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Naked Expansionism

China's aggressive posture in claiming territory deep inside eastern Bhutan, close to the Arunachal Pradesh border, is a move towards keeping the entire India-China border active and unpredictable. Though the news of disengagement in Ladakh is welcome, the statement of the Chinese Ministry of Foreign Affairs regarding the Sakteng Wildlife Sanctuary in Bhutan dashes all hopes of a peaceful resolution of the standoff on the border. The telephone conversation between the Special Representatives of India and China has resulted in a pullback of the PLA troops away from the Galwan valley. But this might yet again yield the Chinese a net gain, using the salami slicing tactic of two steps forward and one back, unless India remains ever wary and watchful.

John Sawers, former chief of MI6, the British secret service, has interpreted the Chinese incursion in Ladakh as an instance of intimidation to prevent India from forging an alliance with the US, Japan and Australia for a common approach towards China, and also to bolster Chinese interests in Pakistan. Analysts like Sawers want Chinese leaders to understand that "they will pay a price", if they impose their hegemonic aspirations on other nations.

China's actions in Hong Kong, imposition of sanctions against Australia, its sinking of Vietnamese fishing boats in South China Sea, the Ladakh incursion and most recently its claims on the Sakteng have all now prompted observers to arrive at an unambiguous understanding of China's expansionist worldview, even in the context of the Belt and Road Initiative (BRI). India's refusal to join the BRI or the Regional Comprehensive Economic Partnership had hastened the slide in Sino-Indian relations. So, a pullback of the Chinese troops from the Galwan valley, Hot Springs and Gogra to create a buffer zone should only be seen as a tactical move by China in its long-drawn-out strategic attempt to browbeat and subdue its neighbours into a client state status, as it has achieved in the case of Nepal and Pakistan. Chinese President Xi Jinping's metamorphosis into a medieval monarch thirsting for battlefield glory and territorial overreach lies exposed, leaving Chinese enterprises vulnerable to political scrutiny.

From *The Tribune*

Abundant Caution

After three rounds of military-level talks, a round between the two foreign ministers, another between the Special Representatives on the Boundary Question, National Security Adviser Ajit Kumar Doval, and China's State Councillor Wang Yi, a movement towards de-escalation is said to be taking place in the military build-up at the Line of Actual Control. Chinese soldiers are said to be stepping back in three of the contentious areas, Galwan, Hot Springs and Gogra. This is a development in the right direction. However, the verification process by the Indian Army is still underway, and it should continue to be so. After all, the incident at Galwan Valley in which 20 Indian soldiers were killed, took place at a time when the two sides were supposed to be disengaging. Moreover, there appears no de-escalation at the other "friction point", Finger 4 at Pangong Lake. In any case, disengagement does not mean a return to *status quo ante* yet. At the Special Representatives meeting, the two officials reiterated their commitment to the maintenance of peace and tranquility in the border areas. But the distinct difference in the tone and tenor of the readouts of this meeting put out by the Ministry of External Affairs and the Chinese Ministry of Foreign Affairs draws attention to the hazards of jumping to conclusions. According to the Chinese statement "the right and wrong of what recently happened at the Galwan Valley in the western sector of the China-India boundary is very clear. China will continue firmly safeguarding our territorial sovereignty as well as peace and tranquility in the border areas".

The challenges ahead for India remain enormous. One is the sheer length of the LAC, 4,000 km of it, compared to the Line of Control which is 740 km. Apart from the disputed portions that already exist and that both sides have discussed in several previous rounds of talks between the Special Representatives, there is now an unpredictability as China disputes portions on which there was no ambiguity earlier. India's perception of the Galwan Valley was not disputed by the Chinese before this summer. A give in one part of this long unmarked boundary may be accompanied by take somewhere else. In the latest demonstration of this unpredictability, China has now opened a new front, staking claim to territory in eastern Bhutan, close to the border of Arunachal Pradesh. This "eastern sector" had never been part of 24 rounds of boundary talks between Bhutan and China. The claim, which first came to light when China tried to block UN funding to the Sakteng wildlife reserve in that area, was reiterated by Beijing on Sunday. Even as the Indian Army is preoccupied in Ladakh, this places more pressure on it in the eastern sector, where China claims all of Arunachal Pradesh.

After Prime Minister Narendra Modi's visit to Ladakh, and his forceful speech to the soldiers there, with its unambiguous messages for the country, Beijing and the international community, the hard slog is here: ensuring that China keeps its commitment to peace and tranquility in the border areas.

From *The Indian Express*

US backs India

US secretary of state Mike Pompeo has come out forcefully in support of India in its border standoff with China, laying the blame directly on Chinese President Xi Jinping. In response to a question on the border standoff, Pompeo said that he saw the "incredibly aggressive" Chinese tactics in the context of Xi's behaviour throughout the region and the world. Pompeo's remarks come at a time when two US aircraft carriers have begun their largest naval exercises in recent years in the South China Sea, which Trump administration officials have linked to the India-China border skirmish.

There's no denying that China under Xi has embarked on a massive expansionist policy. Buoyed by its economic and military rise over the last two decades, Beijing believes few will actually confront it and risk conflict. Hence, it feels it can change the status quo on the ground through naked bullying. While Indian and Chinese forces are in the process of disengaging at the LAC, it's noteworthy that there has been no discernible Chinese pullback at Pangong Tso. Add to this China's new claims over Bhutanese territory that's not even contiguous, or over Galwan valley, and it's clear that Beijing plans to keep New Delhi's periphery hot.

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This will require India to permanently deploy along the LAC, straining its resources and acting as a long term tax on its teetering economy. The Chinese originated the game of 'Go' which requires players to strategically encircle the opponent to defeat them, and they are currently playing this game in South Asia with India as the opponent. Which is why New Delhi needs friends and partners, and the US backing of India is important. Washington must take the lead in rallying democracies to counter China's aggressive tactics. And India, the US and other like-minded nations have to work closely together, to prevent totalitarian China from dominating Asia and the world.

