



The last design: NAL Saras/MDB Duet.

take over the day to day responsibilities for the programme. Raj gave his best to it and in the process created an excellent design team. A measure of his contribution to this programme was that through his approvals on the drawings, he had the statutory responsibility for any failure. That it was a highly successful programme is known from the fact that even today, it is acclaimed as one of the best aircraft of its class.

Over the years, Raj held many important positions in the country. Apart from his involvement with the jet trainer, there is hardly any aircraft design programme with which he was not associated. He was the Senior Designer in HAL from 1961–70. In 1970, he was made the General Manager of the Helicopter Division and had the additional responsibility as the Chief Designer of the Helicopter Design Bureau. In this capacity, he started the design studies for the Advanced Light Helicopter which has been successfully flown recently. He was the General Manager of Aircraft Division, Bangalore from 1975–77 and Managing Director, Design and Development from 1977 till the time he retired from this position in February 1983. He also held the position of the Executive Delegate from India for the Commonwealth Advisory Aeronautical Research Council (CAARC). After retirement, in February 1983 from HAL, he continued his association with the design and development of the Light Combat Aircraft (LCA) as the chief design consultant. He was undoubtedly the chief architect of the programme in its formative phase.

During the last few years before his retirement as Managing Director of the HAL Design Bureau, Raj spent virtually all his time conceptualising the design configuration of the LCA. He worked tirelessly to achieve the critical design objectives, refining the configuration time and again. His involvement with LCA, continued till he resigned from the Aeronautical Development Agency in 1985. With his vast experience in virtually every phase of the aircraft industry, he played a vital role in creating the organisation structure of ADA to fund, manage and monitor the LCA programme. The nation should recognise its debt of gratitude when the LCA flies successfully for his

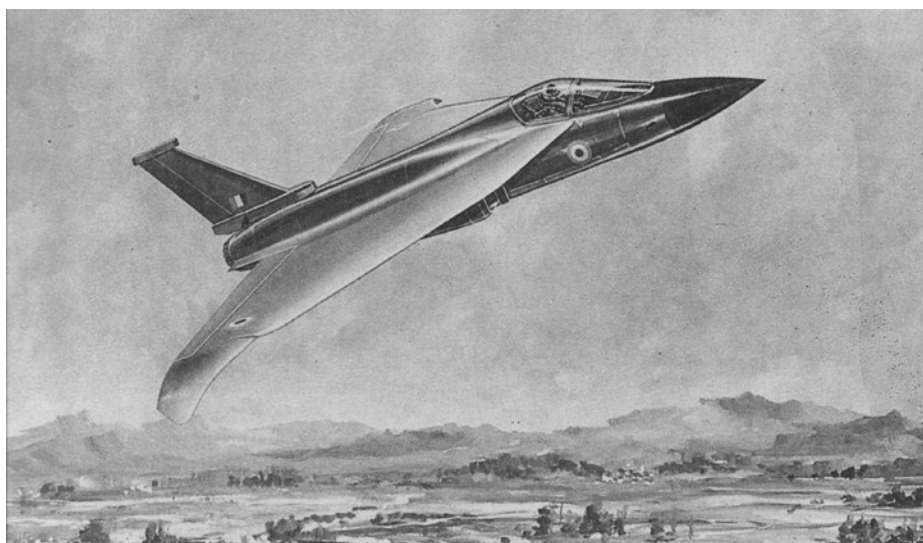


contributions in the formative stages of this programme.

If Raj was disappointed by his departure from ADA, he never showed it. He put it all behind him. This restless person plunged himself into a new odyssey of making countless studies on operation of fourth level aircraft which could one day be built in the country. One such study (on the Light Transport Aircraft – LTA) caught the attention of Prof Satish Dhawan, former secretary, Department of Space and Chairman of the Research Council of NAL. He brought it to the attention of Prof R Narasimha, the then Director of NAL, who picked it up and made LTA and NAL programme. If Narasimha pushed the LTA idea, Raj gave it substance; he worked tirelessly for the LTA till his last breath.

Hundreds of his admirers hope that the LTA will go on to become Raj Mahindra's enduring legacy to Indian aviation. Persons like Raj are hard to come by: he was so gentle and self effacing about his abilities, put every one around him at ease and had this great sense of fair play. But on matters of science and technology, and on the question of self-reliance, he stood his ground and was unwilling to compromise his personal integrity and be overruled by ignorant lesser mortals. Time and again he was proved right on the stands he took. Indian aviation has suffered a serious setback. He will be very much missed by the people who have known him for his professional and personal qualities. ➡

Dr. S.R. Valluri



Depiction of India's Light Combat Aircraft (LCA).

25 Years Back

**From Vayu Aerospace Review
Issue III/1999**

IAF Launches Air Strikes in Kargil Sector

Indian Air Force fighter bombers and helicopter gunships went into action on 26 May 1999, with strike missions launched against heavily armed, Pakistani-led infiltrators occupying the higher reaches of Kashmir's Dras and Kargil sectors. The strikes were carried out against 6 different locations without the employment of bombs but with rockets and strafing. This took place well inside the Indian side of the Line of Control (LOC).

