

VAYU

Aerospace & Defence Review



The IAF at 88
Rafales of the IAF
The Golden Arrows

IAF Force Multipliers
Looping over Dacca
Dalip Singh Majithia

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Dassault Rafale F3-R of No. 17 Squadron at Ambala (photo by Angad Singh)

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Aerospace & Defence Review

V/2020

25 The IAF's 88th Year



As the Indian Air Force marks the 88th year of its existence, Sankalan Chattopadhyay writes on its *Past, Present and Future*. He looks at the present fighter fleet and then ahead to 2035, by which time the present legacy fleet would have been phased out. With the ominous spectre of a two-front situation staring at India, the Government must move ahead to meet the sanctioned strength of 42 combat squadrons for the IAF.

29 The Way Ahead



Shwetabh Singh urges that in context of dwindling number of fighter squadrons, it is imperative that the IAF induct numbers of 'Force Multipliers' in the shape of more AARs, C3I and AEW&C aircraft as also multiple standoff weapons and PGMs.

32 The Rafale – for all Reasons



In this cover story on the Rafale, Sayan Majumdar rationalises on the decision of the Indian Government to select the Dassault Rafale, the first tranche of these omnireole fighters just inducted by the IAF. The F3-R variant has been developed as a multirole strike fighter

with priorities on nuclear strike and precision conventional strike, while retaining formidable air superiority attributes.

36 The Golden Arrows, now with Rafales



No.17 Squadron (Golden Arrows) are the first IAF unit with the Dassault Rafale and the squadron's history is traced by the *Vayu* editorial team from its initial equipment with Harvard piston-engined trainers to Vampires, Hunters and finally MiG-21s before number plating in 2016 and resurrection with the Rafale in 2019.

41 "My tribute to Jasjit Sir"



Even as *The Golden Arrows* take off in their new avatar, Air Marshal (R) Harish Masand pays a tribute to his CO, then Wg Cdr later Air Commodore Jasjit Singh, who commanded No.17 Squadron 45 years earlier, flying the MiG-21 from AFS Halwara. "Jasjit Sir was a remarkable man, thinker and strategist and I have tried to pay my tribute to him".

44 P&W in India



Vayu interviews Ashmita Sethi, President and Country head of Pratt & Whitney which company, apart from their large

portfolio in commercial aviation, also have considerable presence in India in military aviation.

Vayu invited Thales, MBDA, Rolls-Royce, Boeing, Saab and 'MiG' to articulate on their relationship, present and projected into the future with the Indian Air Force as it marks the 88th Anniversary year.

58 Vayu Interview with Lockheed Martin



With the Lockheed Martin C-130J considered as backbone of the IAF's tactical airlift force, *Vayu* interviewed with William Blair, VP & Chief Executive, Lockheed Martin in India alongside Kurt Knust, Director of the F-21 India programme.

75 The Quintessential Aviator

On 27 July 2020, Dalip Singh Majithia turned 100 years of age, the eldest, veteran IAF officer of the sub-continent extant. Editors of *Vayu* are privileged to know Dalip Singh Majithia, that epitome of a gentlemen aviator whose total recall of seminal events in the last century is not only remarkable but a blessing for aviation historians in India – and the world!

83 'That' loop over Dacca

Aditi Patwardhan writes about Air Commodore Suren 'Bundle' Tyagi who looped over Dacca in his MiG-21 FL just after an attack on the PAF airfield in December 1971!

Also : The Special Frontier Force; EDGE acquires AMMROC; Paris Parade 2020; Saber Junction 2020; Blue Wings and MAGDAYs 2020; "From cadets to pilots".

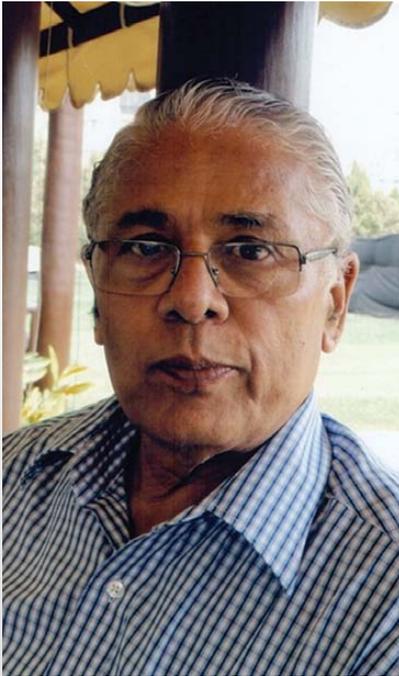
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Farewell, Nirmal ji



Cdr Nirmal, second from the right, with the Vayu team at Aero India 2011

Vayu Aerospace & Defence Review lost their long-standing Bangalore Editor, the veteran Commander Munipella Nirmal (IN) from medical complications after recovering from Covid while still at the Command Hospital in Bangalore on 5 August 2020.

Commander M Nirmal was with the *Vayu* for 17 years, joining the Journal soon after he retired from Hindustan Aeronautics Limited (HAL) in April 2003. *Vayu's* Issue II/2003, welcomed him, publishing an iconic photograph of his standing next to the HAL Gnat, mounted at Minsk Square, close to HAL's Corporate Office.

As written at the time, Commander M Nirmal had for long been a well known personality at the Hindustan Aeronautics Limited Corporate Office, Bangalore and at various expositions, shows and events in many parts of the world, his pleasant personality, readiness to help and infectious confidence being the hallmark.

Nirmal was a Naval aviator for twenty years before his second career brought him to HAL. After getting his BE in Mechanical Engineering in 1966, he went to the Naval College of Engineering at INS *Shivaji* (for Marine Engineering) and thence to the Air Force Technical College at Bangalore for Aeronautical Engineering in 1969.

During his service with the Indian Navy, Nirmal was involved in maintenance support of various aircraft types and their powerplants including the Westland Sea King ASW helicopter and its Rolls Royce Gnome engine before doing sea time on board the cruiser INS *Delhi* and frigate INS *Betwa*. He was Station Air Engineering Officer at the Naval Air Station INS *Garuda*, at Cochin, responsible for 3rd and 4th line servicing of Sea Hawks, Alizes and Kirans of the Navy before moving to INAS 330, operating Sea Kings.

His broad-based experience then included posting as Command Air Technical Officer at INS *Kunjali* Bombay, and later in-charge of the Base Maintenance facility at INS *Hansa* in Goa where Ilyushin I1-38s and Kamov 25/27s were based. In 1987, he became Senior Staff Technical Officer to FONA before, in 1988, joining HAL in the Customer Services Department, providing support to Dornier 228 operators from the Air Force, Navy and Coast Guard.

In 1992, Nirmal was posted to HAL's Planning Department, monitoring production and preparing project reports. Nirmal's natural forte was evident when he moved to the Marketing and Public Relations Department in 1993, where he was to be for the next decade, organising HAL's participation at air shows, both at Yelahanka since 1993 and

international exhibitions at Le Bourget, Singapore, Dubai, Malaysia and Abu Dhabi.

Commander Nirmal's role in preparing and producing HAL's 60th Anniversary Book (*Diamonds in the Sky*) and getting the Department of Posts & Telegraphs to release four special stamps on HAL in the Centennial year of man's first powered flight, were most commendable indeed.

Then, over the next 17 years with *Vayu Aerospace Review*, Cdr Nirmal verily became fountainhead of the Journal at Bangalore and elsewhere, coordinating visits to various aerospace establishments in the city and beyond, interviewing executives of Hindustan Aeronautics Limited, National Aerospace Laboratory, Aeronautical Development Agency, various DRDO establishments and so many more. Cdr Nirmal was at the forefront of *Vayu's* continuous participation at the Air Shows which began at Yelahanka in 1993, including editing of Show Dailies, being Master of Ceremony at the unique *Great Indian Aviation Quiz Contest* at Aero India 2005 where Marshal of the Air Force Arjan Singh DFC honoured the prize winners and much, much more.

He will be greatly missed by his family, the many friends and his colleagues in the Navy, HAL and very much, by the *Vayu*. 🦋

RIP Nirmal ji



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Welcome, Rafale

The formal induction of the first batch of five Rafale multirole fighter jets into 17 Squadron at Ambala air base marks a new chapter for the Indian Air Force — the first imported fighter to be operationalised since the Russian Sukhoi Su-30s in the late 1990s. The jets had landed in the country in end July, nearly four years after the signing of an inter-governmental agreement with France to buy 36 jets for Rs 59,000 crore. The entire fleet is expected to be in India by end-2021 going some way toward filling the country's larger requirement of 126 such jets. It has taken almost 19 years to acquire the new generation fighter jets, a pointer to the painfully slow defence procurement and planning processes.

Amid the unprecedented border faceoff with China, arrival of the fighters does provide a boost for military capability, but is it enough to alter the balance of power or signal a clear strategic shift in India's favour? For the IAF, the depleting strength of fighter jets remains a huge challenge, and any possible collusion between the Pakistani and Chinese air forces only adds to the concerns. The Ministry of Defence recently approved the purchase of 21 Russian MiG-29 and 12 Sukhoi Su-30 MKI fighters as replacements. However, against an authorisation of 42 squadrons, the IAF is expected to have only 29 in 2023.

At the ceremony, Defence Minister Rajnath Singh described the acquisition as a game-changer, while his French counterpart said in military terms, Rafale — which literally means a 'gust of wind' or a 'burst of fire' — lends India a world class capability and its Air Force an incredible sovereign tool. India's military prowess and commitment is unquestioned. While a loud and unabashed reminder to the enemy of the price to pay for any misadventure is normal in these times, a toned-down grandstanding is not a sign of weakness. To the contrary, a country that sees itself as a major player in global politics should practise sobriety by saying less and doing more.

From The Tribune

Facing the Dragon

Tensions along the LAC have escalated with Chinese troops firing in the air to intimidate the Indian side at Mukhpari Top in eastern Ladakh's Chushul sector. This is the first time in 45 years that firing has taken place at the LAC, further exemplifying China's disregard for the 1993 Peace and Tranquillity Agreement and subsequent arrangements to ensure calm at the LAC. It's clear that China wants to unilaterally push the LAC westwards and is extremely upset with Indian forces preemptively occupying strategic heights on the Kailash range — on the Indian side of the LAC — that gives them a clear line of sight of the crucial PLA Moldo garrison and helps them dominate all ingress routes through the Spanggur Gap.

But eastern Ladakh is only one part of the larger strategic-security tussle in play. According to intel reports, the PLA has violated the LAC several times over the past two months in Arunachal Pradesh, Sikkim and Uttarakhand. Thus, China could keep the entire LAC hot and force a war of attrition on India. With far deeper pockets, and having contained the Covid pandemic, Beijing may think it can out manoeuvre New Delhi here.

To tackle this challenge, India has no choice but to adopt a whole of government response whereby it must work on multiple fronts.

It will need bigger spending to shore up its defences. In this regard, global rating agencies such as Fitch and Goldman Sachs forecast the Indian economy contracting by 10-15% in the current fiscal. This needs to be quickly arrested through a big fiscal stimulus package to revive growth in the short term, and simultaneously enacting deep reforms to put the economy on a high growth trajectory.

On the foreign policy front, India must push for an alliance of democracies to counter China. This should include, immediately, asking for advanced satellite intel from the US for greater domain awareness along the LAC (assuming New Delhi hasn't already procured this). Domestically, the government must foster social cohesion and unity at home, which must include arresting the present trend of political polarisation for perceived short term electoral ends. Central agencies must act in an independent and non-partisan manner. States' grievances on GST compensation should be addressed. We must recognise that China today poses an unprecedented strategic-security challenge. The only way we can rise to the occasion is if we become internally strong by mobilising all available resources.

From The Times of India

How to Tame Your Dragon

The meeting between the foreign ministers of India and China made it clear that the situation along the Line of Actual Control (LoAC) and beyond is unlikely to defuse quickly or easily. Though the meeting ended with a joint statement and a five-point action agenda for peace, China is intent on blaming India for the stand-off while India has stressed the necessity of restoring the pre-April 2020 status along the LoAC. Notably, the joint statement leaves actual disengagement not to any political imperative but to the troops on the border and their continued dialogue. The meeting at the political level should serve, it is to be hoped, at least to prevent further escalation of the stand-off into active hostilities.

The restoration of peace and tranquillity is unlikely to be easy. Ahead of the meeting and after it, Beijing blamed India for the situation at the border. India has raised concern about China's troop build-up in the region and along the LAC. The joint statement emphasises the need for dialogue, confidence-building measures and other existing mechanisms. India has maintained the need for dialogue, and the ministerial meeting in Russia is reflective of that. However, confrontation with China, instances of which have increased over the past few years, is unlikely to reduce. India's proactive efforts to forge alliances and partnerships with key global players, concerted effort to improve infrastructure in the border region, and the renewed focus on the development of Ladakh are seen as unwelcome developments by Beijing. The Chinese Communist Party's English language newspaper literally warns New Delhi against close partnerships with the US and other powers.

In response, India must deepen and widen its partnership with the US, Japan, Australia, Southeast Asian countries, the European Union, Russia, West Asia and key Arab and African states, deploying economic, diplomatic and cultural resources to strengthen its credentials as a counter weight to China in the region. In other words, to deal with the surly dragon, New Delhi must go beyond dialogue with Beijing.

From The Economic Times

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A New Equilibrium

The events on the night of August 29-30 once again highlighted the gravity of the situation in the ongoing standoff between the Indian Army and Chinese PLA in Ladakh. It is to the credit of the Indian Army that the troops were alert and displayed resilience in pre-empting the designs of the PLA on the critical southern bank of Pangong Tso.

There is growing frustration at China's intransigence vis-a-vis the confrontation that started in April. There has been no positive outcome on ground, despite diplomatic overtures, innumerable military interactions and three apex-level marathon discussions between the corps commanders. Talks between at the highest diplomatic levels have not given tangible results. Instead of withdrawing, there is a massive build-up of Chinese forces in the areas of intrusion.

India must not fall into complacency and take measures for not only forestalling Chinese belligerence but be poised for gaining the upper hand in case of the extreme eventuality of an armed confrontation. The armed forces need to ensure a high state of "operational readiness" until the onset of the severe winter. Operational logistics need to be pragmatic. The administrative challenge of maintaining troop accretions at this altitude, during the winter season, will be of serious concern. The political-diplomatic initiative will need to be on an overdrive to ensure that the current standoff is resolved without conflict. But in case of conflict, it must be localised to the Ladakh region. Lastly, it is important to ensure that the country is not faced with a "two-front conflict".

There should be no doubt that in any military confrontation we are on our own and have to be prepared accordingly. Also, irrespective of all the hype of "new-age warfare" and "maritime power", limited conventional conflict is still the reality for India due to the expanse of its disputed borders. Therefore, there is a need for clarity at the apex level that expenses incurred for sharpening the arsenal of the armed forces is money well spent. Till Make in India-Defence matures, there is a need for time-bound provisioning of essential war-waging wherewithal.

The prime minister's resolute leadership has resulted in a meaningful disapproval of Chinese high handedness. It has also led to the banning of nearly 200 Chinese applications. These applications were being exploited by Chinese companies, for illegal data mining. These technologically advanced companies are intricately linked to the PLA and Communist Party of China.

Politically and diplomatically, we must ensure continued US and international pressure at China's other pain points — the South China Sea, Taiwan, Hong Kong. We need to continue to isolate China on its insidious role in starting the current pandemic. We need to strengthen the Quad and other multilateral regional groupings of like-minded countries. There is also a need to create a US-led international consensus that deters Pakistan from any aggressive plans while we are addressing the northern neighbour. We need to seriously consider signalling with our "strategic assets" that China limit the use of missiles in any conflict, as it is difficult to distinguish between nuclear and conventional missiles in a hot war situation. To enhance deterrence, India must spell out its red lines, especially when it

comes to territorial intrusions. We need to insist on the reworking of current bilateral agreements with an unequivocal "no war pact" with China and a categorical, time-bound resolution of all border issues.

It is my firm understanding that the India-China relationship has been irreversibly altered. The recent posturing in the Chushul sector is indicative of India's resoluteness to tackle border issues. It has for the first time taken the initiative to change the narrative. This will presumably lead to breaking the deadlock. However, the loss of trust and China's insidious statecraft will also weigh heavily on future engagements. In the words of the NSA and foreign minister, India has realised that it needs to create a new equilibrium in its future relations with its neighbours, including China.

Lt Gen (R) Arun Sahni in *The Indian Express*

Far from self-reliant

The much-touted *Atmanirbharta* in the defence sector is a bridge too far, going by the Comptroller and Auditor General's (CAG) report on Management of Defence Offsets, tabled in Parliament on 23 September 2020. The national auditor has taken to task French aerospace major Dassault Aviation and European missile-maker MBDA for not fulfilling their offset obligations of offering high technology to India under the Rs 59,000-crore Rafale aircraft deal. The two firms are yet to provide technological assistance sought by the Defence Research and Development Organisation for indigenous development of an engine for the Light Combat Aircraft Tejas. The CAG has also observed that defence ranks an abysmal 62nd out of 63 sectors receiving FDI (foreign direct investment), while pointing out lacunae in the country's offset policy. Foreign defence entities are mandated to spend at least 30 per cent of the total contract value in India through procurement of components or setting up of research and development facilities, but there is no effective mechanism to penalise them if they don't do the needful.

Transfer of technology, facilitation of FDI, reduction in imports and liberal funding of R&D projects are the imperatives for giving a fillip to 'Make in India' on the defence front. Last month, the government had announced a phased embargo on the import of 101 weapon systems in an initiative to encourage the domestic industry. Many more such steps are needed to come anywhere near self-sufficiency. For the record, India is the third largest military spender in the world (after the US and China) and the second biggest arms importer (after Saudi Arabia).

The strategic partnership model, which provides for a long-term tie-up of Indian entities with global Original Equipment Manufacturers to set up domestic manufacturing infrastructure and supply chains, needs to offer attractive incentives to woo the world's best vendors. In October last year, French engine manufacturer Safran had told Defence Minister Rajnath Singh that India's tax 'terrorism' was holding up the company's plans to make big investments. Let there be an enabling environment for foreign investors, but hold them accountable if they renege on their promises.

From *The Tribune*

Admiral (R) Arun Prakash flags

China's Maritime Awakening

In the September 2020 edition of its annual report on China, the US Department of Defence (DoD) makes a stunning announcement that the PLA Navy (PLAN) is the largest in the world! With an overall battle-force of 350 ships and submarines, including 130 major surface combatants, the PLAN has overtaken the US Navy, with its strength of 293 ships. China has never bothered to provide a rationale for its ever-increasing military muscle and a bewildered neighbourhood wonders what it portends, especially in the light of its recent adventurism in the high Himalayas.

The PLA Navy has not grown overnight and remains the clearest manifestation of the grand-strategic vision of China's political leadership. Factors that bear on its growing strength may include China's 14,500 km littoral, which is more than double of India's, its objective of "reunifying" Taiwan and its irredentist maritime claims in the South and East China Seas. An expansionist state which seeks eventual parity with the US, China's ambitious *Belt and Road Initiative* and the *Maritime Silk Route* also provide the perfect camouflage for its grandiose maritime strategy.

India, on the other hand, remains a quintessential "status quo" power and has sought military force-levels adequate only to safeguard its sovereignty and territorial integrity. Notwithstanding the low budgetary priority accorded to it, the Indian Navy has built itself into a modern and capable three-dimensional force, rated by other navies as professionally "up to NATO standards" and eagerly sought for as a partner, both for exercises and for maintaining "good order at sea."

Although technology and professional competence are the yardsticks for combat-effectiveness, numbers do matter, and with the IN at sixth or seventh in the international pecking order, there is obviously a significant disparity between the PLAN and the IN. Given the growing gap between the two economies, it would be foolhardy for India to attempt an arms-race with China, but investing in maritime power would pay great dividends in the long-run.

Faced with a difficult situation today, it is incumbent upon India, as a significant

regional power and a democracy, to stand up to its hegemonic neighbour. Regardless of economic asymmetry, India does have the military capability to inflict unacceptable pain in retaliation for any Chinese adventurism, certainly in the mountains, but even more so at sea.

However, as the nation cheers the army's tactical moves in Ladakh, there are misgivings about a strategic void in New Delhi. In this context, the above US DoD report deserves close examination by our "decision-making elite" as well as military leadership; because it shows that politicians—as much in a democracy like the US, as in a totalitarian state like China—accord the highest importance to national security. It bears reflection as to why India has remained an exception to this rule.

The US Congress believes that effective strategy-making defines national interests, objectives, and policies, along with the defence capabilities (and budgetary support) necessary to deter threats. The process provides a shared vision for all agencies and a common playbook to react in times of crisis. Starting with the US National Security Strategy, to be rendered by the President, US Congress demands quadrennial reviews—matching the presidential tenure—by the Departments of Defence, State, Homeland Security and the Intelligence Community.

Where China is concerned, its political leadership has, since 1995, been issuing a defence white paper (DWP) every two years. The 11 DWPs issued so far—all public documents—clearly articulate China's vital interests as well as national security aims, objectives and challenges. Topics of discussion include force-levels and defence expenditure, the PLA's progressively changing roles and re-organisation as well as its newly inducted equipment and platforms.

While the US template may be an "overkill", India has erred egregiously by its disregard for national security. No government has formulated a strategy or doctrine so far; nor has Parliament ever demanded a defence review or sought a white paper. As a direct consequence, "surprise" and "intelligence failure" have become a leitmotif in most of India's post-independence conflicts. Our defence-planning has remained

ad-hoc and under-funded and every crisis evokes confused and fumbling responses, including panic arms purchases.

Another important lesson that emerges from the US DoD document relates to China's "maritime awakening" in the latter part of the last century. While the PLAN owes much to visionary Admiral Liu Huaqing, its commander during the 1980s, it could not have achieved its present status without the Communist Party providing steadfast political support. Every Chairman of the Central Military Commission (CMC) from Deng Xiaoping onwards, has backed the phased growth of China's navy, from an inconsequential coastal-force, to a substantive blue-water navy. The CMC leadership having astutely grasped the reality that "maritime power" is much more than just a "fighting-navy", China is, today, the world leader in ship-building and its merchant marine ranks No.1 in the world. It also fields the largest Coast-Guard that protects the world's biggest fishing fleet. Chinese ports rank amongst the best world-wide.

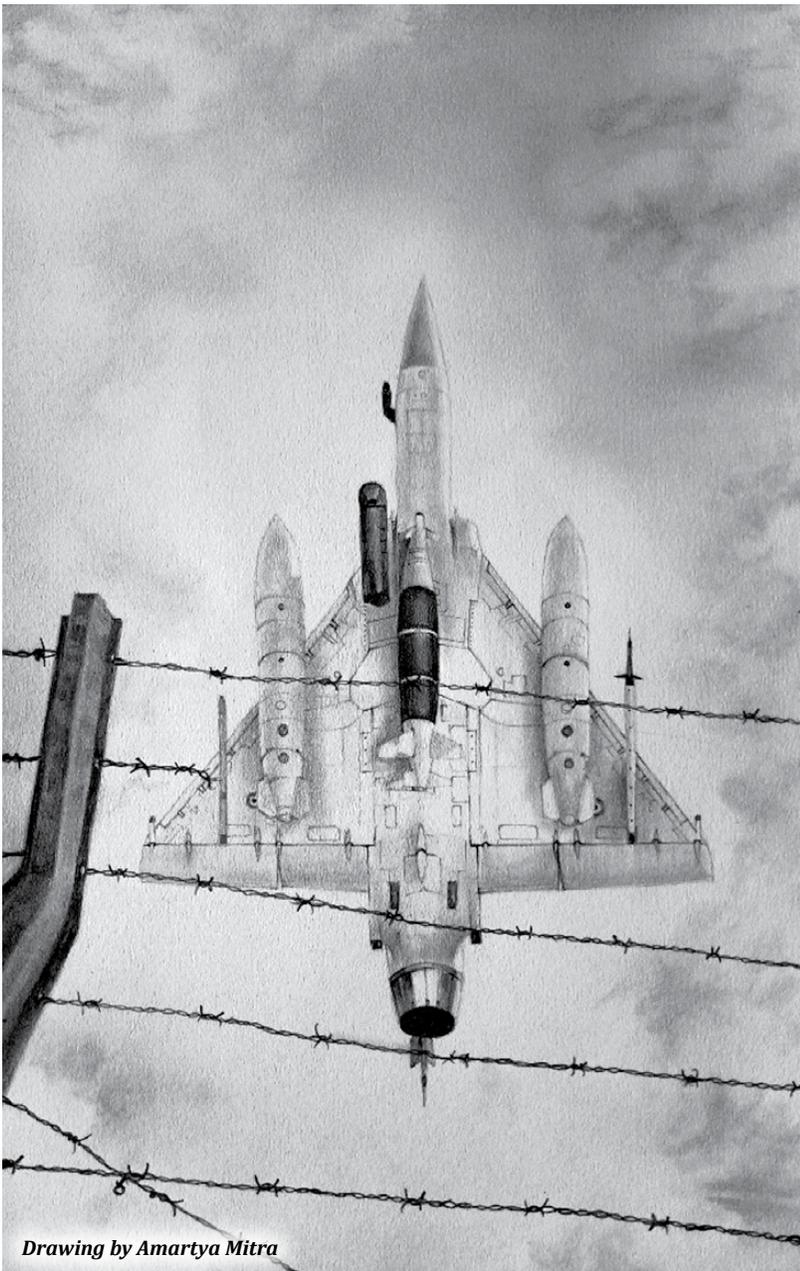
As we watch the situation in Ladakh unfold, it becomes increasingly obvious that not only is a military resolution improbable, but a "hot-war" may be unaffordable for both nuclear-armed countries. The answer lies in extended negotiations at the highest political and diplomatic levels. As the weaker power, India also needs to resort to "power-balancing" and seeking like-minded friends and partners to send out a message of deterrence. India's attraction as a partner for the US, Japan or Australia, lies, not in its powerful army or professional air force, but in its navy's reach and ability to project maritime power.

In the approaching era of fiscal stringency, a sharper focus on its neglected maritime domain would garner immense benefits for India, and not just in terms of enhanced maritime-security. Giving a boost to shipbuilding, expanding the merchant fleet, modernising ports and mechanising fisheries would have a long-term impact on the economy, through growth of ancillary industries, skilling of youth and massive generation of employment—all contributing to *Atma Nirbharta*. 

Air Marshal (R) Brijesh Jayal writes on how we are

“Strangling ourselves with our own systems’

With China having violated various agreements towards maintaining peace and tranquility along the LAC along with associated confidence building measures, it is perhaps time for us to reflect on why we find ourselves at the receiving end of their offensive action yet again, having similarly been deceived in 1962.



Drawing by Amartya Mitra

One area of weakness that must tempt China to take liberties is our perennial under-equipping and modernising of the armed forces driven by an over-cautious and unresponsive defence procurement mindset. What better indication of this than the flurry of activity towards making good equipment deficiencies once the militaries are face-to-face across the LAC? Convening of an emergency meeting of the Defence Acquisition Council and announcing approval of purchase of weapons and ammunition worth Rs 38,900 crore in which were included 33 new (some second-hand) fighters for the IAF as also authorisation for the Armed Forces Headquarters to process cases for buying urgently-needed weapons and equipment to meet their critical operational requirements, are but recent examples. The MOD statement accompanying the announcement perhaps says it all. “Considering the security environment due to the prevailing situation along the northern borders and the need to strengthen the armed forces for the defence of our borders.....”

That the IAF is way short of its authorised combat force level strength has long been known and something that more than our security planners, the Chinese strategic planners are acutely conscious of, as they are of the factor that had India used offensive air power in 1962, the story of that conflict may well have had a completely different ending. One can conjecture that whatever strategic offensive plans the Chinese have conceived towards breaching the LAC this time around, Indian air power capability and its potential use will have played an important part in the thought and planning process and in this, they perhaps sensed a window of opportunity before Rafale aircraft augmented the IAF’s arsenal. This is so because, unlike India, China recognises the potential of air power and has long worked on a strategic plan in aeronautics which vision is to develop aeronautics with Chinese characteristics,



Rafales by Amartya Mitra

of technological progress, self-reliant advancement and aeronautical patriotism and this vision is being guided and driven by none other than their highest political leadership.

Whether or not the IAF's rapid deployment of its front-line assets and flexing its airborne muscle at the front line has come as a surprise to the Chinese is difficult to say. What is certain, however, is that this development will certainly put a spanner in their plans of moving forward.

This is where our democracy needs to introspect, if we are to handle a ruthless and wily adversary like China. It is worth recalling the controversy that erupted following the government's bold decision to order 36 Rafale fighter aircraft along with associated systems and weapons, after five years of dithering. Allegations of wrong-doing, favouritism and corruption flew thick and fast and the media dutifully reported this as such. Even assurances by the top serving IAF leadership failed to placate the critics, thus displaying a lack of trust by a section of our people even in our armed forces. Perhaps this is a new low in our traditional civil-military bonding!

This writer, who had for long dealt with procurements when in service and understands the decision-making process, could only marvel at some far-fetched comments even by respected personalities and publications. Although commercial

competitive jealousies are known to take place in the arms trade, what one witnessed at the time appeared far more deep-rooted and complex and not merely politically-driven. Mercifully, some semblance of calm was restored when in December 2018 the apex court dismissed all petitions and gave a clean chit to the Union government. But the damage inflicted by this needless conflict within our society, to the detriment and morale of the armed forces and the IAF in particular and the credibility of the state can never be quantified.

The deafening silence on this subject thereafter and now a banner headline '*China be warned! First Rafales to touch down on 27 July*', however would have been a pleasant closure to this unfortunate past, but intriguingly another divisive debate has now reared its head wherein statements regarding the actual state of intrusions and pull back by the Chinese forces by official spokespersons are being hotly contested by some, amongst whom are even distinguished veterans. Whilst it is not the writer's case that official versions cannot be questioned, there are appropriate forums and times for the authorities to be held accountable. When our armed forces are poised on the battlefield, this just cannot be the right time, since a bickering democracy does not contribute to enhancing their morale. The armed forces draw their inspiration on the battlefield from a nation that is solidly behind the cause for they are willing to give their lives for, not a democracy at war with itself!

It is with this background that one needs to take note of views of Joshua Philipp, an award-winning investigative reporter and a recognised expert on unrestricted and asymmetrical hybrid warfare and subversion, with ten years research on the Chinese Communist Party. He has been quoted as saying, "As a part of their agenda to instigate trouble in the enemy country, the Chinese Communist Party observes how different countries operate, sensitivities of people in those countries, what are the controversial elements in their system, and how can they be exploited to use those drawbacks against them and unleash chaos in the country." He terms this strategy as '*Strangle them with their own systems*' which the Chinese Communist Party then achieves through psychological warfare, media warfare and legal warfare.

As one looks back on those dark days when the nation appeared at war with itself and the present when we seem to be reliving the past, when Chinese offensive strategic designs are yet to unfold fully, one cannot but help wonder how much of this is fueled by psychological warfare designed by the CCP towards "strangling us with our own systems"? 🦋

Indian Air Power over Ladakh



Classic photo of IAF MiG-29 skirting one of the high mountain peaks in Eastern Ladakh (Source: The Print)

In support of Indian Army build up in Eastern Ladakh to counter aggressive Chinese moves in the high mountains and plateau regions bordering the Aksai Chin and western Tibet, the Indian Air Force (and Navy) have been in much evidence as shown in these images taken by visiting Indian media and others.

There are also reports of the IAF's new (if few) Rafales from Ambala carrying out sorties over the mountains, both Himachal Pradesh and Ladakh, even though no photographs are available.



Far away from their traditional environment, Indian Navy Boeing P-8(I)s have been engaged in electronic surveillance in Eastern Ladakh, although this intriguing photo was taken in Washington State, NW United States ! (Photo: from internet)



MiG-29UPG after landing at Leh (photo by Ramandeep Bajwa)



IAF Boeing CH-47F Chinook over Leh (Photo Bandedep Singh)



Fully armed with MICA air-to-air missiles and long range fuel tanks is this upgraded Mirage 2000(I) (Photo: Indian Trick Shooter via ANI)



IAF Boeing C-17 Globemaster III comes into land at Leh (photo: IAF)

Defence Production and Export Promotion Policy 2020



Providing impetus to self-reliance in defence manufacturing, multiple announcements have been made under the *Atmanirbhar Bharat Package*. The MoD has formulated a draft *Defence Production and Export Promotion Policy 2020* (DPEPP 2020), envisaged as “an overarching guiding document to provide a focused, structured and significant thrust to defence production capabilities of the country for self-reliance and exports.”

The ambitious policy has laid out objectives which aim for “a turnover of Rs 175,000 crore (US\$ 25bn) including exports of Rs 35,000 crore (US\$ 5 billion) in aerospace and defence equipment and services by 2025; developing a dynamic, robust and competitive defence industry, including aerospace and naval shipbuilding to cater to the needs of armed forces with quality products and be part of the global defence value chain; to reduce dependence on imports and take forward *Make in India* initiatives through domestic design and development”.