From *The Times of India*

Filling the fighter gap

The defence ministry's announcement that it had cleared the procurement of Rs 238,900 crore worth of weaponry and defence equipment is to be welcomed, especially given the tense confrontation with Chinese troops at several places in Ladakh. More than 80 per cent of the equipment that has been cleared will be manufactured in India, while over half has been designed and developed in India with the participation of several small and medium industries as prime tier vendors, making it truly Indian. It also true that the MiG-29 upgrade involves radar and missiles, plus range and other improvements, all at relatively low cost. Also it changes the game from being just air superiority fighter to multi role, though it can be argued that their demanding logistics require them to spend more time in the maintenance hangar than most modem fighters.

The problem is it could be several years before this weaponry is available to combat units, since only an in-principle clearance for procurement has been accorded so far, and India's notoriously slow procurement process often drags on for well over three years. Given the urgency of the military's need, the defence Ministry should have cleared the acquisition under the 'fast track' category, which requires a contract to be concluded within a year. The frontline soldiers cannot wait longer than that for the firepower they badly need through the induction of the Pinaka rocket launchers, Astra air-to-air missiles, and Nirbhay long-range cruise missiles that the ministry has cleared for acquisition.

Buying more Sukhoi Su-30MKI fighters provides work to Hindustan Aeronautics, whose Sukhoi-30MKI manufacturing line would otherwise shut down later this at the end of its production run. And the cut-rate purchase of MiG-29 fighters, which are lying in storage in Russia since the Russian Air Force does not want them, would allow the IAF to field an additional fighter squadron cheaply. However, these are insufficient reasons for inducting combat aircraft that are neither state-the-art, nor designed and manufactured like the Tejas.

Admittedly, no country's combat aircraft fleet consists entirely of cutting edge fighters. Given the budgetary constraints, a balanced air force would field equal mix of cutting edge, contemporary, and legacy aircraft. However, that delicate balance gets disturbed when obsolescent aircraft are replaced in service by less-than-cutting-edge fighters. The IAF should not be tempted into cut-rate shopping to make up the numbers. Instead, it should seriously pursue the global tender it initiated more than two years ago for buying 114 state-of-the-art medium fighters from the global market. True, that would strain the already overloaded defence budget. However, as the current border crisis illustrates, capacities must be created ahead of time, not when a crisis is upon us. The government has done well to boost the indigenous Tejas fighter programme and to nudge the IAF to order 83 Tejas in the advanced Mark IA configuration. Meanwhile, the indigenous development of the Advanced Medium Combat Aircraft (AMCA) is moving ahead steadily. However, to fill the gap until these indigenous fighters enter service in significant numbers, the IAF must expedite the 114-fighter global tender rather than wasting scarce defence capital funds on bits and bobs that have no place in the fleet of the future.

From *Business Standard*

Rafale is a reminder

The unusual fanfare surrounding arrival of five Rafale fighters from France is a cautionary tale at many levels. The first is the context of the border confrontation with China. So long as Beijing refuses to restore *status quo ante* along the Line of Actual Control, India must retain a degree of military readiness as a bargaining chip or as a contingency for further violence. Two, the Rafales represent the first strategically significant upgrade in India's air power in decades. While India is also fast-tracking the purchase of Russian MiGs and Sukhois, one has already been pensioned out of the arsenal and the other serves as a second stringer for the Chinese air force. Three, the importance attached to the Rafales and attempts to fast-track the subsequent batches is a reminder of the slowness of India's procurement system and the question marks over its indigenisation drive.

India had the luxury of putting defence procurement and reforms on the backburner. After all, it enjoyed military superiority against Pakistan, and had a military restraint understanding with China. The Balakot dogfights showed that, at best, India had technological parity with Pakistan. The Galwan Valley has shown Beijing no longer feels the need to be constrained by the past 45 years. The Indian political system has been more concerned about accusations of scandals regarding arms purchases than what the weapons meant for national security. It is telling that the Rafales are the first tangible result of a fighter requirement that was first unveiled in 2007. To its credit, the Narendra Modi government has implemented several defence reforms. But the gap has been its focus on weapons indigenisation, where the *Make in India* focus may not be adequate to address the quality needs of the armed forces. But with the changed security environment, the question has to be asked whether, in the case of offensive platforms, this priority makes sense.

The new paradigm means the services also need to relook at their earlier convictions. Networking allows militaries to get more accurate bang for their buck but barely exists in even the most primitive form in the Indian military. A host of new technologies means older formulae need a rethink. The advent of the armed drone, for example, means the original 42-squadron air force goal of the Indian Air Force may be obsolete. The times they are a-changing in dangerous ways and mindsets need to be a-changing as well.

From *The Hindustan Times*

Admiral (R) Arun Prakash advises on

How to play against China

The sudden and tragic loss of 20 Indian army personnel in a treacherous ambush by the People's Liberation Army (PLA) in Ladakh's Galwan Valley has caused deep public anguish and anger, mollified, only partially, by the swift retribution visited on the assailants by our gallant jawans. Equally exasperating for the public has been the cavalier inconsistency of statements emanating from government sources in New Delhi on a matter of grave national importance, especially since the contradictions have given comfort to the adversary and caused confusion at home.

Given that the Sino-Indian territorial dispute has been festering since the late 1950s, it is difficult to avoid the conclusion that the current lack of clarity amongst our decision-makers is rooted in incomprehension of the long-term strategic aims and objectives that underpin China's belligerent conduct. This is hardly a surprise, considering that we have failed to devote adequate intellectual capital, intelligence resources and political attention to acquisition of a clear insight into China and its motivations. Even when intelligence is available, analysis and dissemination have fallen short.