PSLV C-2 Launched

Even as news of the Indian Air Force going into action in the country's extreme north, was coming through, India's first multiple satellite launch was taking place from Sriharikota in the south-eastern part of the peninsula.

Naval Trishul Tested

The naval version of the Trishul surface-to-air missile was successfully test fired from INS Dronacharya, the test-firing range near Cochin on 26 May 1999. Developed by DR&DO in partnership with BEL, BHEL, Bharat Dynamics and various Naval establishments, the naval Trishul is being projected as a supersonic, sea-skimming anti-missile missile, to be delivered to the Navy in 2000.

First Steps for Indian Airlines Privatisation

On May 10, the Cabinet Committee on Economic Affairs cleared Indian Airlines to raise funds from the capital market, a major step in paving the way for its privatisation. The Government has also agreed to infuse Rs.325 crores equity (US\$ 80m) into the domestic airline, and so in effect approving the implementation of the Kelkar Committee report on restructuring of the national airline.

10 More Sukhoi Su-30s By End-99

Air Chief Marshal Anil Y Tipnis, Chief of Air Staff has indicated that the IAF is expected to receive another 10 Su-30s by the end of the current year. Stating this in an informal discussion with the media at Pune on 5 May, the CAS admitted that "the earlier 8 Sukhoi Su-30s received were not fitted with the special avionics system as specified by us".

"Top Priority For AJT"

In his opening address at the Air Force Commanders Conference in New Delhi on 19 April, Chief of Air Staff, Air Chief Marshal AY Tipnis said that "induction of the Advanced Jet Trainer must be accorded the highest priority to ensure operational preparedness of the IAF".

MiG-21 Upgrade Delays Criticised

The Parliament's Standing Committee on Defence has asked the Government to review its project with Russia for modernisation of the MiG-21bis since not even two aircraft have been upgraded in the last three years under the Rs 1,200 crore (US\$ 300m) contract.

"Gorshkov" Deal Progresses

Negotiations for the Indian purchase of the Russian aircraft carrier Admiral Gorshkov are to enter a crucial stage late in May, with the visit of a high-level delegation from Moscow to New Delhi. To follow up the discussions during the visit, the Indian Navy has formed a senior level naval delegation, under a Vice Admiral, to visit Russia thereafter.

Exercise "Blue Crane"

For the first time, an Indian Air Force (IAF) transport aircraft participated in a 17-nation military exercise that included four NATO members, on the invitation of South Africa. The 3 week exercise, code named "Blue Crane", organised by the South African armed forces, was also attended by six Indian Army observers and an Indian Navy warship, INS Sujata, an offshore patrol vessel.

International Airport At Kangra

A team from the Airports Authority of India (AAI) have visited Darkata, to explore the possibility of setting up an international level airport in Kangra district. The team reportedly found that a high plateau of almost 2 km length would be available for the project.

Sahara Airlines' 1st B-737-700

Sahara Airlines took delivery (April 28) of its first Boeing Next Generation 737-700 from Ansett Worldwide Aviation Services and The Boeing Company. Attending the milestone event were Capt SPS Sandhu, general manager of Operations (Sahara Airlines), his team, and Dinesh Keskar, president (Boeing India).

Agni III "Planned"

Indian scientists are reportedly developing an extended-range version of the intermediate range ballistic missile Agni III with a 3,500 km reach, "capable of engaging targets deep inside China", according to the Jane's Defence Weekly.

Tale Spin

Pushpak then and Pushpak now!



HAL HUL-26 Pushpak (left) from the late 1950's and 1960's vs ISRO Reusable Launch Vehicle technology (RLV LEX-02) Pushpak from 2024. Two different eras and we love it.

Next venue for your super cool party?

USA's Seattle Museum of Flight is the place to be and book your gala event! The sole surviving example of the Lockheed M-21 Blackbird with a D-21B drone mounted on the back and hanging above the diners is a sight to behold. When can we book our table?



Dragonfly for Saturn's moon Titan

NASA has confirmed its Dragonfly rotorcraft mission to Saturn's organic rich moon Titan. The decision allows the mission to progress to completion of final design, followed by the construction and testing of the entire spacecraft and science instruments. This follows the super success of the Mars Helicopter that performed brilliantly on planet Mars.



Dragonfly (left) and the very successful Mars Helicopter (right).

Did you know?



A beautiful painting at The National Army Museum, London of Subadar Khudadad Khan VC (1888–1971), 10th Baluch Regiment 1952. He was the first soldier of the British Indian Army to be awarded the Victoria Cross (VC) for his actions on the Western Front in 1914. Despite being wounded, he kept firing his machine gun to defend his position after the rest of his detachment had been killed. Khudadad Khan's old regiment exists today as the Baloch Regiment in the Pakistan Army. 🇵🇰

Afterburner

FLY NAVY, FLY

A HISTORY OF INDIAN NAVAL AVIATION



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