In brief, the MoD wants “To create an environment that encourages R&D, rewards innovation, creates Indian IP ownership and promotes a robust and self-reliant defence industry.”

C-17s airlift T-72s to Ladakh

Bolstering defences in eastern Ladakh, the IAF’s No.81 Squadron (*Skylords*) flying the Boeing C-17 Globemaster III heavy lift transport aircraft have been strenuously employed in



airlift of armoured flying vehicles, including T-72 main battle tank to Ladakh. Air Marshal Harjit Singh Arora VCAS has inspected various ALGs in Ladakh, besides reviewing operational preparedness. “The VCAS interacted with personnel of combat units currently deployed at these locations” according to a statement.

101 items embargoed under MoD’s Atmanirbhar Bharat initiative

On 9 August 2020, the Department of Military Affairs (DMA), Ministry of Defence (MoD) revealed a list of 101 items for which there would be an embargo on import beyond the timeline indicated against them. The list was prepared by the MoD after several rounds of consultations with all stakeholders, including the Army, Air Force, Navy, DRDO, Defence Public Sector Undertakings (DPSUs), Ordnance Factory Board (OFB) and private industry to assess current and future capabilities of the Indian industry for manufacturing various ammunition/ weapons/platforms/equipment within India.

The list of 101 ‘embargoed’ items also comprises some high technology weapon systems including artillery guns, assault rifles, corvettes, sonar systems, transport aircraft, light combat helicopters, radars and many other items to fulfil the needs of the Defence Services. The list includes wheeled armoured fighting vehicles (AFVs) with indicative import embargo date of December 2021, of which the Army is expected to contract almost 200 at an approximate cost of over Rs 5,000 crore. Similarly, the Navy is likely to place demands for submarines with indicative import embargo date of December 2021, of which it expects to contract about six at an approximate cost of almost Rs 42,000 crore. For the Air Force, the light combat aircraft LCA Mk.1A has an indicative embargo date of December 2020. “The embargo on imports is planned to be progressively implemented between 2020 to 2024 ... the aim behind promulgation of the list is to apprise the Indian defence industry about the anticipated requirements of the Armed Forces so that they are better prepared to realise the goal of indigenisation”.

LCH deployed at Leh



In mid-August 2020, both pre-production HAL light combat helicopters (LCH) were deployed for operations in Ladakh. Air Marshal Harjit Singh Arora VCAS flew one sortie along with HAL test pilot, Wg Cdr Subash P John “taking-off from high altitude locations to a forward areas and carrying out simulated attacks on high altitude targets.” This was followed by a landing at one of the most difficult high altitude helipads in the region. In the photograph above the VCAS is seen with the LCH and later meeting with Lt Gen Harinder Singh, GOC XIV Corps.

The Indian Army and the Air Force have combined requirements for some 160 LCHs, the Defence Acquisition Council (DAC) having earlier approved an initial batch of 15 LCHs.

India and Japan in defence agreement

On 10 September 2020, the Governments of India and Japan signed an agreement allowing the forces of either country to seek supplies and services at each other’s bases. This would include fuel, spares and support services. This allows Indian military aircraft and warships to land or dock at any Japanese defence station, which



greatly extends the reach of the Indian military. Conversely, Japanese warships or military aircraft can use Indian facilities. With this, India has completed arrangements of sharing military logistics with all members of the ‘Quad’ or Quadilateral, an emerging alliance of India, the USA, Japan and Australia.

India and Vietnam to boost economic and defence ties



During their virtual meeting on 25 August 2020, co-chaired by Indian External Affairs Minister S Jaishankar and his Vietnamese counterpart Pham Binh Minh, the two countries have agreed to add new momentum to their economic and defence engagement and “to explore closer cooperation in emerging areas such as civil nuclear energy, space, marine sciences and new technologies”. India and Vietnam are also exploring cooperation based on convergences between India’s Indo-Pacific Oceans Initiative and the Asean Outlook on Indo-Pacific, “in the bilateral and regional context”.

HAL’s 150th Dornier 228

Achieving a major milestone, HAL has produced its 150th Dornier Do 228 light transport aircraft, this being IN 259 for the Indian Navy, which already operates six squadrons of this type in the Maritime Reconnaissance & Information Warfare role. HAL’s



(Photo: Angad Singh)

Transport Aircraft Division at Kanpur has been manufacturing this light transport aircraft since the mid-1980s, with its engines and accessories being produced at HAL Divisions in Bangalore and Lucknow respectively.

Unified Air Defence Command

According to reports from New Delhi, the all-service (joint) Air Defence Command (ADC), is likely to be set up by mid-October 2020 and headed by an Air Force officer. Preparations have been afoot to prepare the structure of the Command with its headquarters at Prayagraj (Allahabad) and having under unified command all assets of the Indian Air Force and Indian Army (*image is the crest of Corps of Army Air Defence*).



DAC procurement proposals



On 10 August 2020, the Defence Acquisition Council in its meeting held under Chairmanship of the Defence Minister accorded approval for capital acquisitions of various platforms and equipment worth Rs 8,722.38 crore. The main item concerned HAL's HTT-40 basic trainer aircraft with procurement of 106 such aircraft being cleared. Of these, 70 HTT-40s will be initially procured post certification from HAL and balance 36 after operationalisation. It is recalled that the IAF had ordered the Pilatus PC-7 Mk.II to meet its basic trainer requirement and was initially indifferent to the indigenous HTT-40. It is learnt that the second batch of Swiss-origin trainers will now most probably not be ordered to follow the first tranche of 75 aircraft imported from 2013 onwards.

First S-400s to India by end 2021



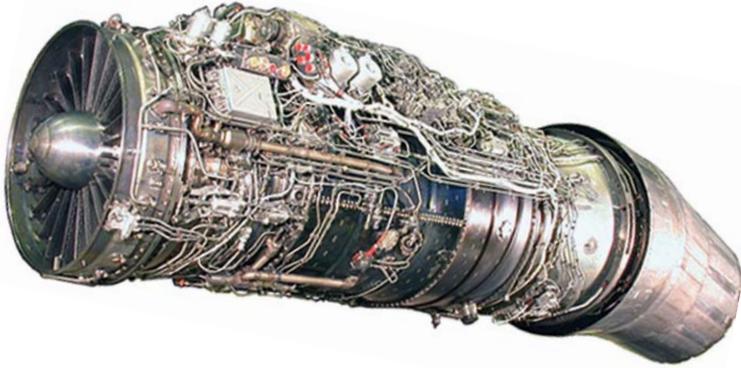
The Russian Government has assured India that the first deliveries of S-400 advanced air defence systems will be made by late 2021. "The schedule of fulfilling the contract has been discussed in detail with Indian partners and the delivery of the first regiment is expected by the end of 2021." This was stated by the official representative of Russian Federal Service for Military Technical Cooperation at the *Army 2020 Expo* at Kubinka, outside Moscow.

CAS flies MiG-21 bison



Air Chief Marshal RKS Bhaduria visited a "frontline air base" of Western Air Command on 13 August 2020. On his visit, he reviewed operational preparedness of the base and interacted with personnel." The CAS urged the personnel to maintain the highest standards of readiness and also appreciated their efforts in preserving IAF's combat potential during the ongoing Covid-19 pandemic. Earlier, the CAS flew a MiG-21 bison sortie of the resident squadron.

500th AL-31FP overhauled engine for IAF



HAL's Koraput Division has handed over the 500th Saturn AL-31FP overhauled engine to the IAF, which powers the IAF's Sukhoi Su-30MKI. The Saturn AL-31 is a family of military turbofan engines, developed by the Lyulka, now NPO Saturn, in the Soviet Union/Russia, originally for the Sukhoi Su-27 air superiority fighter, producing a thrust of 28,000 lbf with afterburning.

Six more Pinaka Regiments



The MoD has signed contracts with Bharat Earth Movers Ltd. (BEML), Tata Power Company Ltd. (TPCL) and Larsen & Toubro (L&T) for supply of six Pinaka Regiments to the Indian Army at an approximate cost of Rs. 2580 Crores. These will comprise 114 launchers with automated gun aiming & positioning system (AGAPS) and 45 command posts to be procured along with 330 vehicles from BEML. Induction of these six Pinaka Regiments is planned to be completed by 2024.

COAS awards 51 Special Action Group



Chief of the Army Staff, General Manoj Mukund Naravane, conferred the *COAS Unit Appreciation* to 51 Special Action Group of the National Security Guards in recognition of the Group's "outstanding achievements in combating terrorism." 51 SAG draws its manpower from the Indian Army and has the reputation of an elite Counter Terrorist Force. Among various operations known of the Group, most noteworthy was *Op Black Tornado* during the Mumbai terror attack in November 2008 and the freeing of over 600 hostages.

DRDO Atmanirbhar Bharat



Responding to the call for *Atmanirbhar Bharat*, a DRDO Rdelegation has met with Defence Minister Rajnath Singh to apprise him about 108 systems and subsystems which have been identified for design and development by Indian Industry. "DRDO will also provide support to industries for design, development and testing of these systems on requirement basis....which will allow DRDO to focus on design & development of critical and advanced technologies and systems."

HSTDV flight tested

DRDO successfully demonstrated hypersonic air-breathing scramjet technology with the flight test of a Hypersonic Technology Demonstration Vehicle (HSTDV) from Wheeler Island, off the coast of Odisha on 7 September 2020.

The hypersonic cruise vehicle uses a solid rocket motor, boosting it to an altitude of 30 kilometres, where the aerodynamic heat shields separate at hypersonic Mach number. The cruise vehicle separated from the launch vehicle and the air intake opened as planned, the hypersonic combustion sustained and cruise vehicle continued on its desired flight path at a velocity of Mach 6, demonstrating critical systems including fuel injection and auto ignition of scramjet.



Testing the Abhyas HEAT



A successful flight test of the Abhyas, High-speed Expendable Aerial Target (HEAT), was conducted by Defence Research and Development Organisation (DRDO) from the Interim Test Range, Balasore in Odisha on 22 September. During the trials, two demonstrator vehicles were successfully test flown.

NAMICA is launched



Prototype of the Nag missile carrier (NAMICA) developed by Ordnance Factory Medak in association with DRDL, Hyderabad was launched on 13 August 2020. NAMICA will be an important contribution towards import substitution estimated at Rs 260 Cr in the first phase, going upto more than Rs 3000 Crore over the next years.



The Abhyas is designed & developed by Aeronautical Development Establishment (ADE), DRDO. It is powered by a small gas turbine engine and has MEMS based Inertial Navigation System (INS) for navigation along with the Flight Control Computer (FCC) for guidance and control. The vehicle is programmed for fully autonomous flight. During the test campaign, the user requirement of 5 km flying altitude, vehicle speed of 0.5 Mach, endurance of 30 minutes and 2g turn capability of the test vehicle were successfully achieved.

Laser Guided ATGM test-fired



A Laser Guided Anti-Tank Guided Missile (ATGM) was successfully test fired from a Arjun Tank at KK Ranges, Armoured Corps Centre and School (ACC&S) Ahmednagar on 22 September. In these tests, the ATGM successfully engaged a target located at 3 km. The missile employs a tandem HEAT warhead to defeat Explosive Reactive Armour (ERA) protected armoured vehicles. It has been developed with multiple-platform launch capability and is currently undergoing technical evaluation trials from gun of MBT Arjun.

The Armament Research & Development Establishment (ARDE) Pune in association with High Energy Materials Research Laboratory (HEMRL) Pune, and Instruments Research & Development Establishment (IRDE) Dehra Dun have developed the missile.

CARACAL International commitment to 'Make in India'



CARACAL, the UAE-based small arms manufacturer, has stressed in a statement "its commitment to the 'Make in India' initiative", after having previously been selected by the Indian MoD in 2018 to fast-track the supply of 93,895 CAR 816 assault rifles for the Indian Army. The CAR 816 carbines are intended to replace the Indian Army's current 9mm Sterling carbines, with the CAR 816 having higher bullet velocity and reduced weight compared with the Sterling carbines.

Hamad Al Ameri, Chief Executive Officer, CARACAL, has reiterated their commitment to the 'Make in India' initiative: "with strong bilateral ties between our two nations, and with India being a key market for CARACAL, we remain on standby to supply the product to the customer upon instruction." CARACAL is part of the Missiles & Weapons cluster within EDGE, an advanced technology group for defence and beyond, and has wholly owned subsidiaries in Germany and the USA.

LONGBOW FCR for Indian Army AH-64Es



The US Administration has recently awarded LONGBOW Limited Liability Company (LBL), a joint venture of Lockheed Martin and Nothrop Grumman, four Foreign Military Sales contracts to provide the AH-64E Apache helicopter with AN/APG-78 LONGBOW Fire Control Radar (FCR) to the Indian Army and also Morocco, Netherlands and the UAE. The LONGBOW customer base now includes 16 foreign militaries and 14 nations. The UAE is updating from AH-64D to the AH-64E variant.

"Corporatisation" of OFB

Consequent to the decision of the Government to convert Ordnance Factory Board (OFB) into one or more fully Government-owned corporate entities, the Government has



constituted an Empowered Group of Ministers (EGoM) under the Chairmanship of Defence Minister Rajnath Singh, to oversee and guide the entire process, including transition support and redeployment plan of employees while safeguarding their wages and retirement benefits. KPMG Advisory Services Pvt. Ltd. (Lead Consortium Member) has been selected along with Khaitan & Co. Ltd. as the Consultancy Agency for providing strategic and implementation management consulting services.

Decade of Rolls-Royce R&D in India



Rolls-Royce has celebrated the tenth anniversary of its *Engineering and Research Centre* (EARC), established at Pune in 2010. The entire MTU Series 1600 of engines has now been transferred to India with full product responsibility. The *Engineering and Research Centre* Pune is *Power Systems*' largest development site after Friedrichshafen in southern Germany (where the erstwhile Dornier GmbH had their headquarters).

Since its inception, the *Power Systems Engineering and Research Centre* has contributed to several significant global R&D projects including the development of environmentally friendly engines and Rolls-Royce's first-ever high-speed gas mobile engine for commercial marine.

ATDS Maareech facility

On 10 August 2020, the Defence Minister inaugurated, through video conference, the upgraded state-of-the-art Maareech Integration Facility. This fully indigenous system involves sensors and decoys developed jointly by DRDO labs, Naval Physical & Oceanographic Laboratory (NPOL) and Naval Science and Technological Laboratory (NSTL) and productionised by BEL. Two production grade systems manufactured by BEL



have been installed and trial evaluated on-board the Indian Navy warships INS *Gomati* and INS *Ganga*. Twelve ATDS Maareech systems will be delivered every year, providing a reliable defence mechanism for surface ships of the Indian Navy.

Controp's iSea-25HD for IN

Controp will supply iSea-25HD Observation systems for installation on new Indian Navy warships under construction at L&T's shipyards, to be delivered during 2020 and 2021. Capable of maintaining boresight even in conditions of shocks and vibrations, the iSea-25HD incorporates digital and mechanical compensatory mechanisms developed by Controp to significantly enhance image quality. The iSea-25HD lightweight system provides maximum range surveillance using highly sensitive sensors, including a high-performance thermal imaging (TI) camera using 3-5 μ IR detector with a continuous zoom lens, a high-sensitivity color day camera, and an eye-safe laser range finder (LRF).



BEML's new products



On 13 August Defence Minister Rajnath Singh launched a number of BEML's indigenously designed & developed products including the BH150E Dump Truck; BE1800E Electrical Excavator; BD50HST Heli-Portable Dozer and Medium Bullet Proof Vehicle *Gaur* (MBPV). The launch ceremony was done virtually in the presence of Secretary Defence and Secretary Defence Production) among others.

Godrej & Boyce partner with OF Chandrapur

Godrej & Boyce's unit Godrej Tooling has partnered with the Ordnance Factory Chandrapur "to conceptualise and develop an indigenous Automated Assembly line for production of Pinaka rockets which not only has enhanced productivity but is equipped with advanced safety features in working with explosives and live igniters. The key advantages of Ordnance Factory Chandrapur include deskilling of operations, real-time quality monitoring of production, automated safety features, 4X increase in productivity in addition to greater availability for the defence forces".

Turbulence continues for India's airlines



Even though two of India's domestic airlines, IndiGo and SpiceJet, have reported some improvement in load factors because of easing in capacity restrictions and lifting of lockdown measures as also reduction in ATF prices, there is still turbulence as fewer passengers are forthcoming. IndiGo is clearly ahead of others, with its market share over 60% but SpiceJet has maintained its place. According to analyses, the carrier is operating at less than half of pre Covid schedule, and has much lower load factors. While passenger revenues were understandably lower, the focus on cargo operations helped sales from the segment rise 144%. The freighter and logistics segment now accounts for 32 % of SpiceJet's revenues.

IndiGo operates over 800 flights, repatriates 150,000 passengers

IndiGo operated more than 800 charter flights while repatriating 150,000 passengers from the Gulf Cooperation Council, South East Asia, Commonwealth of Independent States and SAARC countries from June till August 2020. The airline operated international flights from Middle Eastern countries including the UAE, Qatar, Saudi Arabia, Kuwait and from other Asian nations



including the Maldives, Sri Lanka, Singapore, Malaysia, Hong Kong, Russia, Uzbekistan and the Philippines.

With its fleet of 262 aircraft, the airline has operated 1,674 daily flights during the quarter and connected 62 domestic and 24 international destinations.

Vistara's debut flight from Delhi to London



Vistara, joint venture of the Tata Group and Singapore Airlines, operated its first long-haul flight from Delhi to London with its new Boeing 787-9 Dreamliner on 28 August 2020. The flight departed from Delhi at 0215 hrs (IST) and landed in London at 0655 hrs (BST). Vistara is operating these special, non-stop flights under the bilateral 'transport bubble', flying thrice a week between the two cities. The airline now has a fleet of 43 aircraft, including 34 Airbus A320s, one Airbus A321neo, six Boeing B737-800NG and two Boeing B787-9 Dreamliners, having flown more than 20 million passengers since starting operations.

GVK agreement with Adani

GVK Power & Infrastructure Limited (GVKPIL), along with its subsidiaries, GVK Airport Developers Limited and GVK Airport Holdings Limited (collectively GVK), will cooperate with Adani Airport Holdings Limited (AAHL), the flagship holding company of Adani Group for its airports business (and a subsidiary of Adani Enterprises Limited (AEL).

Commenting on the development, Dr GVK Reddy stated, “The aviation industry has been severely impacted by Covid-19, setting it back by many years and has affected the financials of Mumbai International Airport Limited. It was therefore important, that we bring in a financially strong investor in the shortest possible time to improve the financial position of MIAL, as well as to help achieve Financial Closure of the Navi Mumbai International Airport project, which is of national importance. It is under these circumstances that we agreed to cooperate with Adani so as to achieve these twin objectives. Further, when the transaction is consummated, which is subject to customary approvals, we would be reducing a significant portion of liabilities to our lenders, which is of utmost importance to the group”.

General Aviation Terminal at Palam



An exclusive terminal for General Aviation has been inaugurated at Delhi’s Palam Airport to facilitate operation of chartered or private aircraft. According to Civil Aviation Minister Hardeep Singh Puri, “we expect a bulk of pre-Covid-19 domestic air passengers’ traffic to be back by Diwali, and General Aviation will have a significant contribution on it. The new General Aviation Terminal at Delhi airport is the need of the hour which would significantly support this growth”.

Udan 4.0

Mr Hardeep Singh Puri, Minister of Civil Aviation has stated that “Udan 4.0 is ready to go, seventy-eight additional routes have now been approved, taking the total number of sanctioned routes to 766”. He said 18 unserved or underserved airports would be connected to major cities, including Delhi, Kolkata and Kochi.



The Udan scheme is framed to provide financial incentives from the Centre, state governments and airport operators to select airlines to encourage operations at affordable airfares. In the photo is HAL’s 19-seater Dornier 228 which, with its STOL performance, is considered as an ideal aircraft for most Udan services.



Indian Air Corridor to Central Asia

The Government of India is assessing the possibility of creating an air corridor to the Central Asian countries to boost trade and overcome Covid-related travel and transport restrictions. Initially, this will essentially be a cargo corridor that can be used to ferry goods between India and the five Central Asian countries Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan and Uzbekistan. Issues related to developing air corridor were discussed by officials of MEA, civil aviation ministry, representatives of airlines during a webinar by Federation of Indian Chambers of Commerce and Industry (photo above of Bishkek, capital of Kyrgyzstan, earlier known as Frunze, where batches of IAF officers were once posted for MiG-21 conversion).

Tata Sons to bid for Air India

The Tata Group has reportedly carried out due diligence on the national carrier Air India and may soon make a formal bid, along with some financial partners. Their focus presently is to examine business synergies and viability and perhaps “it is premature



to suggest an official bid the due diligence is complete.” There has also been speculation about the Group planning to merge AirAsia India (in which Tata Sons owns 51% stake) and Air India into a single entity after buying out joint venture partner Tony Fernandes.

Advanced Missile Frigates at Goa Shipyards



Goa Shipyard Ltd has carried out the first plate cutting on 21 September for the *Advanced Missile Frigate Project* for the Indian Navy, marking official commencement of the construction phase. Adm G Ashok Kumar, VCNS presided over the ceremony via Video Conference. The ceremony was also attended by VAdm SR Sarma, Chief of Materiel, Indian Navy, VL Kantharao, Additional Secretary (Defence Production), RAdm Philopose Pynumootil, FOGNA and other senior dignitaries from the Ministry of Defence and the Indian Navy.

Third stealth frigate of Project 17A

Keel of the third ship (Yard-12653) of the P17A class stealth frigates was laid on 10 September 2020. Seven warships under the P17A series (*depicted in photo*) will be constructed of which four are being built at MDL and three at GRSE, with MDL as the lead



yard, using indigenously developed steel and fitted with weapons and sensors along with Integrated Platform Management System. Construction of the P17A warships follow modern technology ‘Integrated Construction (IC)’ methods with blocks are pre-outfitted before joining to reduce the build period.

4th Coast Guard OPV Sarthak



At a ceremony at Goa Shipyard’s Yard 1236, fourth in the series of five Offshore Patrol Vessels (OPV) for the Indian Coast Guard was recently launched and named ICGS *Sarthak*. This was conducted through video conferencing from Coast Guard Headquarters at New Delhi, in the presence of Dr Ajay Kumar, Defence Secretary, DG K Natarajan DGCG and others. The OPV ship is fitted with state-of-the-art navigation and communication equipment, sensor and machinery, displaces 2350 tons and is propelled by two 9100 KW diesel engines.

A major item also cleared by the DAC on 10 August 2020 was procurement of an upgraded version of the Super Rapid Gun Mount (SRGM) to be fitted onboard Navy and Indian Coast Guard warships, made by Bharat Heavy Electricals Limited (BHEL).

Coast Guard ship C-449 commissioned



KShanmugam, Chief Secretary to Government of Tamil Nadu has recently commissioned Indian Coast Guard Ship C-449 at Chennai, the forty ninth amongst fifty four in the series being designed and built by Larsen & Toubro Ltd. at Hazira (Surat). The induction of this ship is a part of the Coast Guard's strengthening of maritime & coastal security along the coast of Tamil Nadu, Puducherry and Andhra Pradesh. Commissioned by Assistant Commandant Ashish Sharma, the ship will be based at Krishnapatnam under the administrative and operational control of the Commander, Coast Guard District Headquarters No.6 at Visakhapatnam.

Exercise INDRA NAVY-20



1st edition of Exercise INDRA NAVY, a biennial bilateral maritime exercise between the Indian and Russian Navies took place in the Bay of Bengal from 4-5 September 2020. "Initiated in 2003, Ex INDRA NAVY epitomises the long-term strategic relationship between the two Navies." This exercise has matured over the years with increase in scope, complexity of operations, and level of participation. The scope of this edition includes wide-ranging and diverse activities across the spectrum of maritime operations.

The Indian Navy had deployed its guided missile destroyer INS *Ranvijay*, indigenous frigate INS *Sabyadri* and fleet tanker INS *Shakti*, along with their integral helicopters. The Russian Federation Navy participated with their destroyers *Admiral Vinogradov*, *Admiral Tributs* and fleet tanker *Boris Butoma* of the Pacific Fleet, based at Vladivostok.

APPOINTMENTS

Vice Admiral Dinesh K Tripathi is DGNO

Admiral Dinesh K Tripathi assumed charge as Director General Naval Operations on 13 August 2020. The Flag Officer is a specialist in Communication and Electronic Warfare and has served on frontline warships of the Navy as Signal Communication Officer and Electronic Warfare Officer, and later as the Executive Officer and Principal Warfare Officer of the guided missile destroyer INS *Mumbai*.



He has commanded INS *Vinash*, INS *Kirch* and INS *Trishul* and has held various important operational and staff appointments which include Fleet Operations Officer of the Western Fleet at Mumbai, Captain (Naval Operations), Cmde (Network Centric Operations), Principal Director Naval Plans and Assistant Chief of Naval Staff (Policy and Plans) at Naval Headquarters.

The Flag Officer has commanded the Eastern Fleet and on promotion to Vice Admiral, was appointed as Commandant of the Indian Naval Academy at Ezhimala, Kerala.

MV Raja Shekhar is Director (R&D) of BEL

MV Raja Sekhar took charge as Director (R&D) of Bharat Electronics (BEL). He was earlier Chief Scientist of BEL's Central Research Laboratory (CRL)-Bangalore and Officer on Special Duty (OSD) at BEL's Corporate Office, before his elevation. He has been involved in the testing of Communication products such as Static and Digital Mobile Tropo-scatter Communication & Satcom Networks, Radar Displays and Command & Control Systems during his tenure at BEL's Ghaziabad Unit. In 2000, he moved to Hyderabad Unit and worked on the testing and commissioning of various Electronic Warfare systems. In 2004, he was transferred to Machilipatnam Unit where he contributed to the design and development of Night Vision Devices supplied in large quantities to the Ministry of Home Affairs and the Indian Army.



Vice Admiral SR Sarma is Chief of Materiel, Indian Navy

Vice Admiral SR Sarma has assumed charge as Chief of Materiel Indian Navy from 1 September 2020. During his career spanning over three and a half decades, the Admiral has served

onboard Indian Naval ships including *Vindhyagiri*, *Rana*, *Krishna* and *Mysore* in various capacities. He has tenanted varied and challenging appointments in Naval Dockyards at Mumbai and Visakhapatnam and at the Weapons and Electronics Systems Engineering Establishment (WESEE), Headquarters, Advanced Tactical Vessel Programme (HQ ATVP) and Naval Headquarters in New Delhi.



As Flag Officer, the Admiral has served as Assistant Chief of Materiel (IT & Systems) in Naval Headquarters, Admiral Superintendent of Naval Dockyard, Visakhapatnam; Chief Staff Officer (Technical), HQ ENC; Director General Naval Projects at Vishakhapatnam, Programme Director, HQ ATVP; and as Controller of Warship Production and Acquisition in Naval Headquarters.

Permanent Commissions to Women Officers



Consequent to formal Government sanction for grant of Permanent Commission (PC) to Women Officers in the Indian Army, detailed administrative instructions have reportedly been issued to all affected women officers giving out guidelines for submission of applications for consideration by the Board. “Women Officers who have joined the Indian Army through the Women Special Entry Scheme (WSES) and Short Service Commission Women (SSCW) are being considered and all of them have been instructed to submit their application forms, option certificate and other related documents to Army HQ.”

More Women Combat Aviators in Indian Navy

On 21 September 2020, four women officers of the Indian Navy completed their Observer Course at INS *Garuda*, Kochi and will join service with frontline squadrons flying Sea Kings, Dhruvs and Dornier 228s. They are, in the photo from left to right, Sub Lt Afnan Sheikh, Sub Lt Kreeshma R, Sub Lt Riti Singh and Sub Lt Kumudini Tyagi.



Meanwhile, according to official sources, a woman fighter pilot of the IAF (Flt. Lt. Shivangi Singh) presently flying MiG-21s, is to shortly join No.17 Squadron equipped with the Rafale omni-role fighter.

The strength of women officers serving the Indian Air Force as on 1 September 2020 is 1875. Of these, 10 women officers are Fighter Pilots and 18 women officers are Navigators. After approval of Ministry of Defence, the IAF commenced a scheme for “Induction of Women SSC officers in Fighter Stream of Flying Branch” in 2016, under which 10 women fighter pilots have been commissioned, till date.



Training of Indian astronauts



According to ROSCOSMOS, the training of four Indian Astronauts at the *Gagarin Cosmonaut Training Centre* (GTC) in Russia has recommenced after some months “on hold” owing to the Covid-19 pandemic. In June 2020 “the Indian astronauts-elect passed training in short-term weightlessness mode aboard an Il-76MDK special laboratory aircraft, and in July, they were trained on board a helicopter while evacuating from the descent module landing point”.

According to the ROSCOSMOS, “regular courses comprise medical and physical training, learning Russian (as one of the main international languages of communication in space), and studying the configuration, structure and systems of the Soyuz-crewed spacecraft”. Further, it also includes training “in a centrifuge and hyperbaric chamber to prepare their organisms for sustaining space-flight factors, such as G-force, hypoxia and pressure drops”.

The Special Frontier Force



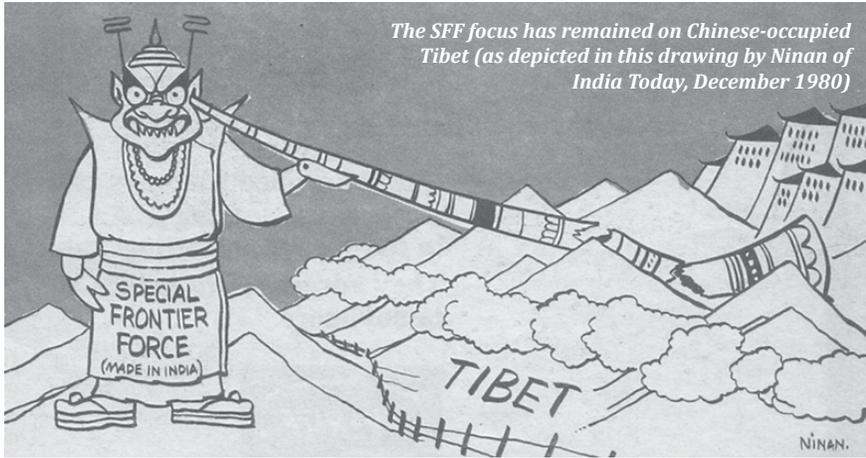
According to an Indian Army spokesman, Tenzin was killed in action after he stepped on an old landmine in Ladakh, south of the scenic Pangong Tso Lake. It was in this area that the Indian Army, in a pre-emptive move on the night of 29-30 August, took commanding positions atop some heights, these features overlooking key Chinese positions across the undetermined Line of Actual Control border. Nyima was a member of the Special Frontier Force (SFF), part of the Indian Army known as 'Vikas Force', which reportedly has seven such units, primarily drawn from the thousands of Tibetan refugees who now call India as their home.

The SFF was formed in the immediate aftermath of the 1962 border war with China. Also known as *Establishment 22*, this was raised by Major General Sujjan Singh Uban, an artillery officer who had commanded 22 Mountain Regiment and so named the new covert group after his regiment.

The units that comprise the SFF come under direct purview of the Cabinet Secretariat and are operationally tasked by

Even though many may have been in the know for over half a century, it was the recent funeral of a Tibetan soldier in Leh that officially lifted the veil from the SFF. Nyima Tenzin, a Tibetan soldier of the Special Frontier Force (SFF), operating under command of the Indian Army in Ladakh, was killed in action on 29 August 2020. BJP's General Secretary, Ram Madhav along with officers of the Indian Army and many people of the Tibetan community paid their last respects to the martyred soldier in Leh on 7 September 2020 (*photo above*).





The SFF focus has remained on Chinese-occupied Tibet (as depicted in this drawing by Ninan of India Today, December 1980)



Maj. Gen. Sujan Singh Uban

the Army. The force is headed by a Major General rank Army officer, who serves as Inspector General of the SFF. Training centre of the SFF is at Chakrata, a hill station at Uttarakhand, its insignia being a *Snow Lion*. This special force recruits mostly from Tibetan refugees, hundreds of thousands of whom made India their home since the Dalai Lama fled Tibet in 1959 and has been in this country since.



The SFF has reportedly been employed in various military operations, including the December 1971 war where it operated in the Chittagong Hill Tracts as also during the Kargil battles in the summer of 1999. However, the SFF (or Vikas Forces) have largely functioned under the shadows, with SFF soldiers owing their dual allegiance to HH Dalai Lama, the flag of Tibet and the flag of India. They are highly skilled mountain warriors and trained to operate behind enemy lines.

Also established in late 1962 was an air component known as the **Air Research Centre (ARC)** which was raised by (then) Air Commodore Lal Singh Grewal, later VCAS, initially equipped with US-origin Curtiss C-46 Commandos and a variety of STOL aircraft for operations at very high altitude airstrips in the Himalayas, its main operating base being at Charbatia in Orissa and Sarsawa in UP.