Consequently, it would seem that from Jawaharlal Nehru's naïve hopes, encapsulated in the "Hindi-Chini bhai-bhai" mantra, to Prime Minister Narendra Modi's prolonged courtship of Xi Jinping, India has been groping in the dark, while grossly misreading China's real intent. As we watch Beijing's sinister border strategy unfold, the absence of a matching counter on India's part becomes painfully obvious.

Indians, as devotees of chess or *shatranj*, have been thinking in terms of striking blows, fighting pitched battles and finally, checkmating the opponent. A similar Chinese board game, *wei qui*, is described, thus, by Henry Kissinger: "If chess is about decisive battle, *wei qui* is about a protracted campaign and 'strategic encirclement' where opponents seek to occupy empty spaces and then surround and capture opposing pieces. While chess encourages single-mindedness, *wei qui* generates guile and strategic flexibility."

Since 1995, China has been issuing a Defence White Paper (DWP) every two years or so. These thematic public documents articulate China's national security aims, objectives and vital interests and also address the 'ends-ways-means' issues related to its armed forces. The 11 DWPs issued so far are a model of clarity and vision, and provide many clues to current developments. It is a measure of our complacency and indifference towards national security that no Indian government since Independence has deemed it necessary to issue a Defence white paper, order a defence review or publish a national security strategy. Had we done so, it may have prepared us for the unexpected and brought order and alacrity to our crisis-response.

Historically, China is heir to an ancient system, based not on sovereign equality of states, but on the divine and boundless reach and authority of the Chinese Emperor. Even in the current discourse there are enough pointers to show that an ascendant China sees itself on track to realising its 'strong nation dream', of becoming the world's No.1 power by surpassing and then replacing the USA. A part of the 'China dream' is the establishment of a 'unified global system', or empire, termed *Tianxia* ('all under heaven' in Mandarin). Translating its enormous economic gains into coercive military power, China expects neighbouring nations to submit to its hegemony.

In order to show India its place, China had administered it a 'lesson' in 1962, and may, perhaps, be contemplating another one in 2020, with the objective of preventing the rise of a peer competitor. For China, the line of actual control or LAC, representing an unsettled border, provides strategic leverage to keep India on tenterhooks about its next move while repeatedly exposing the latter's vulnerabilities.

There is probably no other instance world-wide where two antagonistic neighbours have left such a long border, undetermined, unmarked and unresolved for so long. Our diplomats derive considerable satisfaction from the 1993 *Border Peace & Tranquility Agreement*, which, according to former foreign secretary, Shivshankar Menon, '…effectively delinked settlement of the boundary from the rest of the relationship'. But to a layman, it appears that by failing to use available leverage for 27 years, and not insisting on bilateral exchange of LAC maps, we have created a ticking time-bomb, with the trigger in China's hands. While 'disengagement' may soon take place between troops in contact, it is most unlikely that the PLA will pull back or vacate any occupied position in Ladakh or elsewhere; in which case, India needs to consider a three-pronged strategy.

At the ground-level, we need to visibly reinforce our positions, and move forward to the LAC all along, enhancing the operational-tempo of the three services as a measure of deterrence. Indian warships should show heightened presence at the Indian Ocean choke-points. Cyber emergency response teams country-wide should remain on high alert. While building-up stocks of weapons, ammunition and spares, the Ministry of Defence should seize this opportunity to urgently launch some long-term *atma-nirbharta* schemes in defence-production.

At the strategic level, the government must moot a sustained process of engagement with China at the highest politico-diplomatic echelons. The negotiations should seek multi-dimensional Sino-Indian *modus-vivendi*, encompassing the full gamut of bilateral issues like trade, territorial disputes, border-management and security. Simultaneously, at the grand-strategic level, India should initiate a dialogue for the formation of an '*Indo-Pacific Concord for Peace and Tranquility*', inviting four members of the Quad as well as Vietnam, Indonesia, the Philippines and Malaysia.

Finally, in 1962, India's Parliament had expressed "the firm resolve of the Indian people to drive out the aggressor from the sacred soil of India", a resolution interpreted as a pledge for the restoration of the Aksai Chin. As a nation, we need to be pragmatic enough to realise that neither conquest nor re-conquest of territory is possible in the 21st century. Parliament should, now, resolve to ask the government "to establish with utmost urgency, stable, viable and peaceful national boundaries, all around, so that India can proceed, unhindered, with the vital tasks of nation-building and socio-economic development".

Lt Gen (R) Kamal Davar on

Countering the Dragon

Consistent with its decades-old assertive policies for the region the *Chinese Dragon* has once again flaunted its fangs, a lot more perilously than ever before in the last many years. Gravely beset within its own boundaries, dousing the pandemic Covid-19 that it pushed onto an unsuspecting world, China could not have found a worse time to trigger this uncalled for tension with the other Asian giant, its large neighbour, India. That China is currently under pressure on many fronts, attributable to its strategic over-reach and an overly megalomaniac regional and global world-view, may have tied itself up in many knots. That China's unbridled ambitions may prove to be its undoing in the foreseeable future is now well nigh a possibility.

From 5 May 2020 onwards, Chinese forces have transgressed in Eastern Ladakh at multiple points: along the Galwan Valley, Hot Springs area and the scenic Pangong Tso. China had earlier crossed into Niku La in Northern Sikkim from where it then pulled back, with both sides utilising the existing border management protocols to resolve the matter. However, towards its own side in the Sikkim region, Chinese forces have reportedly been improving their defensive posture and reinforced troops with heavy equipment.