The C-46s have long been replaced by contemporary aircraft types, with many based at Palam Airport, Delhi. ✈️

*Vayu Research Team
Images from the internet*



Air Marshal Lal Singh Grewal



As the Indian Air Force marks the 88th year of its existence,
Sankalan Chattopadhyay looks at its



IAF Sukhoi Su-30MKI (Photo: Angad Singh)

Past, Present and Future

The Indian Air Force was established on 8 October in 1932 in Colonial India as an auxiliary of the Royal Air Force in India. However, a handful of Indian pilots had flown with the Royal Air Force (Royal Flying Corps) 15 years earlier. Hardit Singh Malik was the first Indian pilot in the RFC, who scored six victories against German fighters during World War I followed by SC Welinkar, Errol Sen, Indra Lal Roy, the latter claiming ten aerial victories and posthumously awarded the Distinguished Flying Cross (DFC).

Upon its establishment, the Indian Air Force adopted Royal Air Force uniforms, badges, brevets and insignia and on 1 April 1933, commissioned its first squadron, with four Westland Wapiti II biplanes and five Indian pilots. These were Harish Chandra Sircar, Subroto Mukerjee, Bhupendra Singh, Aizad Baksh Awan and Amarjeet Singh. The sixth officer, JN Tandon had to revert to logistics duties as he was too short!

In 1937, the infant air force saw its first combat experience when 'A' Flight was sent to Miranshah in North Waziristan, to support Indian Army operations against Bhattani tribesmen. There was some

expansion in April 1936 with a 'B' Flight formed, also on the vintage Wapiti biplane. It was not until June 1938 that a 'C' Flight was raised which brought No.1 Squadron to full strength, and remained the sole IAF formation when World War II began by which time the personnel strength had increased to 16 officers and 662 men.

During World War II, the air force was expanded, going through a phase of steady growth. New aircraft were added, beginning with Lysanders, then the more warlike Vultee Vengeance, Hawker Hurricane, Supermarine Spitfire and by end of the war in 1945, the IAF had nine squadrons, all of which had taken part in the war against Japan.

In recognition of their services, King George VI conferred the prefix 'Royal' on the IAF and one of its Spitfire squadrons was sent to Japan as part of the British Commonwealth Occupation Forces.

On independence, and partition of the country, the RIAF was reduced to six squadrons of Tempest II fighters plus some Spitfire XIVs and a handful of C-47 Dakota transports. These were flung into action when Pakistan invaded the then princely

state of Jammu and Kashmir, with the operations lasting from October 1947 till December 1948.

The RIAF entered the jet era on 4 November 1948, when three Vampire F.Mk.3 jet fighters arrived in India, to be followed by the Vampire FB Mk.52 which gained the RIAF distinction of becoming the first Asian air arm to operate jets. Transformation of the RIAF in the jet era was consolidated under AVM Subroto Mukherjee, who on 1 April 1954 became an Air Marshal and the first Indian Chief of the Air Staff.

After India became a Republic in 1950, the air force dropped the 'Royal' prefix. In the early to mid-1950s, the IAF underwent massive transformation and expansion inducting large numbers of HAL-built Vampire FB Mk.52s, then French-origin Ouragans and Mysteres IVAs, followed by British-origin Hunter F.56s, Canberra bombers and strategic reconnaissance aircraft and soon after, the Gnat light fighter which was built in quantity by HAL.

The only heavy bomber type the IAF operated were the refurbished (by HAL) B-24J Liberators which served the IAF



till 1967. The English Electric Canberra interdicator bomber served with the IAF for a half century, from 1957 to 2007 and took major part both in the 1965 and 1971 wars.

The war of 1965 changed everything! Soon after this, the Soviet-origin MiG-21 became mainstay of the fighter force, while another Soviet-origin aircraft, the Sukhoi Su-7 was inducted for the ground attack role. During the December 1971 war, India's first indigenously-developed fighter bomber, the HF-24 Marut took part but, however, to the dismay of many, this elegant fighter remained under powered and consequently had a short service life.

Undoubtedly, the most rapid transformation of the IAF took place during the 1980s. The procurement of F-16s by Pakistan had accelerated this change and consequently the IAF began to procure fighters from the USSR, France and UK almost simultaneously. According to data available, during this period, the IAF procured some 140 Jaguars (mostly built by HAL) plus 50 Mirage-2000s, 70 MiG-29s, 10 MiG-25s, 160 MiG-23s and 165 MiG-27s, the latter being built in India under license. From the late 1990s the IAF began to receive large numbers of the Sukhoi Su-30MKI, again mostly built in India by

HAL while the last version of the MiG-21 was upgraded to become the MiG-21bison.

The MiG-21 has undoubtedly been the longest serving fighter aircraft in the IAF, with several variants including the MiG-21f-13 which entered service in 1963, later augmented by the PF, MF, M and bis. Over the last three decades, the IAF has looked for a suitable replacement for the MiG-21 even as the entire fleet of MiG-23s, MiG-25s and MiG-27s were phased out. With continuous delays faced in the indigenous light combat aircraft (LCA) development programme, the IAF instituted a requirement for some 126 Medium Multi Role Combat Aircraft



(MMRCA) but after over a decade of evaluation and final selection, continued contractual delays resulted in just 36 Rafales being ordered, with none to be produced in country.

The Rafales have just entered service but the requirement for larger numbers remains unfulfilled. Earlier, dissatisfaction with the Russian 5th generation fighter (PAK FA, now the Su-57) programme made India withdraw. However, the procurement and subsequent manufacture of a total of 272 Sukhoi Su-30MKIs has helped to stem the depleting force levels.

The IAF's present fighter fleet consists of a dwindling number of MiG-21bisons which are scheduled to be retired by 2025,

50 upgraded Mirage 2000s, 70 upgraded MiG-29s while some 80 Jaguars are being upgraded to DARIN III standard.

The Tejas Light Combat Aircraft programme is moving slowly with 40 Mk.Is ordered but its follow on Mk.IA programme is again reportedly facing delays. After a considerable period of design, development and certification, some 40 LCA Mk.Is have been ordered on HAL, half of them in service at AFS Sullur and although IAF pilots are full of praise for this 4th generation light fighter, limited numbers make their contribution uncertain.

However, there is much hope that the LCA Mk.IA followed by the Mk.II and then the fifth generation AMCA will

augment numbers in the decade ahead. According to public sources, the combat aircraft strength of the Indian Air Force by 2035 is expected to reach 680 aircraft, by which time, the IAF's present legacy fleet of MiG-21bisons, MiG-29s, Mirage 2000s and Jaguars would have been phased out. So in 2035, there would be some 272 Su-30MKIs, 36 Dassault Rafale F3-Rs, 114 MRFAs, 40 LCA Mk.Is, 83 LCA Mk. 1As, 96 LCA Mk.IIs and 36 AMCAs.

However, this is just not enough as the IAF may have to face a two front situation. By 2035, when the PAF too would have retired all its Mirage IIIs, Mirage 5s, F-7s and earlier model F-16s, which will have been replaced by the JF-17 Thunder, successive Blocks now being received in steady numbers. By the end of the 2020s, there would be some 200 JF-17s in service plus some 40 remaining F-16s. The PAF is certainly planning to induct next generation fighters and China is the obvious source which already has the 5th generation J-20 getting into service alongside the J-31 apart from developing stealth bombers. With possible induction of some fifth generation platforms, the PAF will possess significant capability to take on the IAF even while we face an uncertain and devious China.

It is therefore high time, that the Government of India went ahead to meet the IAF's sanctioned strength of 42 combat squadrons and even if 5th



IAF Mirage 2000 (photo: PSC)



The recently inducted IAF Rafale (photo: MoD/IAF)



IAF Jaguars (Photo: Phil Camp)

generation fighters are still sometime away, it is more than feasible to have a fleet of advanced fourth generation multirole fighters to face possible future challenges. Many still believe that the IAF should go in for more LCA Mk.IAs and LCA Mk.IIs to meet its requirements without economic strain but there will still remain the matter of numbers. As for the next generation,

there are reports that along with the planned development by ADA of a naval twin-engined deck-based fighter (TEDBF), a twin engined land variant could be developed for the air force, being termed as the omni role combat aircraft (ORCA).

However, whatever decision the Government takes, induction of new fighters for the IAF is imperative! The fourth

largest air force in the world must not only maintain air dominance but need to prepare for multi domain multi theatre combat. The People of India deserve a technologically advanced air force by 2035, so as to continue to *Touch the Sky with Glory*. 🇮🇳

Sankalan Chattopadhyay, can be contacted at [@VinodDX9](https://twitter.com/VinodDX9)



IAF MiG-29UPG (Photo: Simon Watson)

The Way Ahead



Phalcon A50 AWACS (Photo: Angad Singh)

Force multipliers for the IAF

Although the concept of ‘Force Multipliers’ is not new at all, there is renewed emphasis for this in the Indian context. The Indian Air Force has been suffering from dwindling number of fighter squadrons as it transits to an all fourth-gen fighter force, with the fifth generation still somewhat far away. As the Indian Air Force has less and less kinetic platforms in its inventory, it becomes imperative to utilise those available to their maximum potential. In a modern battlefield, the efficacy of a platform can be enhanced by using the so-called force-multipliers, systems and procedures that increase on-station time, provide greater output, and get more ‘bang for buck’ from the kinetic options. The Indian Air Force has obviously been working on this aspect for some time, with earlier options initially imported and now indigenous work going on also for the future.

Air-to-Air Refuelling

One of the most important, and possibly the least tech intensive (compared to others) option, is a straight forward air-to-air (AAR) refuelling platform. An AAR platform increases the range of a fighter or a transport aircraft and even heavy helicopters and in turn increases the weapon coverage area/combat radius carried by them. It also

allows the platform to stay airborne longer and carry increased payloads at take-off.

One of the longest quests of IAF has been to acquire an AAR system to complement – and maybe later replace – the older Ilyushin Il-78MKIs. Two renditions of the AAR programme have been finalised and then were cancelled by IAF, both involving the Airbus A330MRTT. The third iteration





DRDO/CABS proposed AWACS using the Airbus A330 platform (Photo: Vayu)

of this quest has the IAF now specifying as requiring only two engines on the tankers, thus removing the chance for more IL-78s. After failing to get them for last 14 years owing to repeated pricing issues, a new idea is floating around, to actually lease the required platforms as a temporary solution. Falling fighter numbers are a big concern, but if the

had different type of assets with different capabilities but were effectively managed to totally dominate the airspace.

Like the American E-8 JSTARS, India too is also planning to acquire an ISTAR (Intelligence, Surveillance, and Target Acquisition Radar) platform for IAF. This first bid in 2017 was made to acquire 2 off



(Photo: PSC/Vayu)

IAF could keep more of them on station for a longer time using AAR, they could extract more utility out of present inventory.

Command, Control, Communications & Intelligence

Technically AWACS/AEW&C are also part of C3I, but we will discuss those separately. C3I is absolutely imperative to take charge in a theatre, having a total picture of the battlefield and effectively managing own assets for maximum utility. A good example of effective C3I was during the aerial part of Iraq war, where Coalition forces



DRDO-Embraer Netra AEW&C flanked by two Su-30MKI's (photo: Phil Camp)

the shelf ISTAR platforms from Raytheon for \$1billion, but was not finalised. Reports came, days before the Balakot strike, that the programme was resurrected in 2019 and now the scope included one platform to be acquired from US and 4 more built in India under US-India DTTI (Defence Technology & Trade Initiative) with the US side helping India develop this. At DefExpo 2020, first renditions were shown, also revealing that of the four India-made platforms, 3 will be for the IAF and 1 would go to the NTRO (see image).

Like JSTARs, these are also planned to help in battlefield management, ground surveillance and command and control.

Airborne Early Warning and Control

Information is key, and is much more so on the battlefield. The fog of war can be dangerous, but the beacons here are AEW&C aircraft. 27 February 2019 serves as a good learning experience for the IAF with its Netra aircraft and the ground-based radars that make up the IACCS. A riposte by the PAF, in form of *Op Swift Retort*, was thwarted owing to the information provided by an on-station Netra AEW&C aircraft.

These two capabilities expand by several orders of magnitude the ability to monitor and predict the scale and direction of an enemy attack. Without an AEW&C capability, interception before weapons release might not be possible. These airborne platforms cover gaps in ground based network and can be pre-emptively positioned to important locations based on prior inputs or traffic detected.

The Indian Air Force currently operates three A.50 Phalcon AWACS (with two more to be contracted for about \$1billion) and 2 DRDO-Embraer Netra AEW&C

aircraft. The DRDO is also working on an AWACS (I), as they call it, system based on the Airbus A330 widebody jet platform and a concept AWE&C on the C295 platform (if the deal ever finalises). Following the Balakot strike, and utility of Netra in the following air skirmishes, has revealed how important these platform, they are in fact *force multipliers*. There were reports that the IAF is seriously considering ordering more Netras.

Electronic Warfare

The element of surprise is one of the basic tenets of warfare, and in aerial warfare this become vital. With multi-powered radars tracking everything, air forces try to reduce this advantage from the adversary and EW becomes even more important in an offensive. Effectively blinding the enemy is like dealing with a handicapped one and gives one unquestionable advantages.

The Balakot strikes and OP *Swift Retort* once again focussed on the need for EW. The effect of jamming on Indian planes was also seen in the conflict, reinforcing an old demand of SDRs to be equipped on Indian planes to prevent such future instances. The IAF too jammed Pakistani radars before delivering payload on the 26th early hours. EW includes many aspects not limited to ELINT, jamming enemy radars and comms, but protecting one's own assets against such offensive jamming and so on.

The IAF has multiple levels of EW systems and similarly has to deal with these at multiple levels. Strategically we have an aging Boeing 707, Gulfstream/Astras, Bombardiers for SIGINT/ELINT operations by the ARC. Their numbers are very limited compared to what the PLAAF fields, with the situation further complicated by "two front war" scenario. The PLAAF has several SINGINT/ELINT/

EW platforms based on its indigenous Y-8/Y-9 platforms.

At a more tactical level, some of the IAF's fighters are equipped with SPJ and EW suites but more work is required. The IAF is working on getting a locally-developed SPJ for the Su-30MKIs even as it has just inducted Rafales with state-of-the-art EW suites.

India's regional adversaries are investing much in this field, with both the PLAAF and PAF making significant progress which could possibly be very far ahead in terms of dedicated platforms. This advantage also trickles down to the PAF as concern EW capabilities for its mainstay JF-17 Thunders.

Stand-Off and PGMs

Stand-off weapons allow own air assets to deliver payloads without entering enemy airspace, thus keeping them away from harm's

adversary's side. The IAF has been catching up with development of an indigenous Astra BVRAAM on multiple platforms besides the 'game-changing' Meteor on Rafales.

The IAF already has a host of PGMs such as Paveways, Spice 2000 and possibly Hammers in the offing, with the DRDO also developing SAAW with a range of 100 kms which will enhance the inventory. The integration of BrahMos-A with the Su-30MKI, induction of SCALP ALCM in the IAF with an unparalleled ability in the region, striking deep without possible interdiction of the launch platform.

There are other force multipliers such as military satellites and UAVs, which certainly endow an increase ISR capabilities of a force, plus UCAVs which provide long range precision strikes on HVTs. Swarm



way. Long range weaponry can interdict enemy supply routes and infrastructure, sever the lines of communication, raise the cost of war to a surgical degree without need to employ strategic missiles.

The much talked about BVRAAM 'gap', which remained in favour of the IAF till the early 2000s, has seen a shift to the

UAVs are coming and were most recently seen when the Aramco facility was attacked in 2019, utilising a mix of swarm drones and missiles to conduct a saturation strike against Saudi defences. Another UAV concept, the *Loyal Wingman* is in evolution at HAL, being an UCAV coupled with a manned fighter, allowing a single pilot to command more ordinance than his own aircraft can carry.

The IAF has an interesting future ahead with local development, and upcoming induction of many new systems increasing command of the IAF in theatres it will fight in, making the force more aware, network centric and a more cooperative one. That is the only way to maximise utility of the assets it has and somewhat make up for in falling fighter numbers. 🦋

Shwetabh Singh (Twitter @singhshwetabh71)



Safran's AASM Hammer

Cover story

The Rafale – for all Reasons



Photo: IAF

The first five French-origin Dassault Rafale F3-R omni-role fighters were formally inducted into the Indian Air Force on 10 September 2020 at Air Force Station Ambala. The ceremony was attended by India's Defence Minister Rajnath Singh and his French counterpart Florence Parly, Chief of Defence Staff General Bipin Rawat, Air Chief Marshal RKS Bhadauria and Defence Secretary Ajay Kumar (*see lead news*).

Some 14 years earlier, on 27 June 2006, Escadron de Chasse 1/7 *Provence*, at Saint-Dizier became the first French Air Force squadron to receive the Rafale, which 4.5 generation fighter, through constant upgradations, strives to reach “near fifth-generation” standard after progressive developments to robustly compete with emerging fifth-generation designs. Commentators have long felt that it is the French political reliability regarding Indo-French cooperation in the “nuclear arena”, including operationalisation of the



Photo: Dassault

IAF's manned airborne nuclear deterrent in the form of modified Mirage 2000H/TH platforms (presently being upgraded to Mirage 2000I/TI standards), and cooperation of the French administration so as not to impose sanctions upon India after *Pokhran II* nuclear tests, which may well have proved (amongst others) to be the decisive factor in selection of the Rafale in the erstwhile MMRCA competition.

It is speculated that a significant proportion of the IAF Rafale force will be assigned the role of manned airborne nuclear deterrence under India's SFC (Strategic Forces Command), officially raised on January 2003 under a 'three-star commander' by the National Security Cabinet Committee (NSCC) when formally announcing India's long awaited *Nuclear Weapons Command & Control Structure*. The IAF's Rafale squadrons are reportedly being configured for delivering a credible "retaliatory nuclear strike" on any rouge nuclear aggressor and are also capable of conducting pre-emptive conventional "counterforce" precision strikes on enemy nuclear arsenals or their Communication, Command & Control (C3) nodes, so as to disable them from launching any "first strike" on Indian forces or the Indian homeland.

The Dassault Rafale F3-R variant has been developed as a multi-role strike fighter from the outset, with priorities on nuclear strike and conventional attack yet at the same time retaining formidable air superiority attributes leading to its classification by its manufacturer Dassault



Rafale with the Thales RBE-2 AESA radar (image from internet)

as 'omni-role', capable of performing strike and air superiority tasks in single operation.

To execute successful nuclear strike and conventional attack missions, the Rafale with its manoeuvrability and high degree of cockpit automation has the advantage of terrain following and masking, including at night and in adverse weather conditions, flying a terrain/obstacle-avoidance profile at

g-bumps enabling them to fly very fast and very low, deliver ordnances on targets with a high degree of accuracy and still be capable of destroying opposing fighters with their formidable defensive weaponry and SPECTRA electronic warfare suite.

The Rafale is also capable of bringing back reliable battle damage assessment, thanks to the Thales-developed Reco NG/



SCALP on the Rafale (photo: MBDA)

very low levels (down to 100 feet), guided by an Automatic Flight Control System (AFCS) which operates in either digital terrain following or radar terrain - following mode. With digital terrain following, the AFCS manoeuvres the Rafale based on a three dimensional map database which is pre-programmed into the AFCS software. The radar terrain following mode of the RBE-2 AESA radar scans the terrain ahead and securely guides the fighter over all obstructions before resuming nap-of-the-earth operations.

In these missions the Rafale's digital fly-by-wire (FBW) controls and canard-type fore-planes allow it to secure all the advantages of delta wing platform including high fuel storage, low drag, increased manoeuvrability with considerably more authority in pitch, fewer control surfaces and reduced Radar Cross-Section (RCS) while minimising most of the instabilities that arise when the aircraft carries significant external stores during low-altitude missions. The digital FBW controls empower the Rafale fleet with remarkable manoeuvrability at low altitudes as well as high resistance to

AREOS reconnaissance pod, consisting of two bi-spectral (IR and visible) sensors for long-range strategic reconnaissance and a high-speed tactical IR line scanner for low-altitude reconnaissance. This is optimally networked via a directive broadband datalink system (that offers a 360-degrees coverage) with terrestrial elements consisting of a mission-planning system and a station for receiving, processing, and disseminating intelligence data in real time.

The Reco Management System (RMS) includes functions for itinerary surveillance, multiple-point image gathering, ad-hoc stereoscopic data acquisition, real-time data link management and digital recording. Conducting a two-ship reconnaissance formation, each aircraft can focus on the same target from different angles or directions and/or from different altitudes. Alternatively, the route of the aircraft can be adjusted so that each fighter takes images of widely separated targets on each side. For the IAF's, such standpoint enhancements of airborne strategic and tactical reconnaissance 'at short notice' have emerged as vital after phase out of



(image from internet)

its MiG-25RB strategic reconnaissance platforms. Accurate navigation is facilitated primarily by two Sagem Sigma 95N (RL90) laser-gyro Inertial Navigation Systems (INS) with embedded Global Positioning System (GPS) receivers.

To complicate tasks of its adversary, the Rafale has significantly lower RCS, with stealth characteristics from its conceptual phase. The two 'kidney shaped' side-mounted intakes lower the Rafale's 'frontal RCS' by shielding moving parts of the Snecma M88-2 engine compressors while the vertical fin is made of electromagnetic transparent composites. Its high acceleration Snecma M88-2 engines with 72.9-kN of thrust each in turn enable the Rafale to fly in 'super cruise' mode performing supersonic flight without the use of afterburners during a part of the ingress and egress route. The FADEC (Full Authority Digital Engine

Control) engine powerplant incorporates advanced technologies such as integrally bladed compressor disks ('blisks'), low-pollution combustor, single-crystal high-pressure turbine blades, ceramic coatings, revolutionary powder metallurgy disks and composite materials. The compressor utilises a three stage low pressure fan and a six stage high pressure compressor. Possible up rated versions of the M88 are under testing/ conceptual stage will assuredly push the performance even further.

For nocturnal strike, the Litening G4 targeting pod, reportedly also offered to the IAF, is a superior system with an one mega pixel (1000x1000) Forward Looking Infra-Red (FLIR) in addition to the mega pixel size Charge-Coupled Device (CCD) sensors and optics already available in the earlier Litening AT version, offering wider field of view and enhanced zoom to deliver more accurate

target identification and location at longer ranges than the previous generation. Another new feature is the Laser Target Imaging Programme (LTIP), employing a Short-Wave Infra-Red (SWIR) laser augmented imaging, which enhances the targeting system's capability so as to capture images in situations where Medium-Wave Infra-Red (MWIR), FLIR and CCD are ineffective.

The Rafale's avionics and electronics are integrated through four Mil STD-1553B data buses and two Mil STD-1760 data buses operating in ADA language to enable integration of a wide range of state-of-the-art weaponry. The standard Conventional Attack Stand-Off Missile (CASOM) of the Rafale is MBDA's turbojet-powered, 5.1 metre long, 1,300 kg weight and 250 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 strike yet staying away from anticipated heavy enemy ground-based defences.

Recent enhancement programmes of the SCALP EG include its capability to relay target information just before impact, utilisation of link-back data-link to relay back battle damage assessment and option for in-flight retargeting capability, utilising a two-way data-link. The *Storm Shadow* was successfully deployed on Tornado GR4 combat aircraft of the Royal Air Force's No.617 'Dambusters' Squadron during *Operation Telic* in 2003. Some 27 missiles were fired during the conflict, proving the missile's exceptional capability to accurately engage targets at extended ranges whilst avoiding collateral damage, ensuring that the launch aircraft remained safely away from the target area.

However, the IAF's preferred option for both its Rafale and Sukhoi Su-30MKI fleet appears to be the MBDA Taurus KEPD 350, an ambitious programme which commenced in 1998 by continuing the industrial capabilities in the field of precision stand-off guided missile systems of LFK-Lenkflugkörpersysteme GmbH (now MBDA Deutschland) near Munich, with those of Bofors in Karlskoga, Sweden. This led to the setting up of a joint venture company, Taurus Systems GmbH, based in Schrobenhausen, Germany, responsible for the development, production, marketing and logistic support of the Taurus stand-off weapon system.



One of the IAF's first Rafales (BS 001) at AFS Ambala, on 10 September 2020 (Photo: Angad Singh)

The Taurus KEPD 350 (Kinetic Energy Penetration Destroyer) weapon system is a modular cruise missile type weapon initially developed for Luftwaffe Tornado IDS strike fighters, and also adapted for the Boeing F/A-18, Dassault Rafale, Saab Gripen and Eurofighter Typhoon. Taurus KEPD 350 has had an extremely short development time, which began in 1998 and completed final testing in March 2004, officially entering German Air Force service with 33 Strike Wing on 21 December 2005.

Five metres long, the 1,400 kg KEPD 350 has a range beyond 100 km and is equipped with the *Mephisto* tandem penetration warhead which can effectively engage stationary fortified targets such as underground bunkers and shelters whilst avoiding collateral damage. The *Mephisto* is based on a large tandem warhead concept comprising a precursor/shaped charge and a high explosive filled kinetic energy penetrator. As with the MBDA SCALP/Storm Shadow, during terminal phase in combination with passive high resolution Imaging Infra Red (IIR) sensors with Autonomous Target Recognition (ATR) system with highly sophisticated line extraction algorithm, the missile retains considerable autonomous operations capability over long ranges. As a future enhancement, the use of a data link is being examined for confirmation of a correctly performed mission and partial BDA. The IAF has reportedly also evaluated the Sagem-developed AASM Hammer (*Armement Air-Sol Modulaire*) Precision Guided Munition (PGM) for its Rafale and Sukhoi Su-30MKI fleet.

The IAF's manned airborne nuclear deterrent

French cooperation in creation of the IAF's manned airborne nuclear deterrent is a very little known, closely guarded both by

French and Indian governments to prevent international criticism. During the 1980s, as the IAF "discovered" the Mirage 2000H/TH to be an excellent nuclear delivery platform, it began necessary modifications, an apparent feature being change of standard livery usually associated with air defence variants to 'camouflage' external body paint. Of course, far more radical changes were those internal, with generous assistance of the French government and aviation industry. It is rumoured that Dassault Electronique/Thomson-CSF Antilope V terrain-following radar (as on *Adl'A* Mirage 2000N nuclear strike platforms permitting automatic flight down to 61-metre and altitude-contrast updating of navigation system) had been installed on select IAF Mirage 2000H/THs along with reinforced radomes and twin INS. Optimum performance during nap-of-the-earth penetration of enemy airspace and strike is thus facilitated, the aircraft still powered by its single yet most reliable Snecma M53-P2 turbofan engine.

Similar cooperation from Dassault has perhaps been assured in "hardwiring" of the Rafale. This would include airframe reinforcements particularly near the appropriately shorter and thickened central pylon and the inboard wing pylons, with the pylon data bus being of a more complex nature with additional connecting pins well in conjunction of differently programmed attack computers, with restricted access.

In French Air Force service, the ASMP-A Land-Attack Cruise Missile (LACM) is tasked for airborne nuclear strike. Compactness of the ASMP-A can be judged by the fact that this formidable nuclear missile measures just over 5-metres in length with a weight of only about 850lb. The ASMP-A has a range of about

500 km at speeds of Mach 3, the extended range ensuring survivability of the launch platform from enemy air defences. The missile retains a speed of Mach 2 during low-level advanced and complex penetration mode with a high (yet undisclosed) degree of accuracy.

A similar indigenous or joint-developed LACM integrated with the Rafale's centreline pylon would enable the IAF's Rafales, with air-to-air refuelling (AAR) and conformal fuel tanks (CFT) to conduct precision strikes against an array of enemy counter-force and counter-value targets ranging from airfields to overland communications, command and control centres in face of intensive air defence installations over land or the seas without penetrating enemys terrestrial or warship-based air defence systems.

Interestingly, the possible commonality of weaponry of the IAF's Sukhoi Su-30MKI and Dassault Rafale may well have served as a strong catalyst for selection of the French fighter. Looking ten years down the line, an emerging IAF multi-role fighter fleet of Sukhoi Su-30MKI, Dassault Rafale and upgraded Mirage 2000H/THs comprising a score of squadrons and further supported by at least two squadrons of Jaguar DARIN IIIs would certainly represent the most potent air power in the Asian continent.

It is important to note that assimilation of the French-origin Rafale in IAF service will be relatively smooth as the IAF has closely followed French combat tactics and procedures developed along with formulation of syllabus and Standard Operational Procedures (SOP) after the induction of Mirage 2000s in 1985. ✈

Sayan Majumdar

Photos from PRO Air Force, Dassault Aviation, Angad Singh



The first batch of IAF Rafales at Dassault Aviation Facility Merignac, France (photo Dassault)

New Innings for *The Golden Arrows*

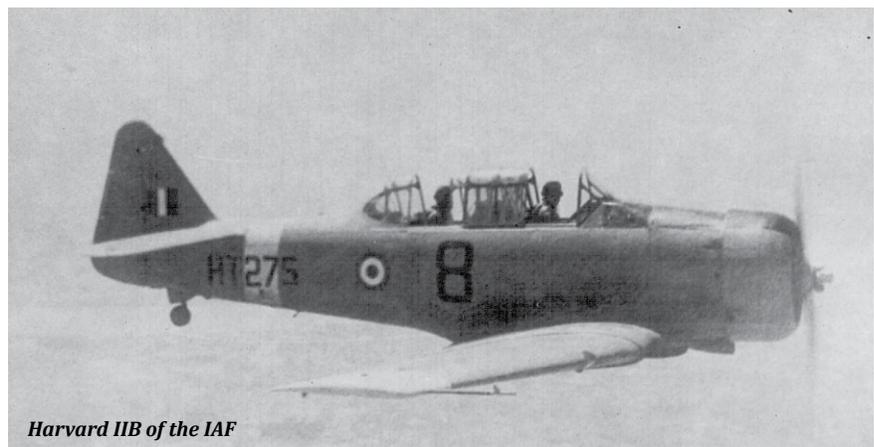
No.17 Squadron, now with Rafales



No.17 Squadron of the Indian Air Force which was formed on 1 October 1951 would be celebrating their 70th year in 2021 but for three years (2016-2019) were in suspended animation, when their MiG-21Ms were phased out at AFS Bhatinda in the Punjab. They would perhaps have remained thus (like several other former MiG-21 squadrons) but for the fact that when squadrons were to be chosen for receiving the new Dassault Rafale F3-R, the CAS was Air Chief Marshal Birender Singh Dhanoa who had been CO No.17 Squadron during the Kargil operations in the summer of 1999. The rest is history!

As for history, the following article appeared in *Vayu's* Issue VI/1988, when most of the officers and men of today's No.17 Squadron were perhaps still in their teens. It is hoped that the 'Golden Arrows' would maintain this record of theirs for inspiration in the times to come.

Militant postures in the subcontinent over the 1950-51 period required that the Indian Air Force be expanded to support the Army in the contingency of operations against Pakistan. The IAF was under severe constraint in terms of equipment and funding at the time but a number of new squadrons were rapidly raised with whatever aircraft could be obtained from reserves within the country. The IAF's combat force then consisted of some six fighter squadrons with the Tempest II and Spitfire Mk.XVIII, some Vampires and two units with reclaimed B-24 Liberators.



One of the new formations was No.17 Squadron, raised on 1st October 1951 (vide order Air HQ/TS 5513/49/D&E Admin. Instruction No.14/11) at Ambala but this unit could only be equipped with 12 Harvard IIB training aircraft, some of these having been transferred from the Advanced Flying School and others overhauled by HAL.

No.17 got airborne on 25th October and six months later was deployed to a new

of the year, No.17 received its first Vampire FB. Mk.52s and a couple of T.Mk.55s as operational trainers. In December 1954, Squadron leader Lakshman Katre (later Air Chief Marshal and CAS, IAF) took over as CO of No.17. In April 1956, the Squadron moved to Poona where it was allocated the task of air defence of Greater Bombay.

In August 1957, No.17 Squadron was selected as one of the first formations to be

Soon after the Hunters arrived in India, No.17 Squadron mounted an impressive Republic Day fly past on 26 January, 1958 and a few weeks later, carried out a fire-power demonstration for a visiting Chinese military delegation. Demonstrating the rapidity with which the Squadron adapted to the new fighter, No.17 Squadron formed the IAF's first (informal) aerobatic team with a 9-Hunter formation carrying out an aerobatic routine not emulated till the



Vampire FB Mk.52 of the IAF



Formation aerobatics by IAF Hunters

airbase in the Punjab, still very much in the formative stage, the Harvard having fairly rudimentary armament of a single machine-gun and some RPs. Army-Air cooperation exercises were carried out but the threat of war soon passed and the squadron moved back to Ambala.

In early 1954, No.17 was finally slated for re-equipment with contemporary aircraft and earmarked for conversion to the Vampire jet fighter. During the course

equipped with the Hawker Hunter F.Mk.56 and the new CO, Sqn Ldr Kanwar Singh and 7 other pilots of the unit proceeded to England for conversion training with No.229 OCU of the Royal Air Force at Chivenor and to Hawker Aircraft Ltd at Dunsfold. The Hunters along with Mystere IVAs ushered in the IAF's transonic age and were to serve with great distinction for two decades, during which the IAF was engaged in two shooting wars.

Thunderbolts were formed (again with the Hunter) over twenty years later.

In late 1958, the Squadron moved to Poona and a year later, won the Arjuna Trophy for the best fighter squadron after winning the inter-squadron gunnery meet. Briefly in 1961, No.17 was commanded by Sqn Ldr MSD Wollen (later Air Marshal and Chairman of HAL), with detachments operating from Hakimpet, Bangalore and Madras.

In November 1961, eight Hunters of the Squadron provided a flypast in honour of the first Indian aircraft carrier INS *Vikrant* as it sailed into Bombay harbour. On 8 November 1961, the Squadron's official crest and motto was awarded: a stretched bow with the *Golden Arrow* pointing heavenwards symbolising the golden radiance of the Creator and the Sanskrit motto *Udaym* meaning "ever rising skywards".

Soon after No.17 were to be blooded in action, taking part in the brief Goa police action when on 18 December 1961, operating from Sambre near Belgaum, four Hunters carried out rocket attacks on Portuguese Army defence positions.



Hawker Hunter F.56 of the Indian Air Force



Napalm attack by IAF Hunter

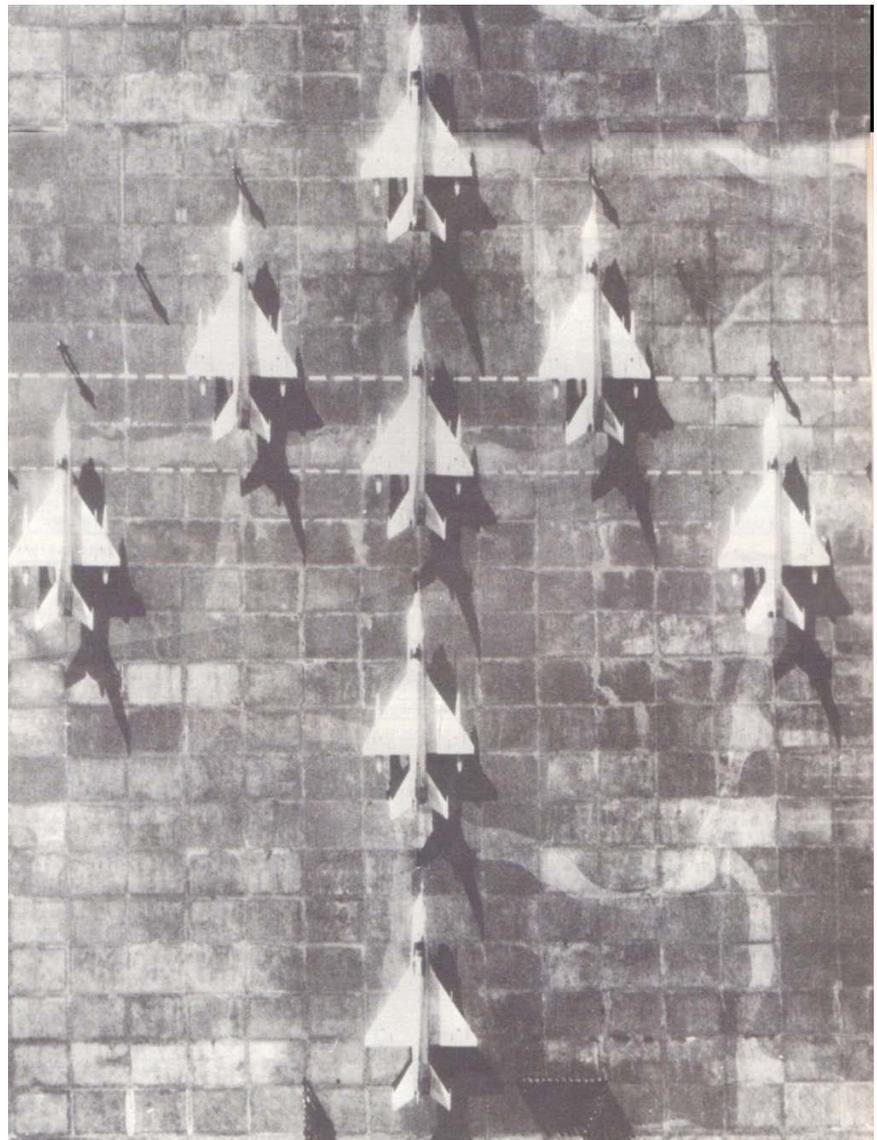
venerable Hunter. In January 1975, under the Command of Wg Cdr Jasjit Singh, the *Golden Arrows* were re-equipped with the MiG-21M and thus entered the supersonic era. The CO flew No.17 Squadron's first MiG-21M on 24 January 1975 and the rapidity with which the Squadron became fully-operational on the new type was evidenced by the award of 'Best Fighter Squadron' in Western Air Command in 1976, and winning of the Bombing Trophy in the Inter-Command Gunnery Meet in 1976 and 1978 and the Rocketry Trophy in 1975 and 1981. The Squadron was also awarded the Flight Safety Trophy in 1975 and 1982. No.17 notched the highest recorded scores in air-to-air gunnery, both by the CO and collectively by the Squadron. (see related article by Air Marshal Harish Masand).

No.17 Squadron then moved to Eastern India in September 1962 and remained on alert during the Chinese conflict later that year. However, the IAF was not called into combat but the Squadron were to stay on in Assam for a long period thereafter, initially at Jorhat and later at Chabua.

During the 1965 conflict with Pakistan, No.17 sent Hunter detachments to two other bases and mounted combat air patrols over the Brahmaputra valley throughout the 3-week war as a deterrence against any escalation of war in the Eastern theatre.

Six years later, No.17 Squadron went to war in earnest. On 4th December 1971, the very first day of war, the Squadron mounted 18 counter air and close air support sorties. The very first formation of 4 Hunters were intercepted by PAF Sabres and in the melee, No.17 shot down two Sabres without loss to themselves. Flt Lt VK Neb who had shot down a Sabre in 1965, claimed a second in this 1971 action as did the CO, Wg Cdr Narinder Chatrath. Detachments of No.17 Squadron Hunters also operated from Kumbhigram airfield on close air support tasks. During the Bangladesh operations, the Squadron carried out a total of 253 sorties for close air support, counter air and fighter reconnaissance, primarily in support of the Indian Army's 20th Mountain Division in action against Pak.16th Infantry Division. By the end of the 2 week war, the *Golden Arrows* had won two Vir Chakras, plus various other gallantry awards.

At the end of December 1974, No.17 moved to Adampur in the Western Sector, and were earmarked for conversion to a new fighter type after seventeen years on the



Iconic image of No.17 Squadron MiG-21Ms at Adampur in 1975



Afterburner take off

In 1985, the *Golden Arrows* achieved the highest flying effort amongst all squadrons on MiG-21Ms in the IAF and thereafter regularly achieved 100% serviceability by flying all aircraft in its inventory once a year for the past several years. The Squadron moved to a number of locations in the sector over the next few years and in March 1988, was taken over by Wg Cdr RK Kachru as Commanding Officer. No.17 Squadron and were presented the Squadron Standard by the President of India at a ceremonial parade at Palam on 8 November 1988.

Thereafter, for the next 18 years there is little information available with this journal although the Managing Editor's last interaction taking place with the 'Golden Arrows' during a superb formal dinner at the Western Air Command Officer's Mess on 10 November 1988.

Their paths next crossed on 16 July 1999 at Srinagar, the day of 'ceasefire'



MiG-21 over the high Himalaya

in the Kargil sector of Kashmir. No.17 Squadron were led in action by then Wg Cdr Birender Singh Dhanoa, one of whose officers Sqd Ldr Ajay Ahuja was shot down during action in the high mountains and

tragically killed after successful ejection (*now subject of a Bollywood movie*). Detailed accounts of IAF's operations over the Kargil sector in the summer of 1999 were carried in *Vayu* Issues IV and V, 1999 and remain a reference to the IAF's Op *Safed Sagar*.

17 years later, the *Golden Arrows* were number plated and later resurrected on 10 September 2019 at AFS Ambala where now CAS Air Chief Marshal Birender Singh Dhanoa, was present along with Air Marshal Raghunath Nambiar, AOC-in-C WAC. The CO designate of No.17 Squadron Group Captain Harkirat Singh SC was presented a plaque and amidst the announcement that the *Golden Arrows* would be the first unit of the IAF to be equipped with the Dassault Rafale F3-R.

Led by Gp Capt Harkirat Singh, selected Indian Air Force pilots, engineers and support personnel proceeded to



MiG-21 outside its blast pen



Wg Cdr Birender Singh Dhanoa CO No.17 Squadron on extreme left, with other IAF officers at AFS Srinagar in July 1999.



'Golden Arrows', resurrected at AFS Ambala



Gp Capt Harkirat Singh with Defence Minister Rajnath Singh in cockpit of IAF Rafale in France

France for conversion training on the Dassault Rafale, the first such IAF aircraft (RB 001, the alphabets chosen after the name of Rakesh Bhaduria, later CAS), being ceremonially received by Defence Minister Rajnath Singh at Mérignac on 8 October 2019, Air Force Day (see *Vayu Issue VII/2019*).

10 months later, the first five IAF Rafales (two twin-seaters and three single-seaters) departed Dassault's Merignac facility on 27 July 2020 for their 8,500 kilometre ferry flight to Ambala staging via Al Dhafra air base in the UAE, with several mid-air refueling enroute.

The IAF Rafales entered Indian air space on 29 July 2020, escorted on their last lap by two IAF Sukhoi Su-30MKIs and touched down at AFS Ambala at 1500 hours that day (see article in *Vayu Issue IV/2020*).

This first tranche of Rafales will be augmented by additional batches of this type over the next year, No.17 Squadron building up to its unit establishment by mid 2021 and beginning a new chapter for the Golden Arrows. 🦋

Vayu Editorial Team

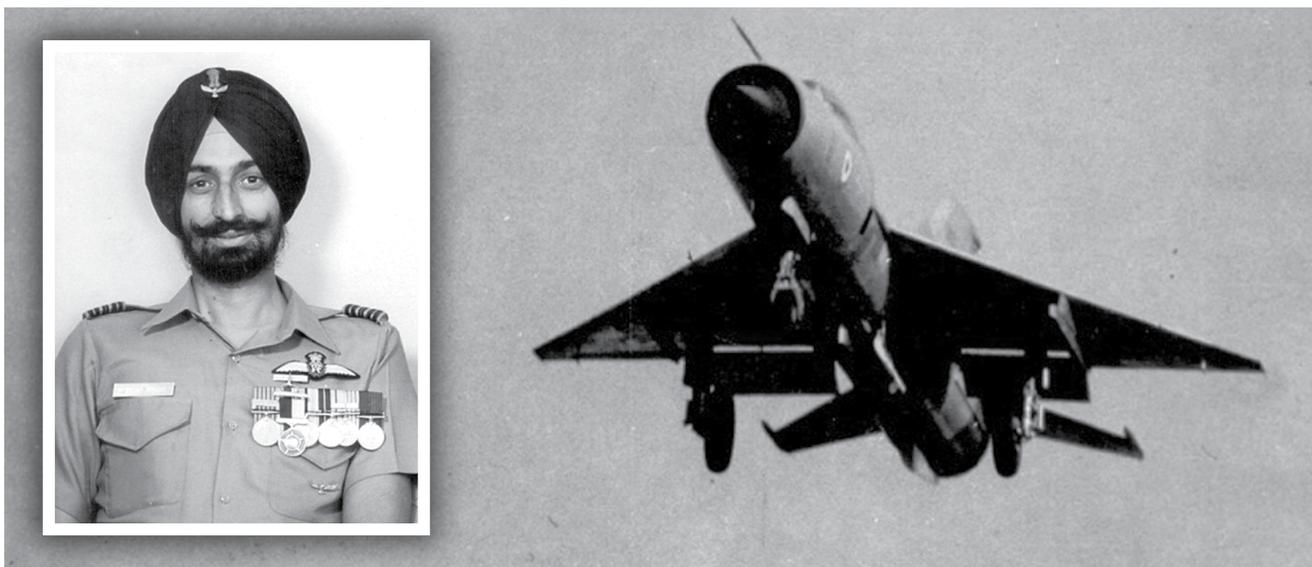
Lead image from Dassault by G Gosset, others from Simon Watson, IAF, and The Society for Aerospace Studies



The fifth Rafale for the IAF (RB 005)

Even as *The Golden Arrows* take off in their new avatar,
Air Marshal (R) Harish Masand pays a tribute to Air Commodore Jasjit Singh who
commanded No.17 Squadron 45 years earlier, then flying the MiG-21.

My Tribute to Jasjit Sir



The highly-publicised arrival of Rafales in an arrow-formation on 29 July 2020 at AFS Ambala as the initial tranche for No.17 Squadron, *The Golden Arrows*, brought back a flood of memories of my association with this Squadron. While I was in Hashimara with 37 Squadron for four years from 1968-1972, No.17 was our sister squadron. Those memorable days of camaraderie and fun, including operations during the 1971 war, remain still fresh in my mind (but would be part of another article on Hashimara and No.37 Squadron).

I had just finished a year as an instructor at the Air Force Academy, Dundigul in July 1975 when my posting to 17 Squadron on MiG-21s came about. Initially, I was reluctant since I was working on my A-2 category and needed just six more months to collect the 300 instructional hours and appear for the categorisation. However, Air Commodore 'Baba' Katre, the Commandant, advised me "to go convert on the MiG-21s", the mainstay of the IAF at that time, "and worry about A-2 Cat on MiG-21s later." Following his counsel, we packed our bags and moved to Halwara. From Delhi, I drove up alone in my faithful

Ambassador, since we were told that there was no married accommodation and the Station Commander, Gp Capt Man Singh, did not permit ladies in BOQs. My wife, Malini was a little upset since we had just been married in late November 1974 and didn't like the idea of staying back. However, she accepted reality and stayed back with my brother in Delhi till I organised some accommodation in Halwara.

I drove up on 17 August 1975, next day being a Monday, my reporting date. Fortunately, there were some friends from Hashimara still with the squadron and I washed up and got to the bar in time to celebrate the reunion. As it happened, the CO of 17 Squadron, Wg Cdr Jasjit Singh, walked into the bar a little later. Bonny Mukherjee, who was with me at that time, immediately introduced me to the CO as an old friend from Hashimara days. Jasjit Sir shook my hand but gave me a look and said, in his typical laconic way, that there was no hurry and I should first find a barber before I came to the squadron. My brother Sonny, from the 85th pilots' course, had already told me a bit about Jasjit Sir including that he was his instructor at the basic stage, was a thorough professional and an excellent

flier but was demanding of his pupils so this didn't come as too much of a surprise.

I hunted down the barber early next morning and charged to the squadron just as they were all coming in from the met briefing. Flt Lt AL 'Oscar' Deoskar, Adjutant of 17 Squadron, gave a funny look at my short hair, having met me at Srinagar in May 1972 with long hair, and ushered in an almost bald Harish, but impeccably dressed with a peak cap and logbooks in hand as was customary, into the CO's office. Wg Cdr Jasjit Singh gave me a cup of tea but refused to look at my logbooks. He didn't say much but exploded a bomb under my chair saying that he did not want me in the squadron – without stating why! I sat there dumbfounded for a moment or two and then told Jasjit Sir, "Well, Sir, you were in P Staff till recently, know most people there, why didn't you get the posting cancelled. You could've saved us both some time and effort?" – or words to that effect!

Our first meeting had ended on that not so pleasant note. Before my MCF on type in Adampur and later, while I was waiting to start flying, I would be sitting in the crew room sipping endless cups of tea or coffee and reading aviation magazines or Russian

manuals on the MiG-21, Jasjit would come to the crew room after his flying to have his regular post-flight cup of coffee or breakfast. As soon as he entered, almost everyone would disappear on one pretext or the other and Jasjit Sir would just sit there, watching me I felt. Later, my friends told me that if you hung around the crew room, Jasjit Sir would find some job for you. So, to avoid being loaded with secondary duties, they would do the disappearing act. Personally, I had no qualms on this issue so, most times, Jasjit Sir and I would be the

up in a desolate area across the runway. If my course mate, BS 'Genda' Grewal was from a farming community, he was out planting trees all across the station with a bit of farming in the clear areas. 'Oscar', being the meticulous bookkeeper, studying for staff college entrance exam was the natural adjutant and ran the squadron well. Soon thereafter, Jasjit Sir nominated me to assist the Flight Commander, MV Singh, in flying training and also to do the PAI's job and assess all attack films and armament scores.

brief, I found myself raising my hand and questioning what he had said on many issues but that never ruffled Jasjit Sir because he loved a good argument. MV and 'Oscar' regularly advised me not to question the CO for my own future's sake but I had become a little hard of hearing by then, perhaps with all that jet noise! However, much later, I found out that Jasjit Sir actually appreciated when the subordinates spoke up, better with facts and indirectly tried to inculcate such independent thinking and speaking up for what one believed in. I am not going in to



only two in the crew room without much conversation exchanged. I soon realised that Jasjit Sir had an uncanny ability to judge a person's abilities and talents through observation and would find the right jobs for them for betterment of the Squadron. So, if Bonny had the gift of the gab, he was the regular MC for all our parties and also i/c Squadron Diary. If RS Pannu had green fingers, he was i/c Garden and, by far, our squadron garden was the best on the station despite the squadron having come

At the same time, Jasjit Sir loved to challenge and goad the younger lot to do better. Towards this, as soon as I started my air to ground phase in the ops syllabus, he would lay a wager, with a chuckle, on the scores of that sortie over a bottle of beer. While I lost a few in the initial days, there was nothing sweeter than a beer won from him later on. I also realised that actually Jasjit Sir also welcomed challenges and questions from his subordinates. While most people never questioned the CO's

specific instances here because that would make for a small book but I will end later with how I found out, and survived despite questioning him and other seniors on the station on so many occasions.

In the middle of my ops training on type, while we were on detachment at Suratgarh in February 1976, I was detailed for a 10 week Photo Interpreters Course at Poona and was asked to move at short notice. Since this would have meant a break in flying and ops syllabus as also the fact that I was unlikely to



Photo in mid-1976 when Gp Capt Maan Singh handed over command of AFS Halwara to Gp Capt Prithi Singh. In the front row, second from left is Wg Cdr Janak Kapur, the O/i C Flying, then Jasjit Singh, Maan Singh, Gp Capt Prithi Singh, Flt Lt Radhakrishnan, Sqn Ldr Pingali, Flt Lt SK 'Hag' Sharma. At the back, just behind Jasjit Singh is the author Flt Lt Harish Masand.

ever be used as a PI unless I became medically unfit, I strongly represented against the course and requested Jasjit Singh to get it cancelled with his P Staff connections. He just smiled and said he had already tried but with my FR experience on Hunters during 1971 war and engineering background, P Staff were quite adamant.

At Intelligence School in Poona, I pretended that I couldn't see the stereo image on the PI's bifocals for the first week when the instructor, Flt Lt Colville D'Souza who had become very friendly by then, told me he had no option but take me to the CO, Wg Cdr Agarkar. The CO asked me to tell him honestly what the problem was. I told him I didn't want to do the course. He then asked which squadron I had come from and why the CO of the squadron hadn't been able to get my name off from the course. The moment he heard it was Jasjit Sir, he almost jumped and said if Jasjit Sir couldn't get it done, no one could so I might as well enjoy Poona for 10 weeks whether I could see the images or not. That is the kind of esteem Jasjit Sir as held in even outside the pilot community.

In mid-September 1976, I finished my ops syllabus by day and was declared 'Ops Day'. In October, my posting came to 101 Squadron in Adampur that had been designated as the training squadron. Despite my impending move, Jasjit Sir got me my trainer captaincy and night qualification. Just before leaving the squadron, he finally told me why he didn't want me in the squadron. He said he knew that as soon as I became operational, I would be moved to some other squadron and No.17 would not get any benefit of having trained me – and that's why he said he didn't want me in the squadron! Fortunately for me, I went back to Halwara a couple of times for RSO duties at SK Range and called on the Jasjit's many times, the reward being a good drink and some good 'gyan'. It was during one of those visits in Halwara when I told him that I was trying to question the seniors less these days, he looked at me with a smile and said I would wither and fade away the day I stopped standing up for what was right. I now realise he was absolutely right.

Even after he moved to IDSA at New Delhi and I moved on in life, I kept calling on him and spending some very educative evenings with him where he discussed topics like air power, modernisation of the Air Force, affordable defence as well as

nuclear issues. His vision and writings on such matters are well known to the entire strategic community in India, and abroad, and I benefited immeasurably by hearing it first hand. The reward now was always an annotated copy of his latest book or paper. The next time I met him, we would sit and discuss what he had given me.

When I was posted to Delhi in 1993 and working on the MiG-21Bis upgrade programme, we got even more opportunities to share a drink and some thoughts. Needless to reiterate, through all these interactions, I learned a great deal from Jasjit Sir and could never repay all that he gave me despite not wanting me in the squadron at first!

Fortunately, I got the opportunity to repay a small part of this debt to the Squadron and Jasjit Sir before I left. I got my Ops Day on 15 September. Less than a week later, DASI came visiting essentially for a check on the senior leadership and Flight Commanders. Jasjit Sir put me in almost every sortie that he could. When the Director, Gp Capt Mally Wollen asked him why, Jasjit Sir just said Harish is the latest Day Ops pilot and he wanted to show DASI how the *Golden Arrows* leadership trained its youngsters.

Jasjit Sir himself was extremely good at low-level navigation and I was put as his wingman in a 4 aircraft LL live strike on SK Range with one 57mm rocket. Halfway through the navigation, the inspector, Wg Cdr Ben Brar declared himself 'hostile'. I spotted him comfortably and ordered a hard turn as had been briefed. A little more than ninety degrees in the turn, Ben called off the attack and declared himself as 'friendly'. We reversed and Jasjit Sir just called out a slight speed increase and steered a few degrees off the calculated course for a while. At pull up point, we were right on time and track and everyone got some good results. Ben Sir, in the debrief, complimented Jasjit Sir on the mission but said with a smile that we hadn't synchronised the compass after the tactical action and so could have gone off-track hinting that the mission success after the bounce was a fluke. I immediately went and got the Russian navigation booklet on the MiG-21 that clearly stated that the KCI-6 was a pure gyro, unlike a magnetic-gyro such as the G4-F compass on the Hunter, and was not to be slaved in flight. Ben Sir was magnanimous enough to say that he had thousands of hours on type but didn't know this!

Another one was when Mally Sir was claiming a kill in group combat before one of the defenders got on to him, without a film and without using the gyro sight and I had to mathematically prove that he required almost three times the lead that he applied on the fixed sight at the range and speeds we were at. Again, Mally Sir complimented Jasjit Sir on the way the Squadron was trained. Jasjit Sir told me later I had paid the *Guru-Dakshina* in full – but I know I still owed him a lot more.

On a lighter note, in late 1987 while I was commanding No.28 Squadron on MiG-29s, his son Ajay Jasjit Singh came and joined the squadron as a young Flight Lieutenant from 45 Squadron in Naliya. Instead of telling Ajay, whom I had known as a boy from Halwara days, that I didn't want him in the squadron, I told him that I would treat him exactly like his father had treated me in 17 Squadron! Knowing his father well, Ajay got visibly perplexed, as I had been more than 12 years earlier, till I couldn't carry on with the joke and assured him that that meant very well and I would teach him as much as I could, like his father had. As a matter of fact, I thought Ajay would do well to take on the low level aerobatics on MiG-29s after Ramesh Goyal and I had left in June 1989 but he was considered too young by the AOC-in-C who said it would be considered later. Unfortunately, Ajay had to leave fighters a few years later because of serious injuries in an ejection but successfully went on to join the airlines.

Jasjit Sir was a remarkable man, thinker and strategist and I have tried to pay tribute to him by attending almost every Jasjit Singh memorial lecture from the time it was instituted – and I was in India. I thought I would pen this down now since there may not be a memorial lecture this year because of the pandemic. 🦋

To Sir, with a lot of respect and affection.



P&W in India

VAYU Interview with Ashmita Sethi, President and Country Head, Pratt & Whitney



VAYU : Pratt & Whitney has a large portfolio in commercial aviation in India, could you tell us more about its presence in India when it comes to military aviation?

P&W: Pratt & Whitney (P&W) has the largest footprint of any engine maker

powering tactical, strategic, mobility and rotary aircraft.

In India, our dependable F117 engines, which generate 40,400 pounds of thrust, power the IAF's 11 Boeing C-17 Globemaster IIIs, one of the largest such fleets outside of the USAF even as

they carry out military, humanitarian and peacekeeping missions. We are also proud that India's young pilots earn their wings on the PC-7 Pilatus trainers powered by the iconic PT6A engine. Our partnership with India's Armed Forces is both significant and growing, be it our growing suite of



F135 engines on the production line for the F-35 (photo: PW)

in the country, and one in every two people flying in India, fly on aircraft powered by Pratt & Whitney engines. With nearly 1500 engines and auxiliary power units in-service on a vast number of aircraft, Pratt & Whitney has for over seven decades, formed the 'engine-power' of India's civil aviation sector, and supports critical platforms for the Indian Air Force.

As makers of the world's first operational fifth-generation engine, the F119 for the USAF's F-22, and the world's most advanced fighter engine, the F135 for the F-35, our history and expertise with advanced propulsion systems is unmatched in the world. Globally, Pratt & Whitney has more than 7,000 military engines in service with 34 armed forces around the world,

File photo of the PW127G engine on an Airbus C-295





P&W's F117 engines power the IAF's C-17 Globemaster IIIs (photo: Angad Singh)

sustainment solutions that keep the fleet mission ready, or our partnerships on local aircraft development programmes.

VAYU : Apart from the C-17s and the PC-7s, are there any future campaigns for the Indian Air Force and Indian Navy that Pratt & Whitney might support?

P&W: There are some key campaigns in the Indian Air Force and the Indian Navy that we are supporting for our customers. Some of the future platforms in consideration with possible Pratt & Whitney engines are the Airbus C295 tactical transport aircraft for the IAF, powered by the PW100 family of engines, then there is the PW210-powered Sikorsky S-76D in consideration for the Naval Utility Helicopter programme.

The IAF is considering the C295 powered by two PW127G engines, to replace its fleet of Avro 748 transport aircraft. The PW127G is part of the PW100 engine family, and our operators across regional airlines, coastal surveillance, humanitarian aid, cargo, firefighting or defence count on its reliability in any environment.

VAYU : The IAF's C-17 Globemaster IIIs are carrying out high altitude operations with heavy loads: what makes the F117 engines ideally suited for these operations?

P&W: P&W's F117 engines power the IAF's fleet of 11 C-17 Globemaster IIIs and the C-17 has been used heavily during the COVID-19 crisis for medical repatriation flights for Indian citizens. The F117 engines are equipped with a directed-flow thrust reverser capable of being deployed in flight. On the ground, the thrust reverser can back a fully-loaded aircraft up a two-degree slope. Also noteworthy is the fact that the F117-powered C-17 set 22 world records during qualification testing before achieving Initial Operational Capability (IOC) for the U.S. Air Force (USAF).

The F117 engine uses technical and material advancements such as second-generation single-crystal turbine materials, improved cooling management and thermal barrier coatings to lower operating temperatures. These enhancements contribute to the F117's excellent reliability, durability and time on-wing.

VAYU : What about the Air Force's requirement of 114 fighters? Is that something Pratt & Whitney might support? Are there any platforms that utilise the F100 engine?

P&W: When it comes to India's current requirement for 114 new fighters, we believe that the IAF and the government will select the most capable platform that meets India's long-term mission requirements. At Pratt & Whitney, we are happy to engage with our customers on any opportunities that they see fit for us in the long term.

Pratt & Whitney's F100 engines have powered thousands of F-15s and F-16s for decades, and continues as the engine of choice for today's F-15 and F-16. In fact, the F100 has powered every operational F-15 in the USAF's fleet since 1972. The engine has benefited from the continued infusion of new technology since its introduction and offers 5th generation technology in a fully modular architecture. The F100 has industry-leading features of safety, reliability, and performance, delivering superior capability to the warfighter. 🦅

“For a better tomorrow, today”

Thales partnering with the Indian Air Force



Rafale and the Thales Spectra electronic warfare system components (Photo: Internet)

With initiatives and policy decisions on several fronts, India is marching steadfastly towards an era of *Atmanirbharta*. The country has shown will and muscle to become a global manufacturing hub and lead in modernisation of the armed forces.

The Indian Air Force has historically provided the country with air superiority and security. Thales is proud of the trust that the Indian Air Force has placed in its advanced technologies ever since it started its India operations in 1953.

Bringing its global expertise in solutions, services and products for aeronautics, defence, space, transport and digital identity and security markets, Thales today has a strong team of over 1800 employees in India, specifically working in the Indian defence and aerospace sectors. Thales' flagship technologies have been helping India's Forces to prepare, achieve and maintain tactical superiority and strategic independence over any form of threat. Over the years, Thales has also built a strong industrial footprint in the country with over 75 supply chain partners, joint ventures with Bharat Electronics Limited, Reliance Aero-structure and Samtel, associations with Hindustan Aeronautics Limited, MKU Limited, Kalyani Group, Bharat Dynamics Limited, among others.

On the cusp of a profound change

The 'Make in India' vision has set in process a series of structural reforms, from the path-breaking Defence Procurement Policy (DPP) of 2016 to the draft Defence Acquisition Procedure (DAP) of 2020, so as to achieve indigenisation and self-reliance. The progressive steps to provide priority for indigenously designed and developed defence products mark a shift towards self-reliance in the true essence of an *Atmanirbhar Bharat*.

At a decisive time like this, Thales remains committed to support the vision of Indian government, equipment and services from Thales being second to none. Its active electronic scanning array (AESA) RBE2 radar, Spectra electronic warfare system, optronics, communication navigation and identification system (CNI), the majority of the cockpit display systems and power generation system provide a technological edge to the Rafale. Thales also has been part of upgradation of the Mirage 2000 fleet together with Dassault Aviation and HAL. Thales offers a host of systems for India's armed forces ranging from radars and systems, avionics, Inertial Navigation and Global Positioning System, reconnaissance pods, IFF (Identification Friend or Foe) to unguided rockets for attack helicopters, which play an integral role in serving needs

of the company's customers and preparing for tomorrow, today.

As drone technology is constantly evolving globally and with its prevalence on the rise, there is always a possibility that some unmanned aircraft could be used for malicious purposes. Thales has solutions that can help civil and military aviation authorities in detection and neutralisation of rogue drones, and to help in maintaining airspace security.

With the future being in digital technologies, Thales identified this trend early and is particularly investing in digital innovations – connectivity, Big Data, artificial intelligence and cybersecurity technologies that support businesses, organisations and governments in their decisive moments. Its engineering competence centre in the Delhi NCR is focused on solutions for digital identity and security. The company's Engineering Competence Centre in Bengaluru is engaged in technologies for aerospace, defence and transportation. Through these centres, Thales seeks to take forward its legacy of fostering R&D and innovation forward and continually create engineering and non-engineering jobs every year.

Thales remains a trusted partner, committed to support the Indian armed forces achieve their goals and provide them with mastery of action whenever they face their decisive moments.

On this note, I wish the Indian Air Force a very happy 88th IAF Day! 🇮🇳



Emmanuel de Roquefeuil,
VP & Country Director, Thales in India

MBDA: celebrating IAF Day during a landmark Year



Seen here are MICA AAMs on a French Air Force Rafale--- which are also in service with the IAF Mirage 2000s and Rafales

The Indian Air Force Day in 2020 comes at a special time when the partnership between MBDA and the IAF has just gone even deeper with induction of the first Rafale fighters. It was the great privilege of Eric Beranger, MBDA's CEO, to be present on such an occasion – the next step in over 50 years of co-operation between MBDA and the IAF.

With Rafale now in the IAF's inventory, the IAF can field a new and potent suite of weapons from MBDA. Unquestionably

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

No less game-changing for the IAF is the SCALP stealthy air-launched cruise missile which also forms part of the Rafale

weapons package. This potent weapon will give the IAF an unrivalled and flexible tool to conduct deep strike missions at long ranges against even the most protected hostile targets.

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

highly countermeasure resistant and therefore highly effective.

With their strong reputation as a reliable partner that has supported the Indian Air Force for over 50 years, European missile firm MBDA understands the importance of operational capability and sovereignty for the IAF. For these reasons, the company is very strongly committed to *Make in India* to deliver both industrial sovereignty and the best of military equipment.