Media reports have displayed commercially available satellite imagery, showing China had positioned two brigades in the Galwan River Valley with over 5000 soldiers, established helicopter landing grounds, tents, moved heavy vehicles including tanks and mechanised infantry carriers upto the Line of Actual Control (LAC), plus the positioning of artillery in its territory. Chinese troops also appeared to have tried to divert waters of the Galwan river from flowing into the Shyok river across the LAC. In the Galwan Valley, Chinese troops appear to have occupied some heights which dominate India's recently built strategic, Darbuk-Shyok-Daulat Beg Oldi highway. China has also upgraded its civil and military airfield at Ngari Giinsa, just 60 kms east of the LAC and reportedly deployed J-11s at this airfield. In addition, it has reportedly activated airfields at Hotan and Kashgar whilst unconfirmed reports suggest that PLAAF aircraft may have staged through Gilgit and Skardu in POK. In the Depsang Plains, north west of the Pangong Tso, Chinese troops have reportedly also concentrated in strength which threatens the IAF's high altitude airstrip at Daulat Beg Oldi (DBO) in India's Sub Sector North (SSN), just below the Karakoram Pass.

Although the Chinese have repeatedly committed transgressions across the LAC in the Ladakh sector even the past many years, the Galwan Valley has witnessed Chinese intrusions for the first time. The Indian Army swiftly moved troops to face the ominous Chinese build-up and both sides are now facing each other in strength, virtually eyeball-to-eyeball. Deployments have continued and which way such a confrontation will shape up is anybody's guess. Meanwhile there are media reports that Pakistan is building up across the LOC to India's west in the Gilgit-Baltistan region, as expected. This collusive build up requires India to remains occupied in these north-western areas and their hope that India is unable to switch troops from opposite the LOC facing Pakistan to the LAC facing the Chinese.

With the world (and China itself) reeling under the deadly pandemic and mounting of fatalities with no end in sight, what has been engaging the minds of strategic analysts of many nations, is this timing: what is the strategic and tactical intent of China's deadly transgressions? Chinese objectives across the LAC appear to be serious enough to prompt US President Donald Trump to offer mediation between the two Asian giants. That the United States and China are themselves engaged in a serious verbal confrontation with the US directly blaming China for the pandemic, which has caused over a lakh of fatalities in the US, is another serious situation. The US (and other nations), are certainly aware of India's consistent policy of aversion towards any mediation by a third country in what India considers its internal matter, so predictably India promptly declined the US President's offer.

Earlier, the US directly criticised China for its role in spreading the lethal pandemic, not cautioning the world about this in time. China's reluctance to allow medical authorities from the WHO and other nations to visit its Wuhan laboratories where allegedly the virus had germinated and spread across the globe, has earned China the indignation and anger of the world, many nations seriously considering the review of their economic ties with China. India has already begun to seriously downgrade in its economic ties with China, cancelling many infrastructural contracts and banning scores of security-risk Apps.

It is clear to India-China watchers that despite the occasional Chinese assertiveness along the 3000+ km India-China mountainous borders, India's overall reactions have been somewhat restrained over the past many decades. In fact, PM Narendra Modi throughout his tenure has endeavoured to foster friendly relations with China – with mixed results! Even during the serious Doklam crisis (near Sikkim) in September 2017 for over 73 days, when India asserted itself strongly, not a shot was fired despite the tensions of large number of troops facing each other. However, despite India's determined response during the Doklam crisis, just some weeks after Indian troops had pulled back, the Chinese intruded into Bhutan territory (at the tri junction of Sikkim, Bhutan and Tibet), and have since built fortifications and stationed troops within inside Bhutan territory, leaving India virtually as a bystander.

Prior to the Doklam face-off, India and China had confrontations in the Depsang Plains in 2013 and Chumar in 2014 (both in Ladakh). The most serious confrontation was in 1985 when India, then under the leadership of, PM Rajiv Gandhi and Army Chief General Sundarji, initiated *Op Falcon* in October 1986 to eject the Chinese

from Sumdurong Chu, north of Tawang in Arunachal Pradesh. This operation alongwith Gen Sundarji's brainchild *Op Chequerboard*, to deploy the Indian Army in strength along the India-China borders were a success in that the Indian Army's determined moves sent a strong message to the Chinese. India's strong stand in late 1986 paved the way for a visit by Rajiv Gandhi to China, a first by an Indian PM in nearly 30 years back. Temperatures between India and China considerably cooled down thereafter and ground work laid for border management protocols between the two Asian giants.

India is now gearing up to the latest and indeed most formidable provocation by China in Ladakh and analysts must be gauging the *raison-de-etre* of the Chinese moves: are these uncalled for actions a result of annoyance with India for supporting the US and global call for a thorough investigation on origins of the pandemic? India is now assuming chairmanship of the WHO Advisory Board and is likely to accelerate global efforts on ascertaining causes of the pandemic and this may well have bothered China.

With US and China relations currently at abysmally low levels owing to many reasons, including the pandemic slugfest, their trade wars irreconcilable and mounting tensions between the two powers in the South China Sea, does China feel that India is getting too close to the US for China's comfort? Does China wish to caution India for getting active in a supposedly anti-China formation emerging in the Indo-Pacific region, including the QUAD comprising India, US, Japan and Australia ?

Another possible reason for China's intransigence towards India over the last few years has been the latter's refusal to recognise China's globally ambitious *Border and Road Initiative* (BRI), particularly the China-Pakistan Economic Corridor (CPEC). The latter runs through the disputed region of Gilgit-Baltistan which India claims and thus can never be a party to. Despite China's President Xi Jingping's pressure on Indian PM Narendra Modi to join this Chinese initiative, this venture clearly harms Indian strategic interests. In addition, with many foreign industries now planning to move out of China and relocate in other Asian countries, could China be looking at the loss of being the world's factory now to a rising India and South East Asia?

However, a tactical reason which may well have provoked China to threaten India could be the latter's improving roads infrastructure in the border region. Over the last 15 years or so, India has been striving to improve its long neglected border roads, particularly that running along the Shyok River till Daulat Beg Oldi which is India's last military frontier post just below of the Karakoram Pass. India has also completed building of a vital permanent bridge over the Shyok river, well inside Indian territory.

Above all, what puzzles most China watchers is the timing of its upping the ante against India at this juncture. China, apart from the pandemic global opprobrium, is currently facing serious problems for itself in Hong Kong and Xingjian, in the South China Sea, with Taiwan and in Tibet, and importantly, with the USA. Perhaps, as China views India as its serious competitor in Asia, is it merely trying to deflect attention from itself out of all these vexed issues to somewhere that it surmises it may meet with some success and end India's rise as a major regional power? Western media also suggests that the 'President for Life' China's strongman Xi Jingping perhaps wants to divert the attention of his politburo and the people from the myriad troubles that China is facing and believes that India could be a convenient pushover. However, whether China find it prudent to trigger a shooting war with a well prepared India on its border regions, is a question which perplexes most analysts. As the coming weeks (and months) unravel the workings of the enigmatic Chinese, one can assume that the Chinese have taken this step as a cumulative fall-out of all the problems which it currently faces.

By mid-June, both India and China had built up adequate military strength facing each other, and a small incident could conceivably spark a violent conflict. Whenever *Ladakh 2020* cools down, either peacefully or otherwise, India will surely be looking at various lessons which emerge, political, military and economic. A serious introspection which in any case must be undertaken is the likely intelligence failure by Indian agencies on allegedly not having detected China's speedy build up in Eastern Ladakh. India certainly has more than an adequate capability in all forms of intelligence but surprisingly it appears that India's security establishment has been caught napping. The Centre must also review the current manning arrangements of our border regions as conceptualised in the 'one border-one force' enunciated by the *Kargil Review Committee*. It is strongly felt that in these border regions where there is 24x7 security threat, even in peacetime or a no-war no-peace environment, the Army must be in total operational control. Para-military forces and Central Police Organisations are best suited for internal security responsibilities.

It will be highly imprudent on China's part to get into a kinetic confrontation with India: our swift and strong military preparedness, combined with a resolute political should deter the Dragon. Dissuasion and deterrence towards an adversary essentially emerge from the sinews of Comprehensive National Power. Despite the grave current economic problems bedeviling the nation, resources will have to found by the government to finance state-of-the–art weaponry and new platform acquisitions. This is certainly the time to truly give a fillip to PM Narendra Modi's much heralded 'Make in India' call which however is lagging behind in implementation. The government also needs to re-energise the not-so-efficient DRDO and India's extensive ordnance factories sector. It is a pity that despite India having a vibrant and effective private industrial sector genuine partnership between the public-private sectors, this has not resulted in meeting national goals in defence production. This grave anomaly must be understood and measures taken to ensure self-reliance for the nation.

India's current defence budget which is around 1.60 percent of the GDP is the lowest since the 1962 war debacle, and is woefully inadequate. Successive parliamentary committees on Defence, including those presided over by many BJP leaders have recommended that the defence budget be around 3 percent of our GDP.

India is certainly capable to combat the wily and ambitious Chinese who will surely get a bloody nose, and its global and regional ambitions thwarted in case it takes imprudent steps to ignite any violent conflict with India. Certainly, it is hoped that wisdom will prevail and cordial relations between the two Asian giants to be restored for the benefit of future generations. In any event, India has to face, with all determination and armed strength, China's bullying tactics. For India this is the hour of reckoning: let's rise to the occasion.

OPINION

Air Marshal Brijesh Jayal cautions that there is

No luxury of experimentation!

Some days before the Prime Minister's address to the nation wherein, amongst other issues, he flagged an ambitious and sorely needed vision of a self-reliant India, the Chief of Defence Staff had highlighted similar sentiments in so far as defence procurement for the Indian armed forces was concerned-although some of his observations may well have an impact far beyond issues of mere self-reliance and to the detriment of the fighting man-machine combination.

Earlier, in the interest of indigenisation he had suggested that the Services should accept some systems after trials even if they conformed only to seventy percent of the stipulated service requirements, believing that with further development the industry would improve the system's performance! The flexibility of accepting a shortfall in operational performance already exists and is best left to the users. The thesis of industry improving system performance after induction is debatable as many other factors like commercial issues intervene and past experience belies this optimism. The HF-24 Marut fighter-bomber aircraft that had the potential, and even participated in the 1971 Indo-Pak conflict, had to be withdrawn from service prematurely for safety reasons. As for improvements, the Marut retired without being cleared to fire its four 30 mm cannon as the IAF's attempt to clear this capability in preparation for the 1971 conflict resulted in the loss of a valuable aircraft and its test pilot and had to be abandoned.

In his interview to a daily, reflecting on the adverse impact of the current crisis on the defence budget, the CDS identified the potential threat as being on our borders and was against overseas deployments, advising the Services that "we should not go for large amount of imports by misrepresenting our Operational Requirements" adding that "the armed forces push for imports, because they come up with unrealistic staff requirements for weapon systems which the indigenous design and production system cannot deliver".

In yet another interview he was asked about progress on the pending IAF tender for 114 multi role fighter aircraft (MRFA). In response, the CDS indicated that this had been "replaced by the existing IAF order for an additional 83 LCAs" quoting the IAF Chief as saying, "I would rather take the indigenous fighter, it is good". Since this was contrary to the IAF's known position of needing both these platforms, not only was this poor reflection on the IAF's professionalism but must have caused confusion within the Service. Not surprisingly, very soon after, the Air Chief in a more balanced television interview, put the issue in its right perspective.

However, the wider impact of these issues merits reflection. If service headquarters are either unaware of the likely threat assessment, or are misrepresenting operational requirements, shorn of niceties, these are reflections on the professionalism on the part of the decision making levels of service headquarters. Indeed in an opinion piece, as a retired Lt Gen has written, "The CDS seemed to have publicly reprimanded the Armed Forces for contributing to arms import dependence".