Indian firms are now supplying key components for the new generation missiles which are enhancing combat power of the IAF. For example Indian industry today is manufacturing 15 major subassemblies of the MICA missile, covering various complex technologies including mechanical, electrical, electromechanical and pyrotechnic items. MBDA continues to deepen its relationship with the Indian industry, as

exemplified by the recent formation of a joint venture with long-standing partner Larsen & Toubro to deliver a series of important missile programmes under the *Make in India* category.

The IAF is also getting a major boost with addition of the ASRAAM as its Next Generation Close Combat Missile. With its large rocket motor and clean aerodynamic design, ASRAAM has unrivalled speed and resultant aerodynamic manoeuvrability and range. The ASRAAM gives it high kinematic capability which delivers superior end-game performance for within visual range air combat. MBDA's ASRAAM missiles significantly enhance the battle capability of India's Jaguar strike fighters, giving them unrivalled self-protection ability and enhanced ability to penetrate hostile airspace. This highly capable missile could also boost combat capability of other IAF aircraft.

Working with HAL, integration of the Mistral ATAM system on the Dhruv advanced light helicopter (ALH) and the Light Combat Helicopter (LCH) has been successfully completed. Key to many of MBDA's programmes are their ability to be integrated with multiple platforms. By utilising the same weapon across different platforms, not only do aircraft benefit from these capabilities, but there are major cost savings and operational benefits to be found in maintaining inventory of common equipment not to mention the training and logistics benefits. As an example, deployment of the Mistral missile on India's helicopter platforms gives the possibility of their use in a ground-based VSHORAD role, as the missile is fully compliant with India's requirements and outperforms capabilities of its rivals. 🦋

Courtesy: MBDA



Mistral ATAM

Rolls-Royce in India



Lasting Legacies, Promising Future

As the 88th Indian Air Force Day is celebrated on 8 October 2020, Rolls-Royce salutes its magnificent history and spirit of the 'Guardians of Indian Skies'. This day is also a reminder of our legacy partnership with India that spans over eight decades, which started with the IAF's Westland Wapiti powered by our Bristol Jupiter engines. Since then, Rolls-Royce has been an intrinsic part of the Indian defence tapestry, building on the relationship with strong threads that will hold far into the future.

Partners in Progress

Rolls-Royce's 60-year-old partnership with Hindustan Aeronautics Limited (HAL) started with licensed production of the Orpheus engine, and is one of the longest in the history of aerospace in India. With the

Adour Mk871 and Adour Mk804/811, also made in India by HAL with Rolls-Royce support, our journey is the original 'Make in India' story.

Rolls-Royce engines power various aircraft of the Indian defence forces including transport, trainer and combat aircraft and helicopters. The Jaguar has flown with the Rolls-Royce Adour Mk811 since 1981, while Adour Mk871-powered Hawk advanced jet trainers have been in service since 2008. Over the years, we have also been working steadily for the development and transformation of India's indigenous aerospace industry. We have also invested in building supply chain capabilities and forged successful partnerships with private sector players like Bharat Forge, Godrej & Boyce, Force Motors, the Tata Group, as well as various MSMEs and start-ups.

Engineering Excellence

Today, more than 750 Rolls-Royce engines of ten engine types are powering aircraft of the Indian military. Our engines power a wide variety of aircraft in inventory of the Indian Air Force, from combat and strike aircraft (the Jaguar, powered by the Adour Mk811) to trainers (Hawk Advanced Jet Trainer, powered by Adour Mk871) to strategic airlift aircraft (C-130J Hercules, powered by AE2100) as also VVIP and Surveillance aircraft (ERJ145, powered by AE3007).

We provide the highest possible levels of support to defence forces for the engines in service. Our field service representatives work closely with Armed Forces personnel to maximise the availability of engines on wing and provide on-ground technical advice directly to our defence customers,



thereby drastically reducing maintenance and overhaul times.

Our *Defence Service Delivery Centre* (SDC) in Bengaluru is the only one in Asia specifically supporting the Indian Armed Forces and Hindustan Aeronautics Limited. Its principal role is to improve our responsiveness to the forces, and to enable further optimisation of engine availability.

Over the years, we have played a vital role in supporting growth of the Indian Defence and Aerospace industry with our portfolio of products and services and the right combination of experience and advanced technologies.

With the help of our engineering talent in India, we are working towards establishing a robust ecosystem that will engage in co-creation across the entire value-chain – from research, design and

development to manufacturing, integration, maintenance and repair. This will further enable the vision of ‘Make in India’, to make for India and for the world.

Future ready!

With more than 16,000 military engines in service with 160 customers in 103 countries, Rolls-Royce is globally a powerful player in the defence aero engine market. From combat to transport, from trainers to helicopters, our engines and pioneering service solutions ensure that our customers have world-leading engine technology available, whatever the mission demands.

We believe the future will be all about ‘Creating in India’ in collaboration with willing global players, with India co-owning the Intellectual Property (IP) in areas of strategic importance. As the world prepares

to rise beyond impact of the Covid-19 pandemic, the manufacturing sector in India also has an opportunity to become a strong lever for economic growth and self-reliance.

Looking at the future, we are happy that both the UK and India are willing to explore opportunities to collaborate with significant technological and talent capabilities on both sides. There is a great opportunity to co-create and co-manufacture customised solutions for India’s future defence needs and support India’s vision for self-reliance. India has the talent, potential, ingenuity and digital ecosystem to recast the framework of defence manufacturing and build an *Atmanirbhar Bharat*. 🇮🇳

Kishore Jayaraman
President, Rolls-Royce India and South Asia

Boeing: “Modernisation and mission-readiness of India’s defence forces defines our partnership with the country”



India is out in front and centre of significant opportunities for Boeing, with India’s defence forces having invested in advanced capabilities for the present and in the future. Boeing is committed to supporting, as well as helping modernisation of India’s armed forces.

At a virtual pre-Farnborough Air Show 2020 briefing, Boeing discussed delivery of

two F/A-18 Block III Super Hornet flight test aircraft to the US Navy. “Boeing is on schedule to deliver next-generation Block III capabilities to the US Navy in 2021. By 2024, one squadron per carrier air wing will consist of Block III Super Hornets. The same Block III aircraft that is being built for the US. Navy is on offer to the Indian Navy.”

Thom Breckenridge, vice president of International Sales for Strike, Surveillance and Mobility, Boeing Defense, Space & Security, stated that “the F/A-18 for the Indian Navy provides the best capability with the Block III configuration, and benefits from the multi-billion dollar investments made towards new technologies in the Super Hornet by the US Navy and





Torbjorn (Turbo) Sjogren, vice president, International Government and Defence, Boeing

international customers. The F/A-18 Super Hornet will provide superior value and tremendous opportunity the Indian Navy. It can enhance collaboration in the areas of naval aviation between the Indian Navy and the US Navy to maintain peace and security throughout the Indo-Pacific region. The F/A-18 Super Hornet will enhance collaboration between the US Navy and Indian Navy in the Indian Ocean region.

Boeing’s plan is to offer ‘By India, For India’ sustainment programme that will build on other successful sustainment programmes that Boeing is executing for the Indian Air Force and Indian Navy today, to sustain, modify and upgrade F/A-18 Super Hornet from India”.

The Super Hornet will offer the Indian Navy the most economical path to get access to newer technologies. With massive scale of the Super Hornets (more than 700 plus aircraft in US inventory), the cost of incorporating newly developed advanced technologies will be very competitive as the overall cost will be spread across a large number of aircraft. Future collaboration between the two navies can thrive on huge economies of scale which helps in interoperability and improves economics for collaboration on new technologies to meet the emerging threats. The F/A-18 Super Hornet has a very attractive lifecycle cost. It not only has an affordable acquisition cost, but it costs less per flight hour to operate



Thom Breckenridge, vice president of International Sales for Strike, Surveillance and Mobility, Boeing Defense, Space & Security

than any other tactical aircraft in production in the US forces inventory, including single engine fighters. This is possible because the fighter is designed for ease of maintainability and offers impressive durability

Torbjorn (Turbo) Sjogren, vice president, International Government and Defence, highlighted trends in

government services offerings seen around the world in digital, training, supply chain and maintenance. “We see tremendous opportunity for growth in India’s defence sector and further strengthening our relationship with the armed forces. We are committed to flawless execution on our current programmes and supporting India with their future defence needs” stated Sjogren. “Also, with India’s recent strides in space exploration and ambitions towards human space flights before August 2022, we see immense opportunity to partner with ISRO in their endeavours. Notwithstanding our six decades of space experience, Boeing is inspired by what India has achieved and its aspirations for the future,” Sjogren added.

With lessons learned from supporting C-17, P-8I and other aircraft in India, combined with in-depth Boeing experience in sustaining aircraft worldwide, Boeing is in the process of developing sustainment concepts for the Apache and Chinook. “Boeing is seeing a wave of big international opportunities and campaigns in this region and around the globe.” 🌐

Boeing and USAF in Deal for the F-15EX

The US Air Force has awarded Boeing a near \$1.2 billion contract to build the first lot of eight F-15EX advanced fighters to help the service meet its capacity requirements and add capability to its fighter fleet. The award also covers support and one-time, upfront engineering costs. Already under construction at the Boeing F-15 production facility in St. Louis, the first two aircraft will be delivered in 2021.



The Gripen E for India



The Gripen E has been ordered by the Air Forces of Brazil and Sweden and deliveries have begun to both nations. The Gripen E has been developed to counter – and defeat – the most advanced threats in the modern battlespace. Its unique architecture makes this an intelligent fighter system that continuously evolves by rapidly embracing new technology and tactics in a manner that will always keep the IAF one step ahead. The Gripen E is arguably the most modern fighter in the world today and along with its weaponry, including the game-changing, Meteor BVR (Beyond Visual Range) missile, the Gripen E will give India an edge against all its adversaries.

Latest high performance sensors such as the AESA radar,IRST system, advanced datalinks and AI-enabled decision support gives the Gripen E pilot superior situational awareness and ability to “see first-act first”.

Its low visual and electronic signatures with a fully integrated onboard self-defence and ECM suite with 360 degree spherical coverage, together with latest and most advanced weapons available, secures its mission success and brings the pilot home safe.

With its combat performance and power projection capability, the Gripen E will assuredly provide the IAF with deterrence power in the region.

The offer for India

We have provided a comprehensive response to the IAF’s *Request for Information* concerning fighter aircraft for the Indian Air Force. The Saab proposal delivers the perfect fighter for India’s current and future needs. Furthermore it supports India’s ambition for stronger indigenous capabilities and self-reliance with the latest technologies

for development and production of future fighters, such as the futuristic AMCA.

Saab’s offer will enable Indian companies to take part in industrial processes of the world’s most advanced fighter, absorbing state-of-the-art capabilities and technologies with applications in both the military and civilian sectors. Through the *Make in India* initiative, a generational shift in full spectrum fighter capabilities will accelerate India’s indigenous defence and industrial ambitions.

The offer consists of very comprehensive *Transfer of Capability* packages focused on building indigenous abilities to design, develop, produce and maintain a modern state-of-the-art fighter system platform. Saab are going far beyond shifting any assembly line to India. Our offer provides for building self-reliant skills in India and consists of a production-oriented



part, a design and development-oriented part related to the Gripen. Saab will also provide a capability-oriented design & development aspect that is intended to support the indigenous development of advanced fighter aircraft such as the AMCA, possibly in close cooperation with ADA and the DRDO. The offer also includes an extensive indigenous MRO solution that will provide India with capabilities to maintain – and upgrade – the aircraft as needed in the future.

The build-up of these capabilities will require substantial investments from Saab, the Indian side as well as from our International partners. Investments will need to be made in facilities, training, machinery and so on. However, these investments will very much serve as a baseline to create thousands of job-opportunities for skilled workers as well as for engineers and technicians. The spill-over effect will be substantial and also DPSUs will be able to benefit significantly



from *Transfer of Technology* or *Transfer of Capabilities*.

The overall aim is to build an ecosystem that in the execution phase that can support with local manufacturing of parts for ourselves as well as for our system partners/suppliers. Saab's successes over the years in forging meaningful partnerships is because the industrial cooperation forms a natural and integral part of any new business initiative.

We are already sourcing aero-structures parts, such as sub-assemblies, machined parts and sheet metal parts and are continuing to undertake further surveys in the aero-structures area. We are now continuing on that process, together with our system partners, in order to find the right partners for our partners so as to reach optimum localisation. 🦋

Mats Palmberg
Vice President (Industrial Partnerships)
Saab AB and Head of Gripen
India Campaign

MiGs in the skies over India



MiG-29UPG of the IAF (photo: Simon Watson)

Diplomatic relations between Russia and India, now for over 70 years, are unique because of openness and efficiency. They have similar views on the global world order, mutually beneficial cooperation in the fields of nuclear energy, industry and agriculture which has made possible to form a common creative view on world developments and well-being of their citizens. One of the key aspects in the long standing dialogue between the countries has been, and remains, military-technical cooperation between the two countries which is now reaching a new level of development.

Projects in combat aviation give reasons for real pride as it is in this domain that, over a long period of time, the brand 'MiG' has made, and continues to make, significant contribution to the air power of India's air forces.

More than 1000 'MiG' aircraft have been supplied to the Indian forces and also manufactured under licence by Indian industry. In fact, the first licence production of MiG-21 fighter, almost half a century back, was actually start of the 'Make in India' programme long before this became an established fact. Second, third and fourth generations of 'MiG' aircraft have been supplied within the framework of military-technical cooperation and Indian pilots got advanced MiG fighters much earlier than other foreign operators. As



IAF MiG-21s (photo: Simon Watson)

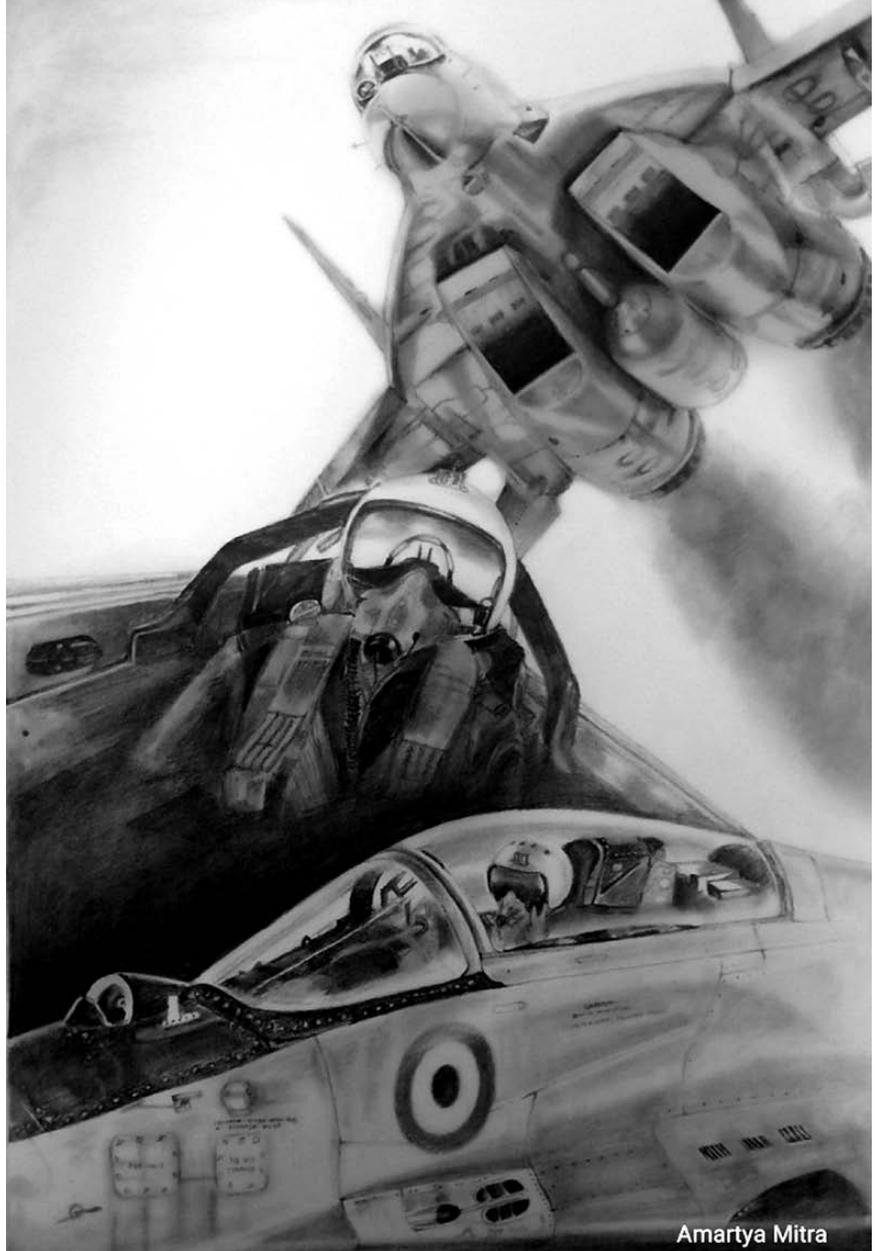
an example, in the 1980s, India was the first country to receive MiG-29s even before USSR allies of the Warsaw Pact did.

Manufacturing, maintenance and repair facilities for 'MiG' aircraft have long been localised in India, which supports the Indian Air Force and Navy to significantly reduce time and cost of all stages of after-sales support, from setting up of technical centres to scheduled maintenance and repair-restoration work.

An important aspect in development of military-technical cooperation between the two countries is a potential decision of the Indian Government to purchase twenty one MiG-29s manufactured by the 'Russian Aircraft Corporation MiG' (as part of the United Aircraft Corporation). Sources in the Indian Ministry of Defence explain that this purchase is necessary for augmentation of the country's combat fleet at a time when the earlier generation MiG-21 aircraft are being replaced according to the plan.

At the same time, in the current international situation, India is considering rapid upgradation of its MiG-29/MiG-29UB fleet as also upgrading MiG-29K/ KUB fighters of the Indian Navy.

Corresponding with modern approaches on the supply and operation of aviation equipment, the 'MiG' Corporation is ready to offer a wide range of services for post-sales support and training of aviation personnel, including the complex maintenance systems,



MiG-35 (photo: MiG)





IAF MiG-29UPG (photo: MiG)

in cooperation with local partners and also long-term maintenance LTA contracts.

It is also important to note that the 'MiG' Corporation offers a comprehensive offset programme, and also that the most important and demanding parts of this programme within the framework of previously concluded contracts are already being implemented by the Corporation. Thus, joint ventures and high-tech opportunities are created in India, with the most advanced technologies absorbed by the industry.

A new and significant opportunity in development of military-technical cooperation between the countries the

potential tender for supply of 114 multi-role fighters for the Indian Air Force. To participate in the tender the 'MiG' Corporation has worked on a proposal for local production of the MiG-35 fighter in keeping with the strategic cooperation agreement involving the Indian industrial partner.

The MiG-35 aircraft is considered as pinnacle of the 'MiG' aircraft family, and designed for operation in high-intensity armed conflicts, in conditions of extensive and layered enemy air defence systems. The MiG-35 can perform complex multipurpose missions in a continuously changing operational and tactical environment against

air, ground and surface targets. Incorporating fifth-generation fighter technologies, radar with active phased array antenna, a modern cockpit, wide range of weapons including those foreign-made, having high rate of operational reliability and with an infrastructure already existing in India, plus experience of the Indian Air Force pilots, this could give great advantage to the MiG-35 in the upcoming tender.

Proposal of the 'MiG' Corporation involves full transfer of technology to the Indian Government, providing the full scope of manufacturing technologies, operational and repair documentation. Implementation of the project for supply and indigenous production of MiG-35 aircraft will allow the Indian aviation industry to exploit advanced manufacturing technologies and developing of key systems of 5th generation aviation equipment, as well as to increase scientific knowhow for the development of other national aviation projects.

This time-tested partnership is one of the important components of the two countries foreign policy. Over the years of being friendly ties in various fields, the peoples of India and Russia have greatly benefited from each other's strengths. Thus, it is important that New Delhi and Moscow continue to expand and strengthen their military-technical cooperation in order to meet modern challenges.

This is the very basis of freedom, independence and prosperity of the 'two' countries for many years to come. ✈️

**Article courtesy: MiG
Drawing: Amartya Mitra**



MiG-35 (photo: MiG)

VAYU Interview with

Lockheed Martin



William Blair, Vice President & Chief Executive, Lockheed Martin India



Kurt Knust, Director, F-21 India Programme and Lockheed Martin Aeronautics

VAYU : The Lockheed Martin C-130J has been backbone of the Indian Air Force in conducting humanitarian and tactical airlift missions. What kind of special configurations have been made to Indian C-130Js to enable the same?

LM: The C-130 programme represents a strong legacy of partnership between the U.S. and India. The Indian Air Force's C-130J Super Hercules have a highly integrated and sophisticated configuration primarily designed to support India's special operations requirement. Equipped with an Infrared Detection Set (IDS), the aircraft can perform precision low-level flying, airdrops and landing in blackout conditions.

Self-protection systems and other features are included to ensure aircraft survivability in hostile air defence environment. The aircraft are also equipped with air-to-air receiver refueling capability for extended range operations. India's C-130Js have been used to support a variety of missions over the past few years, to include humanitarian aid, natural disaster support and floods (an IAF C-130J was the first aircraft to arrive after the Nepal earthquake), airlift, search and rescue, and special operations.

Most recently, the IAF has been extensively using the Hercules for humanitarian efforts in the wake of Covid-19

pandemic for delivering critical medical equipment, medicines, PPEs, sanitizers and other essentials to remote places, airlifting teams of Indian military doctors to countries like Nepal, the Maldives and Kuwait, and for movement of men and material to the forward areas in Ladakh.

The C-130J is the only airlifter that can seamlessly handle all of India's challenging terrain, from short, unprepared landing strips in the Himalayan mountains to vast coastlines. The C-130J's rugged reliability makes it an asset unmatched by other aircraft.



VAYU : Tell us about the Simulation Training Facilities set-up for the IAF's C-130J fleet, and about your C-130J Maintenance & Aircrew Training System (MATS)

LM: In partnership with Mahindra Defence Systems, Lockheed Martin is meeting the increasing global demand for C-130J military flight training at the Indian Air Force C-130J Super Hercules simulator training centre at Hindon Air Station in India. This state-of-the-art training centre provides qualitative and quantitative training for C-130J pilots, combat system operators and loadmasters. Through realistic and holistic learning environments, crew members are able to hone critical tactical and operational skills to conduct a variety of missions including humanitarian aid, natural disaster support, airlift, search and rescue and special operations.

For all nations operating C-130Js, the Lockheed Martin C-130J *Maintenance and Aircrew Training System* (MATS) programme provides a comprehensive range of training devices and training support services teaching aircrew and maintenance personnel without having to board the aircraft. Launched in 2000, the programme provides training devices, training aids, device modernisation, and courseware development for C-130J pilots, loadmasters, maintainers, combat system operators and crewmasters.

The C-130J MATS programme has delivered 36 flight simulators, 64 other simulators and 26 courses with more than 3,300 lessons across eight configurations to date with 26 additional new device deliveries planned through to early 2024. In addition, the C-130J MATS Training Systems Support Centre (TSSC) provides configuration management, engineering tasks and cybersecurity for the Air Mobility Command, Air National Guard and Naval Aviation Systems Command end users. The TSSC provides operational support across a wide range of infrastructure elements, keeping the training system current, configured, relevant and modern.

VAYU : Lockheed Martin has offered its F-21 aircraft to the Indian Air Force for the 114 fighter jet competition and described this as an unprecedented 'Make in India' opportunity. What are the new components and technologies being leveraged for the F-21?



LM: Lockheed Martin is committed to strategic, long-term international defence partnerships with India and hopes to strengthen and grow its relationship with India as part of an unprecedented F-21 fighter aircraft partnership "For India, From India". The F-21 delivers advanced, scalable capabilities to the Indian Air Force, provides unmatched opportunities for Indian industry, and accelerates US-India cooperation on advanced technologies.

The F-21 has unique capabilities including an advanced APG-83 Active Electronically Scanned Array (AESA) radar, which has detection ranges nearly double that of previous mechanically scanned array radars and the ability to track and attack more targets with higher precision; an Advanced Electronic Warfare (EW) System developed uniquely for India that provides enhanced survivability against ground and air threats; Long-Range Infrared Search & Track (IRST), enabling pilots to detect threats without being detected; Triple Missile Launcher Adapters (TMLAs), allowing the F-21 to carry 40 percent more air-to-air weapons; and a Dorsal Fairing enabling increased growth capacity and indigenous systems integration in the future. The F-21 is also the only fighter in the world capable of both probe/drogue and boom aerial refueling capability. This, along with Conformal Fuel Tanks (CFTs),

delivers greater range penetration and loiter staying power to the Indian Air Force.

An F-21 partnership integrates India into the world's largest and most successful fighter aircraft ecosystem – a USD \$165 billion market and demonstrates Lockheed Martin's commitment to India. Simply put, the F-21 goes further, faster, and stays longer than the competition – all at the most optimal Life Cycle Cost for the Indian Air Force. Whether you are talking about battlefields or budgets, the F-21 is the clear choice for India!

VAYU : Could you also elaborate on how the F-21 will complement IAF's existing fleet of aircraft, considering that the Rafale was recently inducted?

LM: As mentioned previously, the single-engine F-21 is the ideal solution to meet the Indian Air Force's capability needs, deliver unparalleled 'Make in India' industrial opportunities, and accelerate India-US cooperation on advanced defense technologies.

We believe that the F-21 aircraft complements IAF's existing fleet as it fits right in between the Tejas and Rafale to provide an operational gap-filler. It delivers an advanced, single-engine multi-role fighter at the most optimal Life Cycle Cost for the Indian Air Force, with the longest service life of any competitor: 12,000 flight hours.

Lockheed Martin “Deepens ties with India’s Defence and Aerospace Supply Chain”

Reaffirming its continued commitment and focus on *Make in India*, Lockheed Martin announced the culmination of the 7th edition of its annual Suppliers Conference on 31 July 2020. The event was co-hosted with Society of Indian Defence Manufacturers (SIDM) and Confederation of Indian Industry (CII).

Themed ‘Making India part of the Global Supply Chain’, the five-day conference had more than 400 delegates, with more than 200 companies of all sizes – large, MSMEs and start-ups, participating in the conference. 62 companies joined the conference as exhibitors and used the virtual exhibition area of the ‘CII HIVE’ platform to showcase their company.

During the conference, Lockheed Martin shared new partnership opportunities with Indian industry on its business areas including Aeronautics, Rotary and Mission Systems (RMS), Missiles and Fire Control (MFC) and Space.

A highlight from the company’s RMS group is future work with MH-60R for India. There is an offset requirement for the programme, and Lockheed Martin will put more indirect work over in India. The RMS team will work with capable Indian companies over the next 7-8 years and provide opportunities to the industry to integrate into the global supply chain. RMS’ Supply Chain team already works with several industrial partners in India and plans to expand that list, strengthening its commitment to the country.



VAYU : Given that you have two joint ventures with Tata in Hyderabad, how will these partnerships help you for the F-21 programme? Additionally, what are some other partnerships that you can leverage for the same?

LM: We have been committed to building trust, technology development and strategic collaboration with India. Our joint venture with Tata Advanced Systems Ltd., Tata Lockheed Martin Aerostructures Limited in Hyderabad for over 10 years produces major aerostructure components for the C-130J Super Hercules transport aircraft. This is the sole supplier of these components to Lockheed Martin and is an integral part of our global supply chain.

Our other joint venture is between Tata and Sikorsky Aircraft Corporation which was established over 10 years ago. This JV manufactures aerospace components for commercial helicopters and aircraft and has expanded to include aircraft engine components for aerospace industry companies as well. It is also fully integrated into the global supply chain.

We hope to strengthen and grow our commitment to India with the F-21 “for India, from India”. The F-21 delivers

advanced, scalable capabilities to the Indian Air Force, provides unmatched opportunities for Indian industry, and accelerates US-India cooperation on advanced technologies.

At the 11th edition of DefExpo, we signed a Memorandum of Understanding with Bharat Electronics Limited, a premier aerospace and defence company in India to explore industrial opportunities for the F-21 programme. We believe that an F-21 partnership with India integrates Indian industry, including BEL, into the world’s largest and most successful fighter aircraft ecosystem and demonstrates Lockheed Martin’s commitment to India. We continue to seek strategic relationships with the Indian Defence Public Sector and Private sector companies spanning large, MSMEs and start-ups to be both competitive and meet the Indian self-reliance initiatives and indigenous content requirements.

Our partnership with the Indian aerospace and defence ecosystem coupled with our understanding of user requirements, offers us the unique advantage of being able to rapidly and efficiently realise our blueprint for the F-21 offer.

VAYU : What are the R&D initiatives of LM in India and does that give you a competitive advantage for the F-21?

LM: As a part of our larger commitment to support Indian innovation, Lockheed Martin has sponsored and supported the India Innovation Growth Programme (IIGP) since 2007 in partnership with the Department of Science and Technology, the Indo-U.S. Science and Technology Forum, University of Allahabad, the Federation of Indian Chambers of Commerce and Industry, Stanford Graduate School of Business, and the IC2 Institute at the University of Texas.

The IIGP has pioneered an initiative that has supported more than 400 innovators and start-ups with in-depth technology commercialisation training and support to commercialise and scale their ventures in India and across the world. To date, the revenue generated for Indian entrepreneurs through this programme is approaching USD \$1 billion, and it is a flagship innovation programme in the Department of Science and Technology.

We believe that the F-21 will significantly boost India’s innovation ecosystem as continuous innovation is a fundamental part of successful fighter aircraft programmes. 🦅

First F-35As for 75 Squadron RAAF



First example of the Royal Australian Air Force Lockheed Martin F-35A Lightning II, made its maiden flight on 30 July 2020, wearing the markings of No 75 Squadron, which will be the second operational RAAF F-35A unit. At present No. 75 Squadron operates the Boeing F/A-18A/B Hornet from RAAF Tindal, Northern Territory.

F-35s for the UAE...

There are speculative reports of an intriguing possibility where, in wake of the United Arab Emirates normalising diplomatic ties with Israel and forging a broad new relationship with the Jewish State under an accord that US President Donald Trump has masterminded, the sale of 5th Generation F-35s to the UAE “could be considered”. On 20 August 2020, President Trump revealed that the UAE was interested in the F-35s and that this matter was “under review”. However, Israeli Prime Minister Benjamin Netanyahu, citing a need to maintain Israeli military superiority in the region, said that his country would oppose any F-35 sales to the UAE.

... and Pakistan ?

Even more intriguing would be Pakistan’s effort to request sale of F-35s to its Air Force, should that country also recognise the State of Israel. In this connection, there are historical references that Israel would have welcomed diplomatic relationship with Pakistan and there were reciprocal feelings within some sections of the Pakistani military. Although, the matter of F-35s to the PAF seems rather fanciful, informed circles have revealed that in the past Israel had supplied components for F-16s to the Pakistan Air Force, after US clearance.

It is also opined that “the proposed transaction is a ‘secret push’ by US President Donald Trump’s son-in-law and senior advisor Jared Kushner and that this clandestine initiative has caused confusion and frustration among agencies and congressional committees that would normally be involved in such a sale, but have been left in the dark”.

66 F-16C/D Block 70s for Taiwan



On 15 August 2020, Taiwan’s long awaited purchase of 66 Lockheed-Martin F-16C/D Block 70s, was formally announced. The move has been strongly opposed by Communist China even as the two nations, divided by the Taiwan Strait have carried out offensive-defensive exercises (*see news item*). The Republic of China Air Force (as it is officially known) is highly trained and relatively well equipped, its fighter inventory including 115 earlier model F-16A/Bs, 46 Mirage 2000-5EIs and 103 indigenously developed AIDC F-CK-1Cs.

Greece to acquire 18 Rafales



The Government of Greece have announced their intention to acquire 18 Rafales for its air force. “This announcement illustrates the strength of the partnership that has linked the Greek Air Force and Dassault Aviation for more than 45 years, and demonstrates the enduring strategic relationship between Greece and France”, stated Eric Trappier, Chairman and CEO of Dassault Aviation.

Greece had ordered 40 Mirage F.1s from Dassault Aviation in 1974, then 40 Mirage 2000s in 1985 and finally 15 Mirage 2000-5s in 2000; this latest contract also includes upgradation of 10 Mirage 2000s to the 2000-5 standard, including major involvement of the Greek industry.

Dassault Rafale production status



According to French sources, production of the Rafale fighter continues for India and Qatar, all 13 aircraft to be built this year (half of 2019's total) being destined for export. Of the 68 Rafales on order, 40 aircraft are under production. Deliveries for national operators will resume in 2022 as France begins receiving the 28 Rafales still outstanding from the 80 aircraft ordered. Dassault's CEO Eric Trappier "is hopeful that it will now go slightly further as part of the government's aerospace rescue efforts". Mr Trappier emphasised that for Dassault's "economic model" to work, "export contracts" are required alongside those from its home nation. Prospective customers have suffered "economic consequences" from the pandemic and the French Government "does have an additional incentive to purchase the Rafale as such orders serve as an economic stabiliser for both the company and the wider supply chain."