The CDS wears the twin hats of CDS and is Secretary Department of Military Affairs (DMA). In the former *avtaar,* he is Chairman Chiefs of Staff Committee and bears responsibility for joint planning and operations along with the three service Chiefs. In the latter, he is responsible as part of the Ministry of Defence for, amongst other areas, promoting use of indigenous equipment, along with his other Secretary colleagues in Defence Production and the DRDO.

It is not easy for one person to be bridging the divide that has long existed in our civil-military relations. Nor can one be expected to talk in compartmentalised terms when discussing wide ranging issues concerning defence with the ever inquisitive media. To be fair, one hopes that it was in his capacity as CDS that he was articulating the potential threat for which our armed forces need to plan for as this would come under that charter and speaking in his capacity as Secretary DMA on other issues of service requirements and indigenisation. Unfortunately, the forces in the field are not sensitive to the administrative niceties of the rarefied atmosphere at ministries and headquarters in the Capital and the fine distinctions of differing hats that the CDS adorns. How they perceive the slighting of their headquarters and senior leaderships within, by another senior uniformed colleague in public, is a far more delicate issue and deserves to be handled with sensitivity.

Starting with the *Kargil Review Committee*, followed by other high level ones including the GOM, we have not been able to arrive at a higher defence model that will best suit our national security interests. At one level this indicates the complexity of the subject and at another the sensitive issue of civil-military relations. In our wisdom, we have now chosen a model where the CDS wears two hats, one military and the other civil. The ensuing contradictions will invariably show, as is now the case. The weakness lies in the very management model that we have adopted and irrespective of personalities, will reveal fault lines.

Regrettably, any damage done to the psyche of those in uniform defending our frontiers and to the institution of the armed forces takes a long time to heal and the luxury of experimentation is not one that we can afford in this very sensitive area. It is definitely time to pause and reflect.

First IAF Rafales in India

On 29 July 2020, the first five Dassault Rafales of the Indian Air Force touched down at Air Force Station Ambala, their arrival at 1500 hours meticulously recorded by the Defence Minister himself, having continuously tweeted their progress as they entered Indian airspace some hours earlier.

The five Rafales (two twin-seaters and three single-seaters) led by Gp Capt Harkirat Singh, CO No.17 Squadron IAF had earlier been 'flagged off' from Dassault Aviation's Mérignac facility on 27 July. Present at the airfield were India's Ambassador to France, Mr Jawed Ashraf, and the Indian Air Attache at the Embassy, Air Commodore Hilal Ahmad Rather, who had been shown the aircraft personally by

Mr. Eric Trappier, Chairman and CEO of Dassault Aviation (*in photo*). Mr Trappier expressed his admiration at the "amazing efficiency and determination of the IAF and Indian MoD, despite the unprecedented world health crisis, to master rapidly all aspects of the Rafale".

Continuing, Mr Trappier referred to the "exemplary cooperation between Dassault Aviation and the Indian Air Force, which began in 1953 and reasserts our total commitment to fulfill Indian Air Force requirements for the decades to come, and to be part of India's ambitious vision for the future".

Taking off on their near 8,500 km flight from Mérignac to Ambala, in the first stage the five IAF Rafales flew 5,800 km in 7½ hours to Al Dhafra air base in

the UAE, being mid-air refuelled over the Mediterranean by French Air Force tankers.

The second stage of the ferry flight covered 2,700 km, with another mid-air refueling this time by IAF Il-78s, and even as the IAF Rafales flew overhead, they established contact with the Indian Navy's guided missile destroyer INS *Kolkata* in the Western Arabian Sea who transmitted "May you touch the sky with glory… happy landings", to which the IAF commander reciprocated "Wish you fair winds, happy hunting, over and out".

Shortly over Western India, the five Rafales in arrowhead formation were joined by two Su-30MKIs, this impeccable formation flying over monsoon clouds towards their destination, Ambala with their progress transmitted real time and seen by millions of viewers on every Indian television channel, with expectancy mounting as the aircraft got closer to base.

There was palpable excitement on the ground at Ambala Cantonment with hundreds of citizens looking skywards for first glimpse of the new fighters, even though the local District Magistrate had earlier issued orders under Section 144 prohibiting people from gathering around or photographing the aircraft *(specifying "anti-social elements and media persons")!* However, the enthusiasm of Defence Minister Rajnath Singh and Prime Minister Narendra Modi was infectious and was reflected in their tweets. Sharing a brief video of a Rafale landing at Ambala, the Prime Minister tweeted *Swagatam* with the hash tag "RafaleinIndia".

The five Rafales peeled off to come in for landing at Ambala in one minute intervals, thereafter given a now traditional salute with water cannon as they taxied to the apron and engines were turned off. The seven IAF pilots then smartly marched towards the Air Chief and other senior IAF officers who were present at the station, their ferry flight having been completed in most professional manner and the Rafales now part of the Indian Air Force's combat inventory.

The 31 remaining Rafales will be ferried from France to India in batches over the next years, No.17 Squadron at Ambala receiving their full complement before the second squadron is stood up at Hashimara in Northern Bengal.

Gp Capt Harkirat Singh, CO No.17 Squadron ('Golden Arrows') seen flanked by Air Chief Marshal RKS Bhadauria, CAS and Air Marshal Balakrishnan Suresh, AOC-in-C WAC, with the first Rafale at Ambala

Ferry of First French Fighters

The first French-origin fighter for the Indian Air Force was the Dassault Ouragan, 71 of which were ordered in 1952, the first batch of four aircraft being ferried from France to India in mid-October 1953. Led by the redoubtable Arvind Moolgavkar (later Air Chief), the four Ouragans took off from Mont de Marson, with stops at Istres, Tunis, Idris, El Adam, Almaza, Mafraq, Baghdad, Bahrain, Sharjah, Karachi and then to Palam. Logistic support was provided by an IAF Dakota and the four aircraft ferry went of extremely well, without a hitch and arriving on schedule.

Met on arrival by the then Defence Minister Mahavir Tyagi, the Ouragan was immediately given an Indian name (*Toofani*) which it was always referred to as thereafter. The aircraft were flown on to Ambala on 30 October 1953, the same air base where 67 years later, the Dassault Rafales have now arrived.

IAF airlifts troops and equipment to Ladakh

The LAC stand-off between India and China in Eastern Ladakh during the summer months of 2020 has seen massive operational activity by IAF aircraft, with Boeing C-17 Globemaster III, Lockheed C-130J Super Hercules, Ilyushin Il-76 and Antonov An-32 transport aircraft continuously flying in troops, supplies and heavy vehicles to Leh and other airfields in the area. The Indian Army build up has considerably reinforced XIV Corps (*see article in this Issue*) also including the induction of T-90 main battle tanks in the Daulat Beg Oldi area plus heavy artillery which has bolstered the defences in that sector.

IAF deploys Chinooks and Apaches

Apart from Su-30MKIs and MiG-29s seen above Leh continuing combat air patrols through the summer, the recently supplied Boeing CH-47F(I) Chinook heavy lift helicopters and Apache AH-64E combat helicopters of the IAF have also been very evident. According to former CAS Air Chief Marshal Fali H Major, "this is sending out a message to the adversary that we have exploited the full capabilities of platforms that can be assigned to undertake all weather, all-terrain and day/night missions in the Ladakh theatre. The message is that we have the capability and it can be used as and when required".

In an announcement in early July, Boeing stated that it had completed delivery of all 22 Apaches and 15 Chinooks to the Indian Air Force and "is fully committed to meet their operational needs of the Indian armed forces". Rear Admiral Surendra Ahuja (retd), MD Boeing Defence India said that the Company "is working closely with India's defence forces to deliver the right value and capabilities to meet their operational needs".

Indian Navy on the Northern Front

(photo: Angad Singh)

Indian Naval MiG-29Ks have reportedly been moved from their home base INS *Hansa* in Goa to Air Force bases in the Punjab. According to reports, these Naval multirole fighters will augment IAF fighter squadrons presently on alert in northern India, even while Boeing P-8 (I) aircraft are being employed for surveillance and 'painting' hostile radar emissions in the sector. IN P-8Is are essentially engaged in their traditional maritime surveillance role in the Indian Ocean and Bay of Bengal area (*see separate news item*).

Air Defence Systems augmented in Ladakh

As part of the India's military readiness plan to counter possible Chinese air actions in Eastern Ladakh, the Indian Air Force has reportedly deployed considerable numbers of quick reaction surface-to-air missiles in the theatre, which include

the indigenous *Akash,* the Israeli SpyDer and Russian-origin Pechora and OSA-AK. Unconfirmed reports also have it that 'advanced' Israeli-origin SAMs have also been moved to Ladakh alongside radar systems. According to Government sources "as part of the ongoing build-up in the sector, the air defence systems of both Indian Army and the Indian Air Force have been deployed in the sector to prevent any misadventure by Chinese Air Force fighters or PLA helicopters which have been identified in the area".

"IAF ready for any eventuality"

Inaugurating the Air Force Commanders' Conference at Vayu Bhawan on 22 July 2020, Defence Minister Shri Rajnath Singh said that the Indian Air Force should "stand ready to handle any eventuality". The Minister praised the rapid deployment of IAF assets at forward locations in response to the prevailing situation in eastern Ladakh, saying "it has sent a strong message to the adversaries (*read China*)". On the IAF bolstering its operational capabilities over the past few months, the Defence Minister said the nation's resolve to defending its sovereignty "stood firm on the faith its people had in the capability of its armed forces".

Chief of the Air Staff Air Chief Marshal RKS Bhadauria said that IAF was well prepared to counter short-term as well as strategic threats. "(We are) evenly poised to counter any aggressive action by the adversary". He emphasised the need to focus on the ability to handle situations at a short notice for ensuring a robust response. All commands were praised in ensuring deployment of force and the IAF Chief termed it as "prompt and laudable".

IAF's 'Vision 2030'

Following the 3-day Air Force Commander's Conference in New Delhi held on 22-24 July, the IAF's *Vision 2030* was articulated upon. As per an Air Force statement, "a series of discussions and reviews on operational preparedness and strategies for countering security threats envisaged across the entire spectrum were taken up" and the IAF leadership "discussed the current situation and thereafter carried out a thorough review of the IAF's transformation roadmap for the next decade". In his concluding remarks, the CAS Air Chief Marshal RKS Bhadauria stated that "it was important to recognise the nature of emerging threats in a rapidly changing world" and emphasised on the "need for rapid capacity building, increase in serviceability of all assets and dedicated work towards effective integration of new technologies in the shortest timeframes". The IAF Chief reiterated that the "long term goals for sustainable capability mandate the acquisition and employment of niche technologies and development of indigenous platforms and weapons". He also stated that "since human resource was the most valuable asset of the IAF, recruitment, training and motivation strategies should keep pace with the changing times".

More MiG-29s and Su-30s for IAF

(Photo of MiG-29UPG by Phil Camp)

The Indian Air Force is to receive 33 additional fighter aircraft from Russia, with the Government planning to procure 12 additional Su-30MKIs, reportedly in CKD condition for final assembly by HAL at Nasik as also 21 MiG-29s which have been in storage at a Russian base for some time. The Su-30MKIs to be finally procured from HAL would be at a cost of Rs 10,730 crores (US $ 1.45 billion) and the MiG-29s would be for Rs 7418 crores (US $ 1.15 billion), after upgradation.