Future Fighters for Canada

The Canadian Government has confirmed that offers have been received for its new fighter programme, the types shortlisted being Boeing F/A-18E/F Super Hornets, Lockheed Martin F-35As and Saab Gripen Es. The chosen type will replace the Royal Canadian Air Force's CF-18A/Bs with 88 new fighters, deliveries of which will begin in early 2025. As part of Canada's *Future Fighter Capability Project*, the cost of the acquisition and associated equipment has been pegged at C\$15-19 billion (\$11-14 billion). Initial proposal evaluations will be completed "by spring 2021 with a final contract award in 2022". A leading contender is the Gripen E, and according to Saab, this fighter "was designed to operate in harsh environments and defeat the most advanced global threats. The system meets all of Canada's specific defence requirements, offering exceptional performance and advanced technical capabilities."



Canadian Hornet Upgrade



Meanwhile, the Royal Canadian Air Force fleet of F/A-18 A/B Hornets is to be upgraded, with Canada requesting Raytheon-produced munitions under the potential deal, including 50 AIM-9X Sidewinder Block II short-range air-to-air missiles and 20 AGM-154C Joint Standoff Weapon (JSOW) glide bombs, along with 20 Improved Tactical Air Launched Decoys (ITALDs). Already approved is the sale of 38 Raytheon AN/APG-79(V)4 active electronically scanned array (AESA) radars and 46 wide-band radomes, as well as support equipment and logistics services. Canada has long operated the F/A-18A/B (designated the CF-188A/B Hornet) and in February 2019, the RCAF accepted the first two secondhand F/A-18A/B Hornets from the Royal Australian Air Force (RAAF) from a planned acquisition of 18, which will supplement Canada's existing Hornet fleet as it progresses with its *Future Fighter Capability Programme*.

Turkish F-35As reallocated to USAF

As a result of the standoff between the United States and Turkey, especially on the S-400 strategic air missiles matter, the first F-35As built for Turkey have been re-allocated for US forces. The US Naval Air Systems Command has options for 14 Lockheed Martin F-35A Lightning IIs earlier meant for Turkey and now re-allocated for the US Air Force plus another six F-35As, from Lot 14. Transfer of the Turkish F-35As to the USAF puts an end to all Turkish participation in the programme.

Gripen offered to Croatia

The Government of Sweden has submitted a proposal for 12 new Gripen C/D fighter aircraft to the Government of Croatia, the type already being in operational service with the air forces of



Sweden, Hungary, the Czech Republic, South Africa and Thailand. Gripen fighters of the Czech and Hungarian Air Forces participate regularly in NATO operations and exercises, proving the fighter's full NATO interoperability, considered an advantage for Croatia.

Gripens for Ireland?

There are reports of the Irish Government considering the possibility of ordering a small batch of Saab Gripen Es for its small air arm. Planning for "an Irish intercept capability" was referred to in the Irish Defence Forces five-year equipment development plan as, since 2015, Russian bombers have frequently violated Ireland's air space, with interceptors being routinely scrambled from "neighbouring countries" to intercept the aircraft. As per Professor Ben Tonra at the University College Dublin's school of politics and international relations "the Saab Gripen would be a good choice because the politics surrounding fighter procurement would be as important as the aircraft's capability. Since its inception, the Republic of Ireland has been militarily neutral, as is Sweden in world affairs and also an EU member".

First Block III Super Hornets



Boeing has delivered the first two F/A-18E/F Block III Super Hornet multi-role fighters to the US Navy for flight testing. The US Navy will familiarise pilots with the platform's advanced cockpit systems, including the new 10in x 19in touchscreen display. According to Steve Wade, VP F/A-18 and EA-18G programmes at Boeing, "the aircraft will be used for carrier suitability and integration testing of all Block III mission system components. These will ensure that crews have plenty of time to become comfortable with the next generation systems before receiving operational aircraft". The Block III Super Hornet also features capability upgrades and an enhanced communication system, along with increased range and a reduced radar signature. The fighter's operational life will be extended from 6,000 flight hours to 10,000. Boeing has been contracted by the US Navy to provide 78 Block III Super Hornets.

Boeing, MHI on F-15J upgradation

Boeing has a commercial agreement with Mitsubishi Heavy Industries (MHI) to upgrade Japan's Boeing F-15J fleet as part of a \$4.5bn modernisation programme. The upgrades will introduce state-of-the-art electronic warfare and weapons, with an

all-new cockpit system, running on a mission computer, to provide enhanced situational awareness. This contract lays the foundation of the modernisation programme where MHI will develop the detailed modification plan for the aircraft and prepare for induction and upgrade of up to 98 Japan Air Self-Defense Force aircraft beginning in 2022.

Production of Boeing F-15EX



The development and production contract for Boeing's F-15EX has been awarded by the US Air Force Life Cycle Management Center (AFLCMC) for up to 200 aircraft over a ten-year period. The USAF plans to replace its Boeing F-15C/D Eagles with the F-15EX. Boeing has begun production the first two aircraft on its production line in St Louis, Missouri, in expectation of the order for first eight aircraft at Eglin AFB, Florida, to support the flight test programme. "The F-15EX is designed so that transition from current F-15 models will require minimal training, and bases for the new aircraft should require little or no infrastructure changes". The most significant difference between the F-15EX and legacy F-15s is the new variant's open mission systems architecture, which will enable rapid insertion of the latest aircraft technologies. The USAF intends to buy a total of 76 F-15EX over the five-year defence programme.

AIM-120C-8 for Netherlands, Japan and Spain

The US State Department has made a determination approving a possible FMS to the Government of Netherlands for sixteen AIM-120C-8 Advanced Medium Range Air-to-Air Missiles (AMRAAM) and related equipment for an estimated cost of \$39 million. The State Department has also made a determination



approving a possible FMS to the Government of Japan of thirty-two AIM-120C-8 Advanced Medium Range Air-to-Air Missiles with support for an estimated cost of \$63 million. This was followed by an FMS to Spain of one hundred AIM-120C-7/8 Advanced Medium Range Air-to-Air Missiles and one (1) AMRAAM Guidance Section (spare) plus related equipment.

Chilean F-16 Upgrade

Lockheed Martin F-16s of the Chilean Air Force are to be upgraded, the present fleet consisting of 44 aircraft, including 26 Lockheed Martin F-16AM mid-life upgrade (MLU) aircraft, six F-16BM (MLU), six F-16C Block 50M and four F-16D Block 50M. The F-16AM/BMs were bought second-hand from the Netherlands and delivered from September 2006, while the F-16C/Ds were delivered as new from January 2006.

Chinese warplanes over Taiwan Strait



While Chinese tensions with India in Eastern Ladakh/Western Tibet dominate news for the past five months, it is China's Eastern Front along the Taiwan Strait which has seen clear display of PLAAF air power. On 17 September, some 18 Chinese fighters and bombers transgressed into Taiwan's southwestern air identification zone, from four different directions, the aircraft identified as two H-6 strategic bombers (*in photo*) as also eight J-16s, four J-10s and four J-11s. In quick reaction, ROC fighters were scrambled and air defence missile systems activated before the PLAAF aircraft turned back to Mainland China.

RAF RC-135W Rivet Joints

The first of RAF's three RC-135W Rivet Joints electronic surveillance aircraft are to be upgraded before resuming operations, this including a new glass cockpit and new flight deck.



The aircraft has undertaken the first of a series of aircrew flight deck training sorties from its base at RAF Waddington, Lincolnshire, where it is operated by 51 Squadron. The aircraft was upgraded by Technologies of Greenville, Texas, in November 2019. Although the US Air Force also has 17 Rivet Joints, none of them have yet undergone such modernisation.

Germany to acquire ISR Global 6000s



The German Government is to purchase three Bombardier Global 6000s for signals intelligence (SIGINT) conversion. The Luftwaffe already operates three Global 6000s in the VIP role, the type selected as the preferred option for the SIGINT requirement for common maintenance, aircrew training, spares and support costs. The SIGINT system will be the integrated signal intelligence system-ZB (ISIS-ZB), manufactured in Germany by Hensoldt Sensor Solutions. The aircraft are expected to enter Luftwaffe service from 2025.

Saab support agreement on GlobalEye



Saab has signed a support agreement with the United Arab Emirates for its GlobalEye advanced airborne early warning and control (AEW&C) system. The agreement is for two years from 2020 to 2022 and covers comprehensive support and maintenance.

Tempest digital design concepts



Using digital techniques, BAE Systems are to design, test and fly conceptual models for the Tempest next generation combat air system. Using digital twin technologies, conceptual shapes for the aircraft have been virtually designed and tested more rapidly than ever before. Following extensive digital testing of the concepts and aerodynamic features, 3D printed scale models have been proven at the Company's wind tunnel facility in Warton in Lancashire, with wind speeds more than twice the speed of sound. Data from the trials will be used to refine and shape final design of the UK's next combat aircraft, projected for service by 2035.

Indra joins the FCAS concept study



Indra has formally joined the European Defence Programme NGWS/FCAS (New Generation Weapon System/Future Combat Air System), as part of the Joint Concept Study (JCS), launched by France and Germany in February 2019. Indra signed a contractual amendment that positions it as a contractor of the Joint Concept Study, along with the national coordinators of France (Dassault) and Germany (Airbus). The French agency DGA was designated as procurement entity acting on behalf of the Defence Ministries of France, Germany and Spain.

Next generation radar for RAF Typhoons



A £317m contract has been finalised to develop the next generation radar for Royal Air Force Eurofighter Typhoons. BAE Systems and Leonardo will develop the Active Electronically Scanned Array (AESA) European Common Radar System Mark 2 (ECRS Mk2) to the required standard for integration on RAF Typhoons.

Leonardo M-346 with Grifo radar



The prototype M-346, equipped with an optimised variant of Leonardo's Grifo radar, made its maiden flight on 13 July. The M-346FA is a new light attack variant of the Company's M-346 Light Fighter Family of Aircraft (LFFA). "This offers multirole capabilities with a single platform, cost-effectively delivering both training and combat roles".

JHMCS II in flight testing

JHMCS II, the latest member of the Joint Helmet Mounted Cueing System family of products, is undergoing flight tested on a Lockheed Martin F-16V aircraft. This follows completion of JHMCS II safety qualification testing, including windblast, tower



and sled tests and is part of the US Air Force's Military Flight Release (MFR) for the F-16V launch customer. The JHMCS II is the only Helmet Mounted Display (HMD) integrated and tested on the F-16V and is manufactured by Collins Elbit Vision Systems (CEVS), a joint venture between Collins Aerospace and Elbit Systems of America.

New Decoy Missile for Gripen

As part of Gripen's E/F Electronic Warfare capability, Saab has reveals development of a new decoy missile system, the *Lightweight Air-launched Decoy Missile*. The decoy missile and the new Electronic Attack Jammer Pod, which Saab began flight testing of 2019, will ensure that fighter pilots are increasingly protected from enemy radars and missiles. The new decoy missile will be a highly capable stand-in jammer for the most demanding missions, will act as a force multiplier as it reduces the number of missiles and aircraft required to complete a mission. "The decoy missile can jam or create false targets for acquisition, tracking, fire control and airborne radars".

AGM-183A flight tested



The US Air Force has successfully flight tested the second Lockheed-Martin AGM-183A Air-Launched Rapid Response Weapon (ARRW) launched by a B-52 Stratofortress from Edwards Air Force Base, California on 8 August 2020. This was conducted with tactical hardware and was instrumented to collect thermal, mechanical and digital data from the flight vehicle, the first time a tactical ARRW missile has been assembled. Additional ground and flight testing will continue over the next two years.

Airbus A321NXs for Luftwaffe

The German Ministry of Defence (BMVg) has acquired two A321-200NX aircraft for the Luftwaffe. The configuration will be 136-163 passengers, with up to six intensive care patients or 12 sitting patients or a mix. The first green Airbus A321neo airframe will be delivered in the second half of 2021 and then modified to Luftwaffe requirements at Lufthansa Technik's Hamburg facility.

German Navy Dornier 228s

The German Marineflieger (Navy) which has operated two Dornier 228s on behalf of the German Ministry of Transport and Digital Infrastructure for monitoring marine pollution in



the North and Baltic Seas, has subcontracted with Aerodata AG for engineering services to support supplemental military type certification. This would increase sustainability of the existing Optimare Medusa Mission Systems, the sensor suites, the communication systems, the spares package, and the ground segment. The Dornier 228s are based with the German Naval Air Wing 3 at Nordholz in Germany.

USAF relocations in Europe



US Defence Secretary Mark Esper has announced reduction in US forces in Germany, including moving its F-16 Fighting Falcons to Italy. 28 US Air Force F-16C/D Block 50s of the 52nd Fighter Wing/480th Fighter Squadron at Spangdahlem in Germany will relocate to Italy, the Squadron's aircraft becoming part of the 31st Fighter Wing. This posture policy plan, however reverses a previous decision and UK-based USAF units at RAF Mildenhall, Suffolk, will continue at present. Similarly, the 352nd Special Operations Wing's two component units, the 7th Special Operations Squadron with Bell-Boeing CV-22B Ospreys and 67th SOS with Lockheed Martin MC-130J will remain at Mildenhall in the UK.

First two MV-22B Ospreys for Japan



The Japan Ground Self Defence Force (JGSDF) has received its first MV-22B Osprey aircraft, delivered by sea to Iwakuni in Japan. They will be located at Camp Kisarazun as their operational base. A second Osprey followed on 16 July.

PLA helicopters and helipads in Tibet/Xinjiang



In support of Chinese Army build up on the borders with India, it is reported that the PLA has built two new helipads in support of ground forces in the Hot Springs and Pangong Tso areas of Eastern Ladakh. Reports have it that the PLA's 76th Aviation Brigade, equipped with Mi-171E and Z-8G transport helicopters, alongside Z-9WZ and ZW-10 attack helicopters have been conducting tactical penetration exercises in the Kunlun mountain range in southern Xinjiang. There are also reports that the new Z-20, built at Harbin, has been operating in the region, this type closely resembling the Sikorsky S-70, some numbers of which were imported by China many years back.

More Chinooks for US Army

Under a \$ 265 million contract, Boeing will produce nine more MH-47G Block II Chinook helicopters for the US Army. With this, Boeing has contracts to produce 24 MH-47G Block IIs, with



the US Special Operations Aviation Command to receive its first example later this year. Potential future Block II Chinook operators including Germany and the UK which could also acquire the latest special forces-optimised version of the tandem-rotor helicopter.

Cessna 208B Grand Caravan EXs for Rwanda

Two Cessna 208B Grand Caravan EX aircraft have been sold to the Rwandan Air Force by the US Government through a FMS contract. The aircrafts' primary mission will be aerial patient movement in support of peacekeeping operations and both will be specifically modified for the Rwandan Air Force. As part of a competitive acquisition process, two offers were received for the contract, which includes associated spare parts and ground support equipment.

Skylanes for Royal Thai Army

Three Cessna A 182T Skylanes have been donated by the King of Thailand to the Royal Thai Army at Don Muang Air Base. Assigned to the 21st Aviation Battalion at the Army Aviation Centre at Lop Buri, they will be used for natural disaster relief operations, and patrols to stop illegal forest encroachment, immigration and drug smuggling.

Australian light helo RFP

The Australian Government has issued a request for proposal (RFP) for the acquisition of light helicopters for operations by the country's Special Forces. Airbus Helicopters are proposing their H145M and Bell their 429 to meet the requirement for some 20 helicopters.

H135s for Royal Thai Air Force

The first Airbus Helicopters H135M destined for the Royal Thai Air Force (RTAF), have been test flown at the factory in Donauworth, Germany. Six H135s have been ordered for the RTAF under a contract signed on 12 February 2020 to provide *ab initio* flight training from 2021.

BAE Systems awarded LIMWS programme



BAE Systems has been contracted by the US Army as part of the *Limited Interim Missile Warning System* (LIMWS) Quick Reaction Capability (QRC) programme. This includes orders for the first two production lots and funding to enable fielding of the next-generation Missile Warning System (MWS). The MWS provides aircrew with advanced threat detection capabilities, improving survivability and mission effectiveness in contested environment.

Russian S-70 'Hunter' UAV



According to reports from Moscow, United Aircraft (UAC) is to advance deliveries of its S-70 *Okhotnik* (Hunter) unmanned air-vehicle by a year. "We received an assignment from the Ministry of Defence to accelerate the design and development in order to begin deliveries from 2024", according to Yuri Slyusar. Designed by Sukhoi and first flown in August 2019, the stealthy flying-wing design will have a 6,000kg (13,200lb) payload, a range of 6,000km and an operating ceiling of 59,000ft. The S-70 is described as a "heavy attack drone with unprecedented capabilities, having very long combat radius, a wide range of weapons, [and] the widest range of equipment".

US modifies MTCR policy, promotes UAV exports



The United States Administration has reportedly modified its adherence to the international Missile Technology Control Regime (MTCR) as regards large unmanned air vehicles (UAVs). Although clubbed with cruise missiles, the MTCR has also restricted exports of advanced UAVs. This decision has in particular been welcomed by General Atomics Aeronautical Systems, manufacturer of the MQ-9 Reaper and SkyGuardian, and Northrop Grumman, which manufactures the RQ-4 Global Hawk family.

Chinese UAVs



According to the Stockholm International Peace Research Institute (SIPRI), weaponised Chinese UAVs have been exported to a wide range of countries including Algeria, Egypt, Indonesia, Iraq, Jordan, Kazakhstan, Myanmar, Nigeria, Pakistan, Saudi Arabia, Sudan and the United Arab Emirates (UAE). During 2008 to 2018, China exported 194 large, weapons-capable UAVs to 14 nations, while General Atomics delivered just 19 MQ-9s and Northrop three unarmed RQ-4As. According to the TEAL Group, "The strict interpretation that the United States has taken on MTCR meant that a number of key allies, such as Saudi Arabia and the United Arab Emirates, were forced to buy Chinese MALE (medium-altitude, long-endurance) systems. In June, the Mitchell Institute for Aerospace Studies issued a report calling for changes to UAV export policy, saying: "China is using this market vacuum to expand its influence, gain an intelligence advantage, and compromise US security partnerships".

Chinese Type-054 class frigates for Pakistan Navy



On 23 August 2020, China launched first of the four advanced naval warships it is building for Pakistan at the Hudong Zhonghua Shipyard in Shanghai. The Type-054 class is equipped with surface, subsurface, anti-air weapons, combat management system and sensors, and regarded as “one of the technologically advanced surface platforms of the Pakistan Navy fleet”. The Pakistan Government had signed a contract with the China Shipbuilding Trading Company Ltd. (CSTC) for the first two Type-054 A/P frigates in 2017.

Pakistan Navy commissions PNS Yarmook



The Pakistan Navy commissioned a new offshore patrol vessel PNS *Yarmook* at a ceremony in Karachi, built by Damen Shipyards of Romania. The second such vessel PNS *Tabuk*, also under construction at Damen is expected to join the PN later this year.

Royal Netherlands Navy orders Thales NS100 radars

The Royal Netherlands Navy, already operating Thales 4D AESA radars on its vessels has now ordered the NS100 radars. The contract specifies delivery of Scout Mk3 surveillance radars to be installed on HNLMS *Johan de Witt* and on the Combat Support Ship (CSS) presently being built for the RNLN, which will also receive a Thales IFF system.



China fires ‘aircraft-carrier killer’ missiles

China has once again launched a volley of missiles into an area of the contested South China Sea. These included the so called ‘aircraft-carrier killer’ DF-21D and DF-26B which are considered as central to China’s strategy in deterring military action off its eastern coast, threatening to destroy the essential sinews of US power projection in the region. According to US Defence officials, these four medium-range ballistic missiles landed in the sea between China’s southern Hainan Island and the disputed Paracel chain near Vietnam.



THC purchases 10 Airbus H125s

The Helicopter Company (THC), fully owned by the Public Investment Fund (PIF) of Saudi Arabia, have signed a purchase agreement with Airbus Helicopters to purchase ten H125 helicopters. The deal comes as part of THC’s commitment to further expand its fleet and introduce new services “that fulfill market demand and support development of the Kingdom’s wider aviation sector”.



The impact of Covid

The continuing global pandemic has greatly impacted the aviation industry, with Airbus retrenching 15,000 personnel worldwide, including 1700 at the UK facilities in Broughton and Filton, 5,000 in France, 5,000 in Germany and 900 in Spain. This grim situation is shared by Boeing, Rolls-Royce and ATR. Meanwhile, more Airlines have announced layoffs including Emirates, the International Consolidated Airlines Group (IAG), Lufthansa, Qantas and Air France.

Successor for the A320

Meanwhile planning continues for development of a new short-to-medium-haul airliner to supplant the Airbus A320. The aim is for an aircraft fully powered by biofuel, offering a 30% fuel consumption improvement on the A320, with the prototype-demonstrator flying in the 2026-28 timeframe with first examples entering service in 2033-36. The next-generation airliner “should define new standards for aviation for which modernised production lines and supply chains with greater digitisation and robotics will be required. An additional target is the development of a highly efficient new regional aircraft using hybrid electric or hydrogen technologies, this demonstrator also to be airborne by 2028 and production beginning some two years later.

ARJ21 operated from highest civil airport in the world

The ARJ-21 China’s regional airliner has carried out take offs and landing from the world’s highest altitude civil aircraft at Daocheng Yading (4411 meters or 14,556 ft above sea level), and flown back to Shanghai in July 2020. Over some 15 days of flight test, take-off and landing capabilities of ARJ21 aircraft in the high plateau airport “were fully verified”. Daocheng Yading Airport is in the Garzê Tibetan Autonomous Prefecture of Sichuan province.



BelugaXL enters service



The massive BelugaXL airlifter has recently flown to Airbus’ facility in Getafe, Spain to join the fleet alongside its predecessors, the five A300-600-based BelugaST. This new aircraft will transport all Airbus family horizontal tailplanes and A350 XWB Section 19 (manufactured in Getafe) and A350 XWB wing lower covers (manufactured in Illescas) from Getafe to other Airbus sites in Toulouse, Hamburg and Broughton.

Ansats flights in Mexico



The Ansats light multipurpose helicopter owned by Mexican company Craft Avia Centre, has begun services from Guadalajara. Craft Avia Centre Ansats helicopters are to be used in Mexico for VIP transportation, firefighting and cargo operations. Craft Avia Centre plans to supply 13 helicopters of this type to the company itself plus 27 for the national air medical services project.

Mi-171s in China



The Ulan-Ude Aviation Plant of the Russian Helicopters holding (part of the Rostec State Corporation) has supplied an initial Mi-171 helicopter with VK-2500-03 engines to a Chinese civil aviation company. In 2019, the Civil Aviation Administration of China had issued a national type certificate for Mi-171 with this new power plant.

Virgin Galactic signs Rolls-Royce deal to develop Mach 3 craft



Richard Branson's Virgin Galactic Holdings Inc. will work with Rolls-Royce Holdings Plc to develop a hypersonic craft which has speeds of Mach 3. Rolls-Royce, which provided engines for the Concorde, the world's only civil-certified supersonic aircraft to date, aims at devising a propulsion system that's both cutting-edge and sustainable, Virgin Galactic Chief Space Officer George Whitesides said "The Spaceship Co., Virgin Galactic's manufacturing division, is seeking to develop a Mach 3 delta-winged aircraft that would fly at an altitude above 60,000 feet and carry between nine and 16 people in a premium cabin, while taking off and landing conventionally."

Saab Carl-Gustaf ordered by US Army



Saab has received orders for Carl-Gustaf AT4 systems from the US Army, valued at \$ 100 million with deliveries to take place in 2021. The order was placed within an indefinite delivery and quantity agreement signed in 2019, enabling the operator to place orders for Carl-Gustaf ammunition and AT4 systems during a five-year period. The AT4 systems and Carl-Gustaf munitions are to be operated by the US Army, Marine Corps, and the Special Forces Command.

NGC and Epirus offer EMP capability



Northrop Grumman has formed a strategic supplier agreement with Epirus to offer the company's Electromagnetic Pulse (EMP) capability as a component of Northrop Grumman's Counter-Unmanned Aerial System (C-UAS) systems-of-systems solution. The agreement augments Northrop Grumman's end-to-end C-UAS capabilities including Epirus' EMP systems to counter UAS swarms and supplements the company's suite of non-kinetic C-UAS effects.

BAE Systems LR-PGK



BAE Systems has received an order from the US Army to further develop its Long Range Precision Guidance Kit (LR-PGK) for 155mm artillery ammunition, enabling the Army to carry out “long range precision strikes in challenging electromagnetic environment”.

Spexer 2000 3D for Bundeswehr C-UAS system



As part of the German Army’s “qualified air defence” drone defence programme, sensor specialist Hensoldt has supplied the latest version of its *Spexer 2000 3D* radar to system integrator Kongsberg Defence & Aerospace. Spexer will be part of the C-UAS system (Counter-Unmanned Aerial System), based on Kongsberg’s remote-controlled *Protector* weapon station, both mounted on an armoured GTK *Boxer* vehicle. 10 systems are initially contracted.

Germany’s NextGen Integrated Air and Missile Defense System

The TLVS bidders consortium (TLVS JV), MBDA Deutschland and Lockheed Martin, have submitted an updated proposal to the German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support for development,



test, certification and delivery of Germany’s future Integrated Air and Missile Defence system. Requirement is for a mobile IAMD system with 360-degree capability and based on an open network-centric architecture.

Hungary JV with Rheinmetall for Lynx IFV

Signing an agreement on 17 August 2020, the government of Hungary has embarked on a massive programme worth over two billion euros to modernise the country’s defence industry and military capabilities. Rheinmetall, which is Europe’s foremost manufacturer of army equipment, will cooperate with Hungary on a joint venture and production facility in Hungary to manufacture the modern Lynx infantry fighting vehicle.



BAE Systems’ first production AMPV

The first BAE Systems Armoured Multi-Purpose Vehicle (AMPV) has been delivered to the US Army. The AMPV is considered as key to the Army’s modernisation objectives and comes in five variants to meet a wide range of missions across the battlefield.



Hypersonic Air-breathing Weapons Programme



DARPA and the US Air Force (USAF) have announced successful completion of captive carry tests of two variants of the Hypersonic Air-breathing Weapon Concept (HAWC) and “are ready to proceed to first free-flight testing within 2020”. The joint Agency and Service effort seeks to develop and demonstrate critical technologies to enable such an effective and affordable air-launched hypersonic cruise missile.

Hellfire missiles for Britain



Government of the United Kingdom has requested procurement of 395 AGM-114R2 Hellfire missiles. Also included is technical assistance, publications, integration support and other related elements of logistics and programme support, at an estimated total cost of \$46 million.

LM contracted for HIMARS launchers

The US Army has awarded Lockheed Martin a \$183 million contract to produce High Mobility Artillery Rocket System (HIMARS) launchers and associated hardware. Lockheed Martin will produce and build 28 HIMARS at its *Precision Fires Center of Excellence* at Camden, Arkansas. The contract calls for launcher and associated equipment delivery starting in late 2022 for the US Marine Corps and “an international customer”.

2020: A non year for Air Shows !

China’s biggest airshow, which takes place every two years in the southern city of Zhuhai, has been cancelled for the first time in its 24 year history. The *China International Aviation & Aerospace Exhibition* was due to take place over 10-15 November. The biennial show first took place in 1996 and where China’s vast array of military equipment and aircraft is showcased. This is the latest international air show in 2020 to be cancelled, beginning with ILA in Berlin, the Farnborough International Air Show in England, along with the highly popular Royal International Air Tattoo (RIAT) and now that in Zhuhai.

The first Air Show of 2020 was at Singapore (Changi) in mid-February 2020 but was sparsely attended owing to the spread of Covid-19. Meanwhile, India’s Ministry of Defence have announced that Aero India 2021 will take place at Yelahanka (Bangalore) in February 2021.

FORM IV

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

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Vikramjit S. Chopra
Signature of Publisher

EDGE acquires AMMROC



Presenting layout of the AMMROC MRO Facility the Dubai Airshow

EDGE, the Abu Dhabi-based advanced technology group for defence and much more has entered into a conditional agreement to acquire the remaining 40 per cent stake currently held by Lockheed Martin Corporation and Sikorsky, a Lockheed Martin Company, in Advanced Military Maintenance Repair and Overhaul Centre (AMMROC).

AMMROC is the leading provider of military Maintenance, Repair, and Overhaul (MRO) services in the Middle East region. Both Lockheed Martin and Sikorsky have been shareholders in AMMROC since its inception in 2010, helping to develop military operation skills and capabilities within the country. AMMROC will continue to have a number of commercial agreements with Lockheed Martin and Sikorsky moving forward, maturing the parties' relationship in new ways.

Upon completion of this transaction, AMMROC will become wholly owned by EDGE which will continue to pursue the aircraft aftermarket business, enabling the UAE and other regional air forces to maintain operational readiness, airworthiness, and technical ownership of various rotary- and fixed-wing aircraft and platforms.

Speaking on the acquisition, His Excellency Faisal Al Bannai, CEO & Managing Director of the EDGE Group, stated, "Lockheed Martin and Sikorsky have played a pivotal role in developing the UAE's MRO capabilities. As EDGE

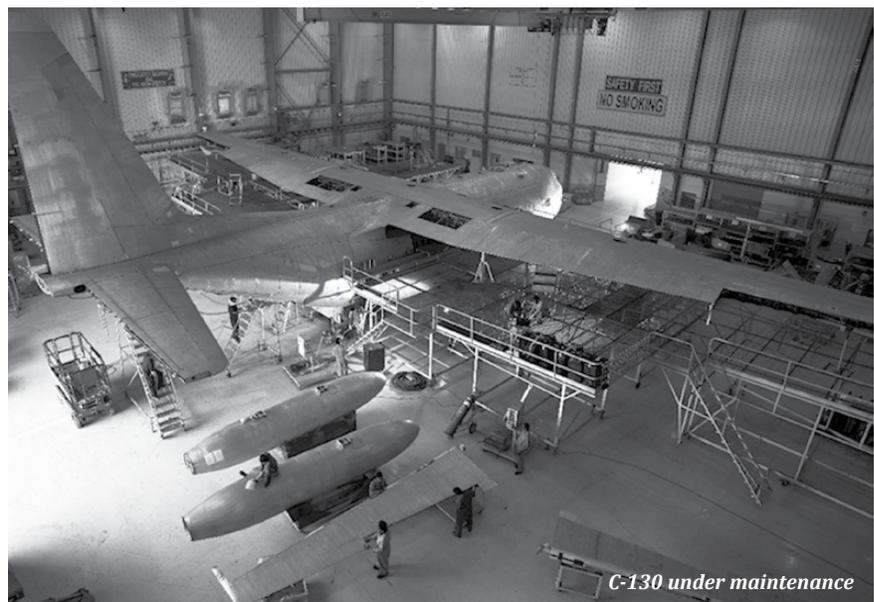
assumes full ownership of AMMROC and continues to pursue the military and civil MRO market with specialist skills, we recognise that such achievements are the outcome of our international partnerships. Going forward, we will continue to explore emerging business opportunities with Lockheed Martin and Sikorsky to further strengthen our relationship."

In his comments, Robert (Bob) S. Harward, Lockheed Martin's Chief Executive for the Middle East, stated "At Lockheed Martin, we are committed to building partnerships that strengthen the region's security through defence,

advanced technology and knowledge transfer programmes. We are proud of our long-standing relationship with the UAE, that spans over four decades and will continue to support and engage with EDGE across multiple platforms."

AMMROC is the region's only authorised Lockheed Martin C-130 Service Centre and also provides MRO services for F-16s and is the depot MRO hub for comprehensive Blackhawk components. The facility is equipped with a dynamic whirl stand to support rotary blades and transmission testing, making it a first in the region. It also has the region's largest military MRO hangar capacities which comprise over 30 back-shops and a dedicated state-of-the-art paint facility.

EDGE is an advanced technology group that develops disruptive solutions for defence and beyond. Solving real world challenges, it is dedicated to bringing innovative technologies and services to market with greater speed and efficiency. Consolidating over 25 entities and employing more than 12,000 personnel, EDGE offers expertise in five core clusters: Platforms & Systems, Missiles & Weapons, Cyber Defence, Electronic Warfare & Intelligence and Mission Support. Today, EDGE is reimagining capabilities through technology leadership with research and development at its core. 🦋



C-130 under maintenance

The Quintessential Aviator

Celebrating the Century of Dalip Singh Majithia



The Editors of Vayu are privileged to know Dalip Singh Majithia, that epitome of a gentlemen aviator whose total recall of seminal events in the last century is not only remarkable but a blessing for aviation historians in India – and the world! His personal flying log books have been generously handed over by him to the IAF Museum at Delhi which, one hopes, will be preserved not only for posterity but serve as an inspiration for today's and tomorrow's aviators.

This article is based on many years of knowing Dalip Singh Majithia as also viewing some of his interviews – and blurred reproduction of his precious log books, the originals now closeted with the Indian Air Force.

On 27 July 2020, Dalip Singh Majithia turned 100 years of age, the eldest, veteran Indian Air Force officer of the sub-continent extant. His is a story of faith, courage and adventure, joining the Indian Air Force in 1940 even as the Second World War was raging in Europe and the infant air arm was striving to expand.

After getting his wings, he flew a variety of obsolescent biplanes with which the Indian Air Force was then equipped, including the Wapiti, Hart and Audax, thereafter multi-engined Atlantas on maritime patrol in the Bay of Bengal, finally Hurricane fighter bombers, with which he went into action on the Burma front and later on watch and ward duties along the North West Frontier. After the Second World War was over, and serving in various staff duties, Dalip left the Air Force in August 1947 to join the family business – but continued his passion for flying! The saga of his continued romance with aviation is exemplified by his pioneering flight to the Himalayan Kingdom of Nepal, landing at Kathmandu's parade ground on 23 April 1949 (see *Vayu Issue III/2010*).

Early Years

Dalip Singh Majithia was born at Simla on 27th July 1920 in a highly regarded family of the erstwhile undivided Punjab.

His grandfather was the venerable Sardar Bahadur Sardar Sir Sundar Singh Majithia who had schooled at the Aitchison College and Government College, both at Lahore.



Young Dalip Singh at Karachi Flying Club with Gypsy Moth in June 1940

Sardar Sundar Singh later became Honorary Secretary of the 'Chief Khalsa Diwan' on its formation in 1902 and remained so till 1920. In 1926 he was knighted and was thereafter appointed as Revenue Member with the Governor's Executive Council of the Punjab, playing a leading part in forming of the conservative Khalsa Nationalist Party. From April 1937 he was Revenue Member of the Punjab Executive Council in Sir Sikandar Hayat Khan's cabinet of undivided Punjab.

Dalip Singh's mother was from the Patiala Royal family and they also had a home in Simla, 'Skiplin Villa', near the Christ Church, where he was born. He did his early schooling at Khalsa College, Amritsar

of the airship R.101. Also with him at the Karachi Flying Club was Lt Diwan Mishri Chand who had volunteered for a flying career before going to the Initial Flying Training School at Lahore (Walton).

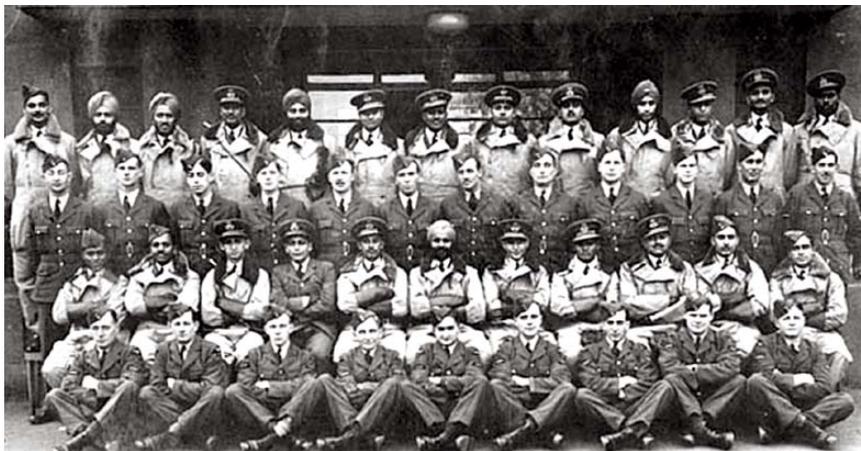
The Pioneers

Increasing numbers of young Indians were now joining the IAFVR, all assembling at the Air Cadet Training School at Lahore (Walton). Amongst those commissioned on 1 August 1940, along with Dalip Singh Majithia were Minoo Engineer, Anantha Ananthanarayanan, Vasudeo Bhide, Vernon Shib Bonajjee, Arthur Chako, HN Chatterjee, Yeshwant Malse, Chaman Lal Mehta, Pirojsha Reporter, Surinder Singh,

Singh, Paljor Namgyal (of Sikkim), Jagdish Chandra Verma, Ganamuthu Daniel, David Bhore, Krishna Agerwala, Keki Motishaw, Arvind Moolgavkar (later Chief of the Air Staff), Jagjit Singh, Mohammed Asghar Khan (seconded from the Army, and later Chief of the Air Staff, Pakistan Air Force).

These magnificent men were followed some months later by Padam Singh Gill, Gyan Dev Datta, Mohd. Mukhtan Ahmed Cheema, Mohan Suri, Piyara Singh, Murat Singh Aulakh, Rafiq Bukhari, Malik Nur Khan (later CAS, Pakistan Air Force) and Kartar Singh Saund. Two months later came Codanda Cariappa, Narendra Lali, Cowas Lichmore, Murkot Ramunny, Sahebjada Imtiaz Khan, Samuel Bobb, Venkat Reddy, Dinshaw Edujee, Pritipal Singh, Iqbal Singh, Krishna Wagle, Chinglepet Amarendra, S. Bambawale, Cherala Rao, Vicoo Billimoria, Guru Charan Singh Babra, and the last to be commissioned in the flying branch on 11 March 1941, Maurice Barker. Many of these pioneers were later to reach very senior ranks in the Indian (and also Pakistan) Air Forces.

But we go back to Dalip's first service training flight which was on 5 August 1940 in a Tiger Moth at Walton airfield in Lahore with Sgt Hart and later Flt Lt Frogly from the Royal Air Force as his pilot instructors, leading to his first solo on 22 August after 15 hours of instruction. Flying training at this former Boy Scouts Camp continued steadily, including formation flying, cross country sorties. Dalip Singh Majithia's flying skills were quickly recognised, being



The IAFVR 'X' Squad (Photo from archives of The Society for Aerospace Studies)

before moving to the Government College at Lahore where he completed his BA, just a year after Arjan Singh (later Marshal of the Air Force) had gone on to train at RAF Cranwell along with Prithipal Singh, the last cadets to join as regular commissioned officers in the IAF. Meanwhile, Dalip's uncle Surjit Singh Majithia had been commissioned as a pilot officer in the Indian Air Force Volunteer Reserve (IAFVR) on 8 November 1939, just months after start of the Second World War, doing his flying training at RAF Habbaniya (Iraq). Young Dalip Singh was enthused to do the same.

Actually he had originally wanted to join the Cavalry, but was 'persuaded' to opt for the Air Force instead. After a few 'introductions', Dalip was interviewed by Gp Capt Bussell of the RAF and following medical tests, received a letter accepting him for service with the IAFVR. He proceeded for preliminary flying at the Karachi Flying Club and well recalls that massive tower at Drigh Road originally built for docking

Harbans Singh Thapar, Victor Srihari and Teja Singh Virk who were followed in November 1940 by Om Parkash Mehra (later Chief of the Air Staff), Rajendra



July 1940: Dalip Singh being awarded 'Best Pilot' of the Course Prize by Sir Henry Craig, the Governor of Punjab. On the left is Commanding Officer Sqn Ldr Hogg, RAF, at Walton, Lahore



At the Walton Flying School at Lahore, Dalip Singh awarded 'Best Pilot' of the Course with Tahapar Singh 'Best Ground Subject' of the Course

photograph). Dalip Singh was also selected but gallantly stood down for another officer who had requested such posting for family reasons. Dalip clearly recalls that at this stage those proceeding to the UK wore blue uniforms while the others remaining in India, continued in khaki dress.

It was now time for operational flying training and in December 1940 young Dalip moved to No.1 Flying Training School at Ambala for advanced flying on the Westland Wapiti IIA, logging many hours including night flying, thereafter on the Hawker Audax and Hart with which the IAF's sole squadron (No.1) was then equipped.

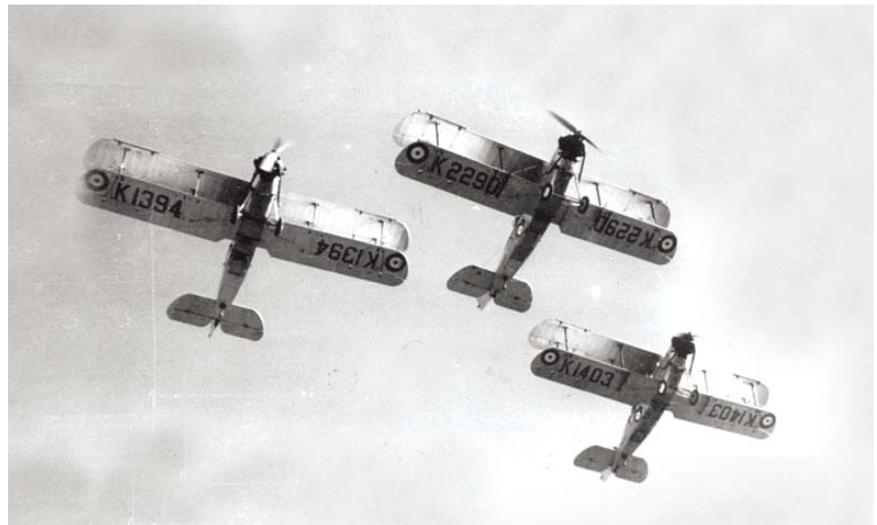
There were to be many cross country flights including those from Ambala to Delhi and back and soon enough, dive



Dalip Singh with his Flying Instructor Sgt. Hart

awarded the 'Best Pilot of the Course Prize' by Sir Henry Craig, the Governor of the Punjab, in July 1940.

Soon thereafter, twenty four of the batch were selected to form the IAFVR 'X' Squad, proceeding by ship to the UK for conversion training on fighters, bombers and coastal patrol aircraft with the Royal Air Force. These included 'Chacha' Manmohan Singh and Hari Dewan, Mohindar Singh Pujji, Shivdev Singh, Kali Chaudhary, Mian Mohammad Latif, Tarlochan Singh, Rustam Dastur, Ali Raza Khan Pasha, Erlic Pinto, Satyapal Shahi, Ranjan Dutt and others (*seen in historic*



Three Westland Wapiti IIAs of the IAF's No.1 Squadron fly in formation.



Hawker Hart of the IAF over Drigh Road, Karachi.

bombing and low level bombing practice with the Hawker Hart. On 11 April 1941 young Dalip had his first professional interaction with the legendary Sqn Ldr Meher Singh (popularly 'Meher Baba') while ferrying a four-engined Atlanta from Drigh Road (Karachi). However, he continued to log hours mostly on the Wapiti and Hart.

Gaining proficiency, Dalip then undertook his first long distance flight to the deep south of India, in Hart (K2103) which he flew from Ambala, with refueling stops at Jhansi, Kamptee, Secunderabad and then finally reaching Madras, which station he was to return to for operations during war. On the return flight, he flew back to Secunderabad, on to Poona, to Juhu (Bombay), to Ahmedabad to Bhuj and finally Karachi, where he had first learnt to fly. A true sub-continental odyssey!

Coastal Defence Flights

As the war in Europe grew ever more grim, the specifically appointed Chatfield Committee recommended that in addition to the regular air forces for the defence of India, Volunteer Flights were to be entrusted for coastal defence and maritime patrol. There were to be six Coastal Defence Flights, all stationed at major ports along the Peninsula. Dalip was posted to No.1 Coastal Defence Flight (CDF) at Madras in July 1941 flying the Atlanta on maritime patrols over the Bay of Bengal, alternating with the Hart for more 'warlike' purposes including dive bombing. Dalip converted to fly the Atlanta four-engined monoplane which he soon grew very fond of. This first British four-engined cantilever monoplane, had entered service in 1932 with Imperial

Airways, being chiefly employed on long routes from Britain to Africa as also to and within India. The Atalanta carried 17 passengers with a crew of three and was powered by four 340 h.p Armstrong Siddeley Serval III engines, flying regular domestic services from Karachi to Calcutta.

Two Atalantas (VT-AEF and VT-AEG), then serving with Indian Transcontinental Airways were requisitioned by the

endurance sortie in Atlanta (DG 452) over the sea but to also keep his proficiency in more aggressive manner, he practiced low level attacks on ships flying Hart (K2131).

With the relentless Japanese advancing in South East Asia and having overrun Burma, the war was getting very close to India and flying increased in March-April 1942, maritime patrols continuously carried out by the Atlantas of No.1 CDF including



Sqn Ldr Meher Singh at the parade at Ambala before taking command of No.6 Squadron. Aircraft types at the background are (right to left) Vultee Vengeance, Audax and Hurricanes

Government in the emergency. Armed with one moveable machine gun, the Atalantas were operated for routine maritime patrol in the Bay of Bengal, also exercising with the Navy and on convoy escort duties. On 1 January 1942, Dalip logged his longest

search for Japanese warships that were now roving the Bay of Bengal. By this time, the Atlantas had been modified to carry bombs as well and on 21 January 1942, along with Pilot Officer Cariappa, Dalip scored direct hits on a target at sea.



Armstrong Whitworth A.W. 15 Atalanta, formerly with Indian Transcontinental Airways, seen in Service markings.

Great expansion of the IAF

However, by mid-1942, the end was nigh for the Coastal Defence Flights which had, for two years, fulfilled their desperate tasks with stout heart but little hardware, covering large geographical areas of the Indian peninsula, flying thousands of hours of escort and patrol. The IAFVR was then at its peak strength in personnel (and aircraft) but in June 1942 the CDFs were renumbered as Flights: No.101 at St. Thomas Mount with the Atalanta and Hart, No.102 at Juhu with the Dragon-Rapide and Wapiti, No.104 at Vizakhapatnam with Wapiti IIAs, while No.103 Flight (ex-3 CDF) was equipped with Hudsons and moved to Cuttack.

The new AOC-in-C India, Air Marshal Sir Richard Pierce had reviewed the war situation and made plans for the Indian Air Force more suited to their flair and abilities, promising the young Service “the best single engined aircraft which the Command could then provide”, which were to be Hawker Hurricane fighters and Vultee Vengeance dive-bombers. However, the biggest change of all: the new IAF squadrons were to be all-Indian, commanded by the young officers who had done so well with No.1 Squadron in the first Burma Campaign, flying obsolescent Lysanders in the face of superior Japanese fighters.

A signal from Air Headquarters India Command on 11 November 1942 notified AHQ Bengal, the various Groups and Squadrons that the Coastal Defence Flights were to be disbanded on 30 November 1942. The IAFVR personnel were posted out to form the new IAF squadrons then being equipped with more modern combat aircraft for the imminent campaigns in Eastern India and Burma.

Three new squadrons of the Indian Air Force, including No.6, were formed on 1 December 1942, under Air HQ formation order 268 of 18 November 1942, their pilots and airmen weaned from the Coastal Defence Flights which were disbanded a day earlier, on 30 November.

No.6 Squadron was established at Trichinopoly under the command of Sqn Ldr Mehar Singh and with personnel and assets of Nos.1 (Madras) and 2 (Bombay) Coastal Defence Flights plus from No.104 General Reconnaissance Squadron RAF. The Squadron was equipped with the Hawker Hurricane IIB, becoming the third IAF Squadron to get the Hurricane after Nos.1 and 2 had been so-equipped. It was



Sqn Ldr Mehar Singh, CO No.6 Squadron IAF with his Hurricane

assigned the role of tactical reconnaissance, message dropping, air-to-ground strafing.

No.6 Squadron was to have been commanded by Sqn Ldr RHD Singh but he had met with an accident and was thus medically unfit. Sqn Ldr Mehar Singh who then was at the Staff College in Quetta, was given command of No.6 Squadron – and the rest in history! Mehar ‘Baba’ was already a flying legend, an extraordinary aviator, with a natural sense of precise navigation and infinite courage. He commanded enormous respect, even reverence, not only amongst the Indian officers and men but too, with the British personnel who served under him. With Sqn Ldr Mehar Singh were Flt Lt Haider Hussain of ‘A’ Flight and Flt Lt Mansukhani, of ‘B’ Flight, other officers including Flying Officers Dalip Singh Majithia and MM ‘Minoo’ Engineer.

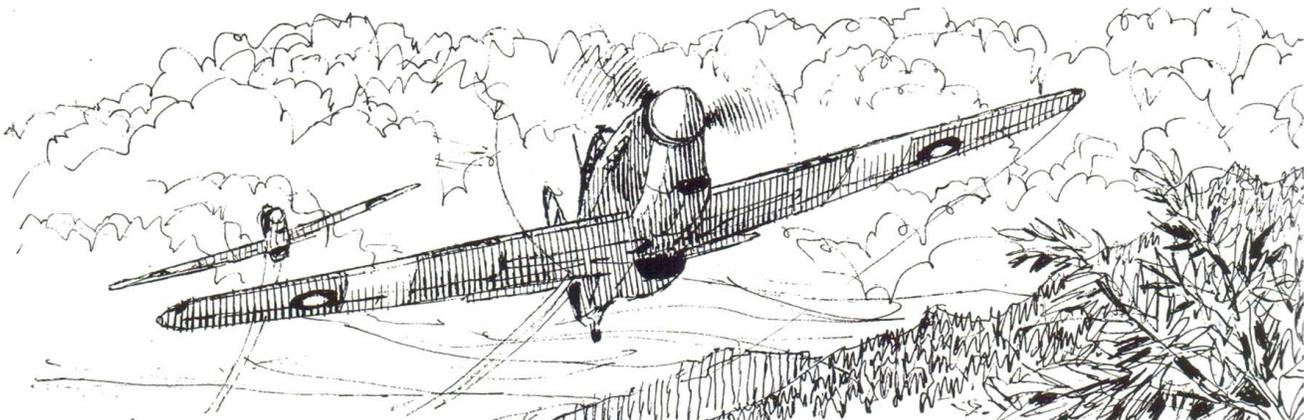
Earlier, Dalip’s last flight with the Atlanta had been in October 1942, thereafter

converting back to single-engine aircraft, first on Harvards at No.151 Operational Training Unit (OTU) at Risalpur on the NWFP in December 1942 in preparation for conversion to the Hurricane fighter bomber, making his first solo flight on type on 13 January 1943.

Gaining his proficiency, Dalip strenuously trained on the Hurricane for air combat, dog fighting ground attack and formation aerobatics. He took part in formation display at Delhi on 21 March 1943 and thereafter air to ground firing practice from Bhopal. His ‘dream’ posting was in April 1943 to No.6 Squadron flying the eight-gun Hurricane IIBs and commanded by the legendary Mehar Baba, soon being declared ‘fully operational’ on type. *(In his monograph ‘Up in the Air – a celebration of flying’ privately published, Dalip Singh has dedicated the book to Air Commodore Mehar Singh DSO who was his mentor and inspiration).*

The Hawker Hurricane was one of military aviation’s most outstanding machines, founding a new era in fighter evolution, becoming the first interceptor monoplane of the Royal Air Force. It was the first combat aircraft to exceed 300 mph in level flight and had extraordinary versatility, awesome (for its age) firepower and the superb Rolls Royce Merlin engine. More than 300 Hurricane IIBs, IICs, IVs and XIs were eventually supplied to the Indian Air Force between 1942 and 1944, this aircraft type becoming backbone of the service in the Assam and Burma campaigns.

After operational training at No.151 OTU Risalpur, No.6 Squadron flew east to Allahabad and thence to Bairagarh (near Bhopal), but of the 15 Hurricanes, six aircraft of ‘B’ Flight had lost their way and force-landed at Biora, some aircraft



Depiction of IAF Hurricanes over the front during the Second Arakan Campaign

being damaged. However, at Bairagarh, the Squadron worked hard, with stress on low level photo reconnaissance and air-to-ground firing. Intensive training continued in central India, flying from various airfields at Saugor, Bhopal, Jhansi and Bidar, carrying out tac-recces, strafing bombing, before the squadron moved in November 1943 to Chittagong and on to Cox's Bazar – and the war against Japan.

At War

No.6 Squadron flew their first operational sortie on 30 November 1943. They were to be in the thick of the Second Arakan Campaign continuously for the next six months, achieving great distinction and earning the sobriquet. 'Eyes of the XIV Army'. The Hurricanes of No.6 Squadron, flying high and low, taking vertical and oblique photos, would fly with two aircraft

as a tactical pair, each sortie being a dual affair, the 'Leader', who took photos and did the recce work and his No.2, the 'Weaver', protecting the leader's tail. No.6 Squadron's Hurricanes were to become a familiar sight over the Arakan, soon being known as 'Eyes of the XIV Army'.

Tac/Recces were flown all over the battlefield, particularly over Maungdaw, with strafing of enemy rivercraft, even as the Army battled the Japanese as war raged in the Buthidaung – Singhyin and Maungdaw areas. An interesting entry in Dalip's log book is 12 December 1943 when in Hurricane (HW 428), he flew a low level tactical reconnaissance to determine elephant grazing grounds near Maungdaw! As for his flying assessment, Dalip's ability was rated as 'above the average'.

After the intensive operations in war under leadership of Sqn Ldr Meher Singh

whose command Dalip recalls with particular nostalgia. At this frontier post the Hurricane IICs were wheeled into the Fort at dusk, out of harm's way so to speak from snipping tribesmen, and wheeled out at first light. The Hurricanes flew low level patrols over the rugged hills, carrying out reconnaissance as also leaflet dropping to warn dissident tribesmen of retribution which occasionally followed in the form of 250 lb bombs or strafing by 20 mm cannon.

Hurricane detachments also took part in exercises in other parts of India, including 'White Horse' in Dehra Dun during the winter of 1944. With him as part of the Miranshah Flight was Flying Officer Asghar Khan who had schooled of the RIMC at Dehra Dun. Both intrepid flyers remained close friends. In early 1947 with the clouds of partition overhanging the sub-continent,



Hurricane Mk.IIC over the rugged mountain terrain of north western India



Hurricanes at dispersal in one of the many landing grounds

(awarded the only DSO in the Indian Air Force) No.6 Squadron moved back to Ranchi for conversion to the four cannon armed Hurricane IIC in 1944 and air to ground firing and dive bombing practice.

Dalip was now posted to another Squadron also flying Hurricane IICs, No.3 Squadron commanded by Sqn Ldr Prithpal Singh, with the responsibility of 'watch and ward' duties on the turbulent north west frontier of India.

No.3 Squadron was based at Kohat with a semi-permanent Flight at the advanced landing ground at Miranshah,

Dalip had prophesied that if there was to be a new country—and a new Air Force—Asghar Khan would definitely become its Chief! They remained good friends even though separated by the Radcliffe Line.

In January 1945 Dalip was posted back to the Burma front, this time with No.4 Squadron, flying Hurricane IICs from various advanced landing grounds including Bawli Bazar and many airstrips on Ramree Island. The Arakan offensive had now begun, the objective being to capture the Maya peninsula and Akyab, contain the Japanese in the Arakan and prevent

them from crossing the Arakan Yoma and interfering with advance of the XIV Army. No.4 Squadron operated in direct support of the land forces and bombed Japanese strong points at Haparabyin and Ratheduang.

As the XIV Army pushed the Japanese forces southwards and moved towards Rangoon, No.4 Squadron also followed suit and kept moving from one advanced landing ground to another. From Cox's Bazar the Squadron moved to various *kutchas* airstrips including Hove, Indian Dabiang (satellite of Akyab) and finally Kakpanu on Ramree Island. The airfields were all temporary ones, with some airstrips made of impacted sand. At Cox's Bazar however, there was a tarmac and runway with dispersals, taxi tracks and parking bays covered with PSP sheets. At Hove, the airstrip was prepared hard ground but the taxi tracks and parking bays were soft sandy ground covered with thick bamboo matting. At Indian Dabiang, the airstrip was actually on the beach, two miles long, accommodation for the officers being in bamboo *bashas* with deep trench latrines.

Enemy targets were engaged with bombs and strafing by cannon. Operations in the month of February 1945 was particularly concentrated, Dalip flying some 30 operational sorties from the 1st to 24th of that month when he suddenly developed total numbness in his right arm perhaps owing to severe strain. His fellow officer, again Ft Lt Asghar Khan, volunteered to fly Dalip Singh to the Command Hospital in Calcutta in a Harvard two-seater and later, under medical advice was evacuated to England for treatment at a specialist hospital.

Recovery was fast and three months on, Dalip was cleared for flying, returning to India in a Sunderland flying boat in August 1945. This was about the time the Japanese had surrendered. He re-joined No.4 Squadron at Ranchi and shortly thereafter, alongwith Asghar Khan, flew in Harvard (FE 209) from there to Allahabad on to Lucknow, then Delhi to Lahore, Rawalpindi and finally to Peshawar, where he was posted as Sqn Ldr (Operations), under the AOC Air Commodore Coe. His flying passion unabated, Dalip converted to the Spitfire Mk.VIII at Peshawar on 12 November 1945.

In the following months, No.4 Squadron was selected to be part of the British Commonwealth Occupation Forces



Dalip Singh Majithia, Detachment Commander of the Hurricane Flight at Miranshah Fort in the NWFP. On his right is Asghar Khan



Dalip Singh and squadron mates on the beach during the campaign.



Sqn Ldr Dalip Singh with Hurricane Mk.IIC of No.4 Squadron, IAF on the Burma Front

(BCOF), re-equipped with the Spitfire Mk.XIV and moved to Japan in April 1946 based at Iwaquni, alongside RAF and RAAF fighter squadrons. Dalip was posted to the headquarters BCOF at Melbourne in Australia, getting there in an adventurous flight that took him first to Colombo, thence via Cocos Island to Perth in Australia, onto Sydney and finally Melbourne. It was during his posting at Australia, that Dalip



Dalip Singh and Joan Sanders at Melbourne (photo taken by leading fashion photographer Athol Shmith on Collings Street)



Dalip Singh Majithia with his Beechcraft Bonanza (VT-CYQ), seen after landing at Kathmandu on 23 April 1949



In celebration of Dalip Singh Majithia's centennial year, he was invited to visit the IAF Museum at Palam where these evocative photographs were taken of him with appropriately painted Hurricane and Lysander, juxtaposed with those taken some 75 years earlier, the same types at IAF airfields in north western India (courtesy Air Vice Marshal Vikram Singh)

met the lovely Joan Sanders (whose father Colonel William George Sanders was with the British Indian Army) but this romantic story will be recounted elsewhere!

In 1947, Dalip returned to India, got married to Joan on 18 February 1947 at the family home in Gorakhpur, where there were large land holdings and considerable business interests. He was now persuaded to leave the Air Force to look after the family business which he did – but his flying passion remained unabated.

Fortunately, even while he was in the Air Force, Dalip had obtained a private pilots licence which he continued to keep valid. The family land in Sardar Nagar included an air strip with a number of L-4 and L-5 light aircraft purchased after the war from the US Army, to which soon were added two Beechcraft Bonanza V-tailed four-seater cabin monoplanes. It was in one of these that Dalip made that historic flight to Kathmandu on 23 April 1949, in Bonanza (VT-CYQ) which story has been related in detail in *Vayu's Issue III/2010*.

Dalip Singh Majithia's passion for flying continued for the next three decades, making his last recorded flight in command on 16 January 1979, again in a Beechcraft Bonanza which aircraft still remains with the family, frequently flown by his cousin S. Satyajit Singh (son of S. Surjit Singh Majithia) who has carried on the tradition of flying Majithias into the 21st Century.

The 'Armada' at the Majithia aerodrome at Gorakhpur (now a major Indian Air Force fighter base) had peaked with some half a



'Big' Uncle Surendra Singh Majithia in the hangar with L-5 at Gorakhpur airfield



Still in uniform: Surjit Singh Majithia with his nephew Dalip Singh Majithia. The uncle later was Deputy Defence Minister of India and still later, India's first Ambassador to Nepal

dozen aircraft including a Gulfstream G150, Cessna Citation J2+, Beechcraft Super King Air B200C and B200 King Air C90A, B-58 Barons, Bonanzas and the veteran L-4 and L-5. While *Saraya Air Charters* are active with the earlier mentioned aircraft, including for medical air evacuation, some of the others are now awaiting their C of A – and a dignified resting place at an appropriate Aviation Museum. 🦅

Watch this space!

Pushpinder Singh

Reference material from 'Himalayan Eagles': History of the Indian Air Force by Pushpinder Singh.

Pictures sourced from Dalip Singh Majithia and archives of The Society for Aerospace Studies, New Delhi.

'That' loop over Dacca



Image for representation purposes only (3dsmolier.com)

It is an honour for me as an aviation enthusiast to write this story which has been little known - until now! In a recent conversation with Air Commodore Suren 'Bundle' Tyagi, an Indian Air Force veteran, he happened to narrate a rather quirky incident which caught my imagination and I felt this was a story that just had to be told! And as good luck would have it, Mr Pushpindar Singh of Vayu Aerospace Review tasked me with writing this story.

So we go back to July 1971, some months before Indo-Pakistani War. MiG-21FL fighters of Nos. 4 Squadron 'Oorials' and 28 Squadrons 'First Supersonics' both operating from Guwahati, were on ORP (Operational



No.4 Squadron pilots before a mission: (left to right) Balasubramaniam, Ajit Bhavnani, Suren Tyagi and Lawrie Menezes.

Readiness Platform) at the airfield. When an air base maintains an ORP, there are normally 2-3 fighter aircraft combat-ready, with full weapons load, tasked to scramble within 2-5 minutes.

Quick history: No. 4 Squadron 'Oorials' was formed in Peshawar in 1942 during the Second World War, later moving to Rilaspur and then to various other places like Phaphamau, Bhopal, Sulur, Ranchi, Kanpur and then Tezpur in Assam nearer the frontlines. It has the rare distinction of not along participating in the Burma Campaign during the War, but was the only IAF unit that went to Japan as a part of the British Commonwealth Occupation Forces.

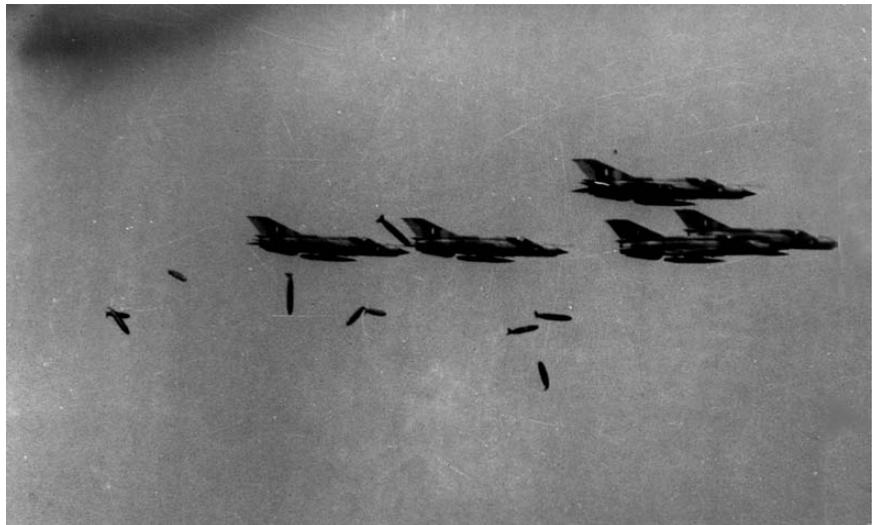
No. 28 Squadron are decidedly the 'First Supersonics', being the first squadron in the Indian Air Force to receive supersonic fighters, the MiG-21 in 1963. They were initially based in Chandigarh, then moved to Tezpur in Assam before the 1971 War, and much later to Pune, converting to the new generation MiG-29 and are presently at Jamnagar, where Air Commodore Suren Tyagi has settled after his retirement.

Then Flight Lieutenant Suren 'Bundle' Tyagi was posted to No.4 Squadron in 1971, spending many months at Guwahati, with preparations going on for the possible show down in East Pakistan. On 1 December 1971, eve of action, Flt Lt Suren Tyagi along with other pilots were re-located from Guwahati to Tezpur, whose Base Commander was Group Captain MSD 'Mally' Wollen, many years later to become Air Officer Commanding-in-Chief, Eastern Air Command at Shillong.

The MiG-21s re-located to Guwahati on 3 December evening, flying very low to avoid radar detection. Suren Tyagi was soon on ORP at sundown, staying at the Operational Readiness Room (ORR) that night, an underground facility for pilots to rest till the call for scramble, the war having begun with Pakistan carrying out attacks on IAF bases in the west.

The MiG-21FLs were parked in makeshift pens, 'protected' by sandbags. At dawn on 4 December, four MiG-21s were launched for CAP (Combat Air Patrol) missions while eight aircraft (4 aircraft with 500 kg bombs), plus 4 escorts took off for the first mission over enemy territory.

Targets were the runways at two airfields at Dacca (then capital of East Pakistan), Tezgaon and Kurmitola, which were



accurately struck by bombs as were their parallel taxi tracks. Later the same day, the MiG-21s were tasked on CAP missions as other the strike formations were returning. Early on 5 December, another CAP mission was airborne, four aircraft, two from each squadron (Nos. 4 and No.28), to provide cover over the Initial Point (IP) where 4 Hunters from Hashimara were tasked to attack the Armament Factory at Jaydevpur in East Pakistan.

Flt Lt Tyagi led this section with a wingman in tactical formation, flying very low at 90 metres and speed of 840 km/h. Complete Radio Transmission (RT) silence was maintained. Two minutes before reaching the IP, CAP Leader from Guwahati, and the Strike Force from Hashimara established radio contact.

Strike Force Leader: Golden Arrow 2 minutes from IP.

CAP Leader: Roger, pulling up to set up CAP over IP, approaching in 1 minute.

As the MiG-21s set up CAP over the IP, Strike Force Leader: Golden Arrow over IP, setting course.

CAP Leader: *Roger. Turning and returning.*

"At the stage, Suren Tyagi transmitted: *One from three. Let's wait for the Strike Force to return... We have enough fuel.*"

CAP Leader: *Negative. Descending and returning.*

Suren Tyagi to his wingman: *Spread out on my left in offensive sweep formation. We will fly over Dacca runways till the Strike Force returns.*

Suren Tyagi, along with No.2 flew over both Kurmitola and Tezgaon, then did a tactical turn inward, rolled out, hoping

that an enemy fighter would try to intercept them ... unfortunately, they did not.

Disappointed, and perhaps in a rush of blood, Flt Lt Tyagi decided to carry out a loop over the Tezgaon runway!

Look for my tail... Going for a loop. Follow after I recover.

And so he did, diving the MiG-21 and then carrying out a loop before recovering with aplomb!

As he recalls, this could have been fun if we were not being shot at by anti-aircraft fire. Suddenly, there were puffs of smoke, with Pakistani AAA in action and the forbidding Meghna river below.

Bundle Tyagi to No.2: *Abandon loop, hard right, hard left.*

Coming abreast of each other, both MiG-21s then flew back to Guwahati and landed without any further excitement. That (in)famous loop was never spoken about, almost as if never happened.

The War continued for another ten days, the MiG-21s of Nos. 4 and 28 Squadrons continually carrying out bombing and close support missions, enabling the Indian Army to advance forwards towards Dacca without any interference. Dacca fell on 16 December 1971 which marked end of the War, and India's most decisive military victory. A new country 'Bangladesh' was created.

But coming back to that loop, it must have been quite demoralising for the grounded PAF to witness such confidence of the IAF. As a PAF pilot was later quoted as saying, "on top of it all, we even witnessed an Indian fighter doing a loop over Tezgaon".

A haunting recall! 

Aditi Patwardhan

Behind the Scenes

The Paris Parade 2020



Every year on 14th July, the National Military Parade (*défilé*) is held in the French capital of Paris commemorating start of the French Revolution. On 14 July 1789, the Bastille prison had been raided by people from Paris, an event that began the French Revolution. Traditionally thereafter, a spectacular military parade is held with soldiers, trucks and tanks in the heart of Paris while aircraft and helicopters fly overhead in an air parade (*défilé aérien*).

However, this year, because of the ongoing pandemic, several restrictions were imposed. The ground parade was confined to the Place de la Concorde and visitors were not allowed, having to watch the parade on television. The main theme of the parade was the liberation of France 75 years back as also the 80th birth anniversary of the 'Free French Air Force' (*Forces Aériennes Françaises Libres*' (or FAFL). The parade climaxed with an aerial display of various helicopters from the Army (*Armée de Terre*),

Air Force (*Armée de l'Air*), Navy (*Marine Nationale*) and the Police (*Gendarmerie Nationale*).

The participants operated from various airbases, some from their home bases (*Air Force*: C-130, A400M, E-3F, C-135F, A330MRTT, Mirage 2000D, Mirage 2000C; *Marine*: Rafales, Atlantic, E-2D, Falcon 50M) as also from airbases close to Paris where fuel was an important factor (BA Evreux, west of Paris for the Mirage 2000C and Rafale, local transport aircraft ;





BA Villacoublay, south of Paris for Marine and Air Force helicopters; BA Creil, north of Paris for Army helicopters).

The participating Rafales (with one Rafale having a special decorated tail of EC 2/30 *Normandie-Niemen*), took off from runway 22 to fly overhead Paris, while the spare aircraft did their flight-preparations and left BA Evreux after the parade was over.

The participating Mirage 2000C of EC 2/15 *Île-de-France* taxied to the runway, but take-off was aborted because of low cloud ceiling. From BA Evreux, a C-160 Transall and two CN235s took part.

The *Forces Aériennes Françaises Libres* (FAFL) or 'Free French Air Force' was established by General Charles de Gaulle in June 1940 from personnel of the French Army, Navy and Air Force which had escaped France for the United Kingdom.

The original squadrons of the FAFL were:

- Groupe de Chasse n°1 *Alsace* (341 Squadron RAF)
- Groupe de Chasse n°2 *Île-de-France* (340 Squadron RAF)
- Groupe de Chasse n°2 *Normandie*, later Régiment de chasse Normandie-Niémen (Soviet Union)

- Groupe de Bombardement *Lorraine* (342 Squadron RAF)
- Groupe de Bombardement *Bretagne*

A Dassault Rafale from *Escadron de Chasse 2/30 Normandie-Niemen* had a specially painted tail, to commemorate their operations from the Soviet-Union during WW2.

Also flying over Paris were two Royal Air Force Typhoon FGR4 fighters of 1(F) Squadron from RAF Lossiemouth, one of the pilots being a French exchange pilot. 🦅

Photos and article by Joris van Boven



Saber Junction 2020'



In south Germany, near Nürnberg, is located the United States Army Garrison Hohenfels Training Area, managed by the 7th Army Training Command. This Joint Multinational Readiness Centre (JMRC) regularly organises large exercises at the Hohenfels Training Area and at the 'Grafenwoehr Training Area', which is some 100km away.

From 3 to 27 August 2020, the JMRC organised Exercise 'Saber Junction 2020'. This is an annual and a large-scale exercise in which the 173rd Airborne Brigade (*Sky Soldiers*), an American Airmobile Brigade based in Vicenza, Italy is evaluated for their immediate deployability. Some 4000 soldiers participated in this exercise, and in addition to US troops, there were soldiers from Albania, Georgia, Lithuania, Latvia, Moldova, North Macedonia, Romania and the Ukraine.



The Germany-based 12th Combat Aviation Brigade (12CAB) provided CH-47 Chinooks, UH-60 Blackhawks, HH-60 MEDEVAC Blackhawks and AH-64 Apache helicopters for this exercise. On the first day, three US Marines MV-22 Ospreys from Marine Medium Tiltrotor Squadron 263 also participated.



During the exercise, several Eurocopter UH-72 Lakota light support helicopters operated over the Hohenfels area, these militarised EC145 helicopters being flown by the locally-based JMRC Falcon team. The green-coloured Lakota was used by the observers and referees of this exercise and the yellow/brown coloured Lakotas as enemy helicopters (*Red-Air*).

On 13 August 2020, a media day was organised at the Hohenfels range, such images now shared with readers of the *Vayu*. 🦋

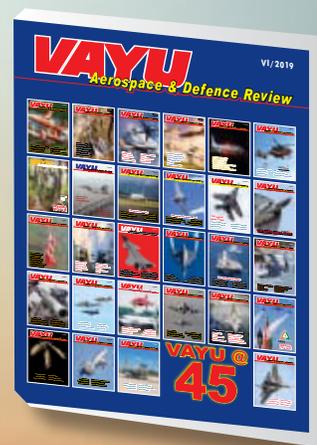
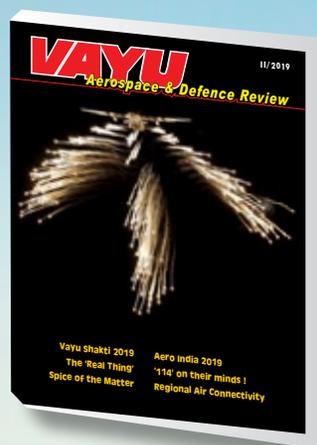
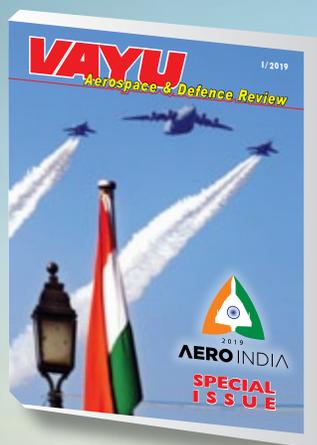
*Photos and article by Joris van Boven
With thanks to 12CAB's PAO Major
Fellingham.*



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In remembrance of the past - and looking to the future

Germany and Israel record aviation history



Formation flight (photo Luftwaffe)

In July 2020, for the first time in history, Israeli fighter aircraft landed on German soil. Six F-16 ‘Barak’ jets took part in the exercise *Blue Wings 2020*, together with two KC-707 tankers and two Gulfstream aircraft. Hosting them was fighter wing TLG31 ‘Boelcke’ of the German Luftwaffe, which operates the Eurofighter EF2000 from Nörvenich air base.

“On behalf of the German air force, it is an honour for me to welcome the Israeli air force entering German airspace for the first time in history. My Israeli friends, General Norkin, Amikan, now our Blue Wings fly side by side,” Lieutenant General Ingo Gerhartz, commander of the German Luftwaffe, said, welcoming the Israeli delegation to Germany.

As part of preparations before the real exercise, multiple transport flights were made with C-130H and C-130J Hercules aircraft. The F-16s themselves

were accompanied by two KC-707 tankers during the journey to Nörvenich. The Israeli delegation consisted of some 200 personnel while TLG31 with 1,100 personnel and EF2000s formed the German part. Security measures were taken, not only because of the Israeli presence but also because of Covid-19, including testing all participants before they can roll in.

This exercise followed multiple visits to Israel by Gerhartz and it was no coincidence that World War II ended exactly 75 years ago. To commemorate this, the day after arrival a formation flight was made over Dachau concentration camp. This formation was led by an Israeli Gulfstream 550 with both Gerhartz and commander of the Israeli air force, Major General Amikan Norkin on board. They were accompanied by two F-16s and two Typhoons. Above Dachau, Norkin broadcasted: “Flying together above the valley of darkness, making room for

only light ahead. As we vow: never again!” This commemoration flight with the Israeli and German fighters flying side by side, did not only honour the numerous victims of the Nazi regime, but also showed the world that an inseparable friendship has emerged from an apparently insurmountable enmity. Norkin: “By remembering the past, we ensure the future.”

The formation also made a pass over Fürstenfeldbruck airfield. Here in 1972, eight Palestinian militants took 11 Israeli athletes who were participating in the Olympic Games as hostages. After flying over the area, the formation landed at nearby Lechfeld and both air force commanders visited the monument at Dachau concentration camp. Here a remembrance ceremony was held, including amongst others the German Minister of Defence and the Israeli Ambassador.



Next day, tactical part of the exercise began and some 170 sorties completed throughout the entire exercise *Blue Wings 2020*. During the second week, both forces also participated in the NATO exercise MAGDAY, which takes place several times a year. A spokesperson of the German air force explained, “MAGDAYs are a central element in strengthening the cooperation, interoperability and capability development of allied air forces. As a NATO partner nation, the Israeli AF took part in this MAGDAY as part of the *Mediterranean Dialogue*.”

During this second week, two KC-707 ‘Re’em’ tanker aircraft of the Israeli air force were based at Nörvenich. Although already some 45 years old, these aircraft of Nevatim air base of 120 ‘Giants’ Squadron are still going strong. Apart from this, 122 Squadron with their special missions Gulfstream 550 aircraft is based at Nörvenich as well. One



KC-130H 427 performing a support flight



Brand new C-130J-30 667 of 103 squadron



F-16C of 101 ‘First Fighter’ squadron returning after a mission

of the G550s was the ‘Nachshon-Eitam’ equipped with a Conformal Airborne Early Warning (CAEW) system, easily recognisable by the conformal phased-array radars on both sides of the fuselage, while the other one was a ‘Nachshon-Shavit’ specifically outfitted for signals intelligence (SIGINT). These aircraft performed dual role as VIP transport aircraft and to carry out electronic warfare. The three F-16Cs were from 101 ‘First Fighter’ Squadron

while the three dual F-16Ds were from 105 ‘Scorpion’ squadron, both based at Hatzor.

Special Temporary Reserved Airspace (TRA) was used, mainly above the North Sea and over Rheinlandpfalz/Saarland. “The exercise is being held to continue enhancing the Israeli AF’s capabilities, maintain its readiness to face various scenarios, and to continue strengthening its bonds and cooperation with allied air forces,” as explained in a press statement. Air



Israeli pilot in his "office"



German EF.2000 returning back to Nörvenich



Full afterburner take-off



Gulfstream 550 'Nachshon-Eitam' with conformal AEW system clearly visible



Returning home after the last mission of Blue Wings 2020



Take-off (photo Luftwaffe)



Flying side by side

combat, surface-to-air action, defeating surface-to-air missile threats, and "other combat scenarios in enemy territory" were practised. After end of the exercise, a spokesperson of the Luftwaffe added, "The main focus of *Blue Wings* exercise was on the exchange of flying experience with the Israeli participants on 'Tactics, Techniques and Procedures (TTPs)' when carrying out multinational air operations. These experiences help in the further development of the national TTPs. The long-term and intensive cooperation with the Israeli air force could be continued very successfully."

Lieutenant Colonel Mbassa, Deputy Commodore of TLG31, as the responsible leader for the *Blue Wings* exercise, concluded, "The result has been an excellent exercise and a very intensive exchange, which has particularly helped our young comrades. This gives us a positive outlook on our future cooperation with our Israeli partners." 🦁

Text and photos by Patrick Dirksen & Frank Mink

Blue Wings and MAGDAYs 2020



German Luftwaffe and Israeli Air Force in air exercises

During the period 17 to 27 August 2020, Israel Air Force F-16C/D Barak fighters participated in exercises *Blue Wings* and *MAGDAYs 2020* in Germany. The German Luftwaffe and the Israeli Air Force had earlier trained together in 2019 at Ovda AFB in Israel in exercise *BlueFlag*, and in August 2020, the Luftwaffe hosted the MAGDAY (Multinational Air Group Days) exercises.

Chief of the Luftwaffe, Lieutenant General Ingo Gerhartz had invited the Israeli Air Force to take part in this exercise. In preparation for this joint exercise, the Israelis flew to *Taktisches Luftwaffengeschwader 31 'Boelcke'* a week before MAGDAY to plan necessary tactics, train technicians and standardise various procedures for this event. These two exercises were the first on German soil between the Air Forces of Israel and Germany, a historical event.

Blue Wings 2020

First of the two weeks bilateral exercise *Blue Wings 2020*, was a follow on to the earlier exercise *Blue Flag* which had taken place in Israel during 2019. Six F-16C/D *Barak* fighters, two Boeing 707 *Re'em* tankers and two Gulfstream G-550 *Nachshon-Eitam* aircraft flew to Nörvenich Air Base in



Germany. The Luftwaffe flew its EF2000 Eurofighters during the exercise from Tactical Air Squadron 31 'Boelcke' (TLG-31). Over the two weeks, aircrew practiced numerous aerial scenarios alongside the German NATO aircraft as part of the MAG (Multinational Air Group) exercise.

The air exercises included air-to-air combat, ground attack, countering surface-to-air missile threats and other combat scenarios in hostile environment. There





MAGDAYS

During the second week, the actual MAGDAYs exercise was held with German, Israeli and Hungarian participants. The Hungarians brought 4 Saab Gripens and 30 staff members and were located with the *Taktisches Luftwaffengeschwader 51 Immelmann* at Jagel airbase in Schleswig-Holstein.

Lieutenant-General Ingo Gerhartz Commander of the German Luftwaffe welcomed the Israelis and stated “On behalf of the German Air Force, it is an honour for me to welcome the Israeli Air Force entering German airspace for the first time in history. My Israeli friends led by General Amikam Norkin is now flying side by side as our Blue Wings.”

was opportunity to tactically fly and under variety of threats using advanced technology, using NATO’s and Israeli doctrines.

Blue Wings 2020 began with Israeli and German aircraft first carrying out a commemoration fly-by over former concentration camp at Dachau and then Fürstenfeldbruck air base near Munich. On 18 August 2020, a *Memory for the Future* the flight past led by an Israel Gulfstream G550 and F-16s alongside two German Eurofighters (see separately). The flyby over Dachau concentration camp was to remember the Holocaust victims while that above Fürstenfeldbruck was in memory of the 11 Israeli Olympians who were murdered in a terrorist attack in 1972. After the flyby, an official memorial ceremony was held at the Dachau concentration camp. The ceremony was attended by the German Federal Minister of Defence Annegret Kramp Karrenbauer, the Israeli Ambassador to Germany Jeremy Issacharoff, Commanders of both the Air Forces and other dignitaries.



The German Air Force organises MAGDAY exercises several times every year and as part of this year’s exercise, two Boeing 707 tankers of the Israeli Air Force supported their F-16s. The German Eurofighters were refueled by German A310 and A400M tankers.

Responding, Major General Amikam Norkin said, “Well my friend, I am proud to lead our first deployment to Germany. It is a testimony to our strong ties and mutual commitments. Thank you very much. I salute you and your Air Force.”

Text and photos: Joris van Boven and Alex van Noije





“From Cadets to Pilots”

A Grob G103A Twin Astir glides towards Guidonia over the surrounding hills

The 60° Stormo, ‘Gruppo Volo a Vela’

History of the *Volo a Vela* Group goes back to beginning of the 20th century, when it inherited traditions of the *Pavullo School* in Frignano, founded in 1927. The actual establishment of departments dedicated to training on gliders within the *Aeronautica Militare* (Air Force) must certainly be attributed to Adriano Mantelli. As a fighter pilot and ace of the *Regia Aeronautica Italiana* (Royal Italian Air Force) during the Spanish War, he always had great interest in gliding. With this strong passion and interest, he started a small company (SDAM) in 1929 for the construction of gliders.

Moving on to modern times, on 1 January 2013 the *Gruppo Volo a Vela* (GVV) began transformation towards its current form when the CVV (Gliding Centre) was merged with the Guidonia Airport Command, assuming functions of a normal Flight Group. On 28 March 2013, the CVV was renamed as *Gruppo Volo a Vela*. After almost two years, on 15 February 2015, with the activation of 60° Stormo, the GVV finally took on its present form and the wing began to work in the new way.



With a variety of aircraft in its inventory, the pilots of 60° Stormo are skilled on different types to allow for maximum flexibility

The Gliding Group consists of two units, the 422nd and the 423rd Squadrons. Major ‘Max’ T, Squadron Commander of 60° Stormo, explained, “Our two squadrons are the operational ‘arm’ of the Wing, because they take care of all the activities related to flights entrusted to the Wing,

Even though we are operating a full Wing, there are only ten pilots in charge of the GVV and all our pilots are ‘chameleon-like’, every day showing their knowledge of how to adapt to the individual management of every single person who performs flight activities at Guidonia. This ranges from a



S.205s with their unusual tail markings

General who carries out AVM activities, to a student pilot for whom it is necessary to also impart military doctrine in addition to the notions of flight, to the civil student of the Aeronautical Culture Course who has no military background and must be managed in a different ways. Actually Guidonia is the only Italian Air Force base where gliders, propeller and jet aircraft are operating together and, in some periods, even helicopters with a TH-500B (local designation of the NH-500E)".

Glider courses

The teaching of flying on gliders for those attending standard courses of the Air Academy is certainly one of the most interesting tasks for GVV instructor pilots, especially as this type has been included in the pilot training programme of the Italian Air Force, since Corso Eolo V (2005) onwards. As Maj T elaborated, "The student pilots arrive in Guidonia after having first obtained the BPA (Airplane Pilot License) in Latina. Each course consists of 48 students and every course usually lasts two weeks and about 20 flights are carried out, of which 12 are for qualification and eight to increase their skills. Out of the eight, the final three are carried out with launches by winch and the course ends with a solo flight". These activities represent an important training step of the new training process called IPTS 2020 (Integrated Pilot Training System) and is key in obtaining the BPM (Military Pilot License).

The students return to Guidonia by end of the second year of their studies to carry out a maintenance phase, while at end of the third year, they go to Latina to do the aerobatic-advanced part on the SIAI-Marchetti T-260B trainer (local designation of the SF.260EA). Maj. T



Uniquely, students fly both the powered T-260B and gliders

continued "The glider was included in the training process because it was considered very educational and introductory to learn coordination in general. Furthermore, it will help the student in the use of commands, especially with regards to the pedals, which are used much more in

and includes operational activities outside of Italy. 🦋

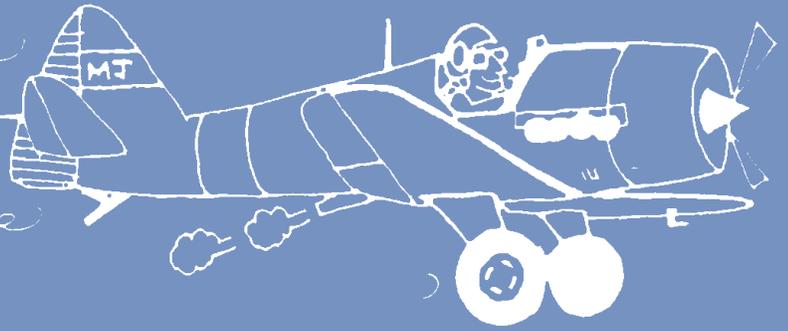
Article and photos: Erik Bruijns

The authors thank men and women of 60° Stormo. Special thanks goes out to Maj. T and Cap. Pil. Angelucci for their support in writing this article.



Two MB-339 jet trainers are on loan from 61° Stormo at Lecce and used for both SAC training and generic pilot training

Ancient Aviator Anecdotes



Air Vice Marshal (R) Cecil Parker and.....

The Writer's Distaff Line

The first in line was my maternal grandmother who, after marriage, relocated from Bengal to Gujarat in the late 1800s. Her eldest male grandchild (this writer) was born in 1932 at Anand and was thereafter taken to his Nani's home in Surat. Like all grandmothers she doted on her grandchildren and, though she passed away when I was only seven years of age, I have clear memories of her singing me to sleep, teaching me my very first words in Bengali and introducing me to *nankhatais*, a craving for which has never quite gone away!



(Drawing for representation purposes only)

At two years of age I was introduced to my Hindi-speaking paternal grandmother in our family home in the tiny village of Jyotipur in Chhattisgarh. From there my Dadi presided over her family and was always delighted to welcome the 'first born son of her first born son'. I was of course quite spoiled by this matriarch and enjoyed the many holidays spent in the farm house with its large garden. When she learnt that I was going to join the air force, she berated my father, (translated: "*the boy fell out of a tree and will now fall out of an aeroplane*" and how right she was!). She lived to the ripe old age of 96.

Much like my Nani, my mother too was a soft spoken, gentle lady who by profession was a language teacher. Like all mothers she lavished unconditional love on her first born but was equally strict about my studies. We were a nomadic family but wherever we went she personally supervised all my homework and academically 'shepherded' me till I left for boarding school in 1942. Even so, being a prolific letter writer, she never failed to mail me an encouraging letter every week through school and college. Despite my father's opposition, she strongly supported my decision to become a pilot. A quiet lady of great personal faith, she taught me a great deal by example.

I was a lone child till the age of six when my sister arrived and parental attention shifted focus from son to daughter. She was a bright and talented little girl who followed me around like a puppy. Our relationship was interrupted by my years away in school and college. Academically she was always top of her class and in her professional life she was a very successful teacher. Our meetings are intermittent as she settled in Mumbai after marriage while

I kept moving around from air base to air base till 1986.

And then came the only lady I personally invited to join our family. When we met in 1951 she was a 15 year old school girl and I was a flight cadet undergoing pilot training. I courted her for five years and we married in 1956. For the next 30 years in the air force she managed our 15 moves, raised our two children, designed the house we built and continued with her work as a teacher wherever possible. The two wisest choices I made in life were choice of wife and profession. Now in the 65th year of our marriage, she continues to run the house, rules over her husband and only improves with age!

The arrival of a baby girl not only lit up our house for the second time but also completed our family. Which normal father does not dote upon and indulge his little daughter? We know that we have this lovely little lady for only a few years before she leaves home for higher studies, a profession, marriage and the raising of her own family. Of course she keeps in touch regularly and visits whenever possible but we feel the passage of time as our daughter is soon to become a grandmother herself!

And then the four granddaughters who require only grandparental love and a little spoiling to add great delight to our lives. But like all grandchildren they grow too fast; our youngest is about to enter her final year at university while an older one (a doctor) has not only just won the 2020 Fulbright scholarship for medicine, but is soon to be married herself.

These then are the ten ladies who, past, present and future continue to enrich the life of this very fortunate and grateful ancient aviator.

Banking On Continuity



Apart from a vague notion that they had something to do with money, banks did not feature in the lives of my generation which grew up in the 1930s and '40s. Our interest in finance was restricted to receipt of pocket money in boarding school (Rs 2 pm) and college (Rs 20 pm). As flight cadets at the AFA in 1951-52 we were limited to Rs 40 pm, remitted from home direct to the CGI's office and then given to us in cash. As young, newly commissioned officers, we received our salaries in cash. Some of us were fortunate to have trusted *sevadaars* (*desi* Jeeves) who took care of our salaries and tried to keep us financially solvent till the end of the month! When officers messes insisted upon payment of mess bills by cheque, we began to think about banks.

In 1953, as a pilot officer, I was posted to my first squadron at Palam when my father visited Delhi and I sounded him about a 'loan' to purchase a motorcycle. He asked me the name of my bank and,

hearing that I had no bank account, whisked me off to a colonial era building that housed his bank on Parliament Street. I was introduced to the manager, given some forms to sign and asked to pay Rs 10 to open my very first bank account. I was frightfully embarrassed as I had less than that in my wallet! Whereupon my father paid the amount, handed me a cheque book and reminded me that I was now a debtor to him! This was my introduction to the world of banking 67 years ago. (Incidentally, the 'debt' was cleared and in due course a new BSA Golden Flash motor cycle appeared).

As bachelor officers we were moved frequently from one air base to another. In those days there were no banks within the perimeter of any operational air base and, for all banking services we had to open an account with any bank in the nearest town. After 20 years in squadrons / FTEs (Flying

Training Establishments), I was posted to the faculty of the Air Wing at DSSC Wellington in late 1972 and was happy to experience the services of a bank on campus. In 1975 I moved to HQ TC IAF Bangalore but within three months was moved again to take over command of the air base at Hakimpet. My personal bank account now moved from Wellington to Bangalore and on to Hakimpet where a branch of the bank had opened recently. Thereafter my account continued to move with me. In 1980 while attending a years course abroad, the London branch of the bank was very helpful in payment of my income tax back home.

In 1986 I took premature retirement from the air force and was happy to discover that a branch of the bank was located within the AFOCHS Ltd Vayupuri where I had built my retirement home and thus opened my pension account and slowly got to know the names of nearly all the staff. It is now 47 years that I have banked with the same bank which has always had a close association with the defence services. A few years ago, on its annual, give-away desk calendar, the bank had endorsed my name and decorations as its tribute to Indian gallantry awardees of the armed forces. I was of course very touched but even this recognition did not save this octogenarian pensioner from standing long hours in queues during demonetisation!

The recent decision to merge my bank with another larger nationalised one did sadden me somewhat. I can only hope that, though its identity will be lost, the merged entity will continue being a "Faithful, Friendly, Financial Partner". 🐦



25 Years Back

From Vayu Aerospace Review Issue V/1995

The Editorial

And what is that we shall tell our succeeding generations when they ask as to how was it that the Indian Air Force which, in the mid-80s, was reputedly one of the world's largest and most powerful air arms, was allowed to degenerate in quality and quantity a mere ten years later? That those who donned the mantle of its leadership at Vayu Bhawan could not convince the pundits at South Block of their urgent necessities? That those bureaucrats who assumed the right to damn or delay vital requirements of the nation's air force could not get those wheeling and dealing politicians to spare the time or interest in making such moves as would have saved the country great cost, both in direct and in so many intangible ways?

The IAF's 63rd Anniversary

63rd Anniversary of the founding of India's Air Force was marked by an investiture parade at Palam Airport's Technical Area on 8 October 1995. Following an inspection by Chief of the Air Staff, Air Chief Marshal SK Kaul, the smart march past by some 500 officers and men of the IAF included a number of women officers, while the flypast was led by six Jaguars, followed by six MiG-27MLs while the transport comprised an Ilyushin Il-76 flanked by two Antonov An-32s flanked in turn by two Dornier Do 228s.

There was much nostalgia when three Canberras flew overhead, followed by three Hunters as this was to be the last public flypast by these venerable and classic aircraft which have now served with the Indian Air Force for four decades and which types are to be phased out by mid-1996. The flypast ended with a sole MiG-29 which came in at low level and executed a perfect 'Vertical Charlie' over the parade ground.

PAF's 'Highmark 95'

Pakistan has informed India of its major air and military exercise *Highmark-95* which also involves all combat squadrons of the Pakistan Air Force. While there has been no official Pakistani word on the scale and strategic scope of *Highmark-95* this exercise seems in reaction to India's earlier exercise *Brasstacks*, the importance of which Pakistan seems to have taken very seriously. As for the finer details of *Highmark-95*, the PAF official has been quoted as saying, "There will be considerable air activity near Karachi, as the port and its infrastructure could be prime targets for the enemy."

The Tata-SIA Joint Venture

India's Finance Minister, Dr Manmohan Singh finds a lot of attractive features in the Tata-SIA joint venture now awaiting approval by the Foreign Investment Promotion Board (FIPB). "I welcome foreign investment in such sectors and feel that competition is good for the Indian Industry", he added. Although the Finance Minister heads the empowered committee on foreign investment which would have to bestow the final seal of approval on the project if it gets off the ground, he was somewhat hesitant about commenting definitely on the project, obviously because Civil Aviation Minister Ghulam Nabhi Azad had expressed contrary views, placing the joint venture in jeopardy.

Air India Fleet Expansion

To expand its services, Air-India is to wet-lease five 200/250-seater passenger aircraft in December 1995. The wet-leasing of the aircraft (two long-range Lockheed L.1011-500s and three Airbus A. 310-300s including the two already in operation) was approved by the Air India board in early October. The induction of these aircraft would enable Air India to expand its network by commencing operations to four new stations - Amsterdam, Brussels, Entebbe and Tel Aviv—besides helping the Airline in phasing out three of its old Boeing 747-200s. All leased aircraft

would fly with an Air India flight number, while the aircraft crew, maintenance and insurance would be from the lessors.

Airbus Industrie invites Indian (and Chinese) participation

Airbus Industrie is considering inviting India, along with China and South Korea for participation in its mega 600-800 seater airliner. President of Airbus Industrie, Mr. Jean Pierson, stated that both India and China have been recognised as the fastest growing markets in aviation today and the Toulouse-based company would "not mind" asking these countries to enter into joint ventures to enlarge the manufacturing base for this high capacity aircraft slated for induction after 2005.

IAF to assist UAE Air Force

A high-level six-member UAE defence delegation headed by Brig Hayyl Juma Al Hamlli, Director Operations of the UAE Defence Forces, was in India in August, 1995 and there are reports that the IAF may be requested to train pilots belonging to the United Arab Emirates on the Russian-made Il-76 strategic lift transport aircraft. These aircraft, which also from part of the IAF's inventory, are currently being flown by Russian pilots in the UAE. Another major possibility of bilateral cooperation is the servicing and overhauling of UAE's Mirage 2000 multi-role fighter aircraft of French origin (the IAF currently has two Mirage 2000 squadrons). These aircraft are now being completely overhauled in India. While the IAF overhauls the engines, HAL overhauls the airframe at Bangalore.

RTAF favours F-18 Hornets

The Royal Thai Air Force appears to prefer the MD F-18 Hornet as its choice for its next fighter requirement, augmenting the present fleet of Lockheed Martin F-16Cs. Thailand is considering initial eight fighters for delivery by early 1999, later increasing this to 18 aircraft, to equip a full operational squadron. Thailand has also made procurement of either the F-16 or F-18 dependent on the US Government's release of the Hughes ALM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM) for sale.

The more things change...

....the more they remain the same!



Readers, please recognise the fighters 'escorting', the big bad Bear over so many decades !

Golden Arrows All

After some years of being sheathed, the 'Golden Arrows' are now very visible, this crest of No.17 Squadron IAF being proudly worn by its personnel.

The Golden Arrow is certainly a very popular symbol for companies, football clubs as also Army Divisions: here are some examples and readers are invited to select the most attractive of them all!



The crest directly above was designed by young Saurav Chordia from Basugaon, Assam in celebration of No.17 Squadron getting Rafales. Alongside is the sign of the 7th Infantry Division, Indian Army, also known as the 'Golden Arrows', with a long wartime history.

Afterburner

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