The official MoD statement of 2 July 2020, also continues in that the procurement of MiG-29s would be alongside upgradation of the existing 59 MiG-29s in service which have been subject of an earlier upgradation programme which began in 2008. The IAF's fleet of MiG-29s had received a new avionics package, the multi-functional radar *Zhuk-E*, a new weapon control system and a range of new air-to-air and air-to-surface missiles.

Combined Graduation Parade at AFA

The Combined Graduation Parade on 20 June 2020 at Air Force Academy Dundigal was reviewed by Air Chief Marshal RKS Bhadauria who formally conferred the 'President's Commission' on 123 Flight Cadets as well as awarding 'Wings' to 11 officers from the Indian Navy and Indian Coast Guard. Amongst the newly commissioned officers, 61 officers joined the flying branch, 62 being

inducted into Ground Duty Branches of the IAF and included 19 women officers. Two Flight Cadets from the Vietnam Air Force also completed their flying training at AFA and were presented 'Wings' (*photograph above of IAF Hawks flying over the saluting base, dominated by the inspiring statue of Fg Offr Nirmal Jit Singh Sekhon PVC*).

Three cadets from the Sainik School Kapurthala distinguished themselves with Jasnoor Singh getting the Chief of Air Staff Trophy and declared 'Best in Flying', Jagdeep Singh was 'Best in Aerobatics' the third being Rishab Chandel, whose father Sergeant Ravi Chandel had served the IAF for 20 years.

US 'offers' jet fighter training to India, Japan, Australia

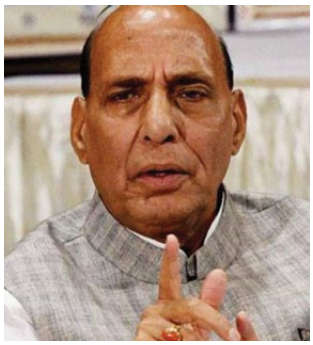
In an unusual move and for the first time after nearly half a century, the United States has offered jet fighter training to India, along with Japan and Australia, even as it plans "multiple initiatives to counter China's aggressive moves in the Asia-Pacific region". The National Defence Authorisation Act (NDAA) for the 2021 FY starting October includes this proposal, identifying the US Pacific territory of Guam for such purpose (*in photo are various USAF types displayed at Guam*).

In late 2019, US Defence Secretary Mark Esper and Singapore Defence Minister Ng Eng Hen had signed a MoU for Singapore to establish a fighter training base at Guam. Interestingly, the NDAA also seeks acceleration in efforts to establish F-35A operating bases in the Indo-Pacific region. Singapore, Japan and Australia have recently ordered the F-35 fifth generation fighter.

'Air India One'

The Government of India had contracted early in 2019 procurement of two aircraft dedicated for VVIP flights, essentially for international travel of the Indian Prime Minister and President. These aircraft which are ex-Air India Boeing 777s, will be integrated with Infrared Countermeasures Self-Protection Suites (SPS), even as they are converted with executive interiors. The SPS consists of a Northrop Grumman Directional Infrared Countermeasure system, a Harris-made Advanced Integrated Defensive Electronic Warfare Suite, and BAE's Airborne Countermeasures Dispenser System, among other systems.

India-Israel discussions on Ladakh situation



According to reports, Indian Defence Minister Shri Rajnath Singh has been in touch with his Israeli counterpart Lt Gen Bejamin Ganiz, particularly on the current situation along India's border with the Chinese in Eastern Ladakh. Focus was also on speedy implementation of ongoing Defence Procurement programmes as well as further expansions of overall defence and security ties between the two countries. Matters also related to procurement of various weaponry and munitions by India from Israel on a "fast track mode".

Urgent need for more RPAs

The Indian Armed Force's requirement for medium altitude long endurance (MALE) remotely piloted aircraft (RPA) has been accentuated with the live situation along the 3000km plus border with China. While Israeli-origin Herons are reportedly operated by the Army in Eastern Ladakh, the need for long range drones both for real time reconnaissance as well as attack has been stressed by the Air Force, as per reports from New Delhi. The Navy has a long pending requirement for Sea Guardian RPAs (variant of the Predator-B made by General Atomics) with acquisition of this system remaining in process.

MoD extends contract periods

The MoD has extended the delivery period of all existing capital acquisition contracts by four months because of supply chain disruptions arising out of the Covid-9 pandemic. According to the order "Force majeure shall be applicable for a period of four months, that is 25 March (when the national lockdown first came into force) to 24 July. Duration of this force majeure will be excluded while calculating the delay in delivery of contracted equipment / service and imposition of liquidated damages charges".

Mi-17s fight locust swarms

IAF Mi-17s equipped with quickly rigged spraying equipment have been employed against locust swarms which 'invaded' areas of Rajasthan in the first weeks of July 2020. Using in-house technology to spray atomised pesticides from the air, the Mi-17s were effective in many swathes of land near Jodhpur, Jaisalmer, Barmer, Bikaner, Nagaur and Dausa in Rajasthan plus Jhansi in Uttar Pradesh.

IAF Airborne Rescue Pod

The Indian Air Force has developed and manufactured an Airborne Rescue Pod for Isolated Transportation (ARPIT), for evacuation of critical patients from high altitude areas, isolated and remote places. The prototype was developed at No.3 BRD Chandigarh and has since undergone various modifications, for use as a lightweight isolation system made from aviation-certified material.

India and Australia in strategic bilateral cooperation

In early June 2020 the Governments of India and Australia announced two bilateral strategic declarations for cooperation in the Indo-Pacific region and signed seven agreements, including a key defence Mutual Logistics Support Agreement (MLSA) that will enable either country's defence platforms, including ships and aircraft using each others bases for repair and replenishment of supplies, including fuel and spare parts. The Government of India has already signed similar agreements with the United States, France and Singapore and this signed with Australia is to "increase military inter-operability through defence exercises… which will deepen and broaden defence cooperation", particularly Navy-to-Navy cooperation".

Indian contingent at Moscow anniversary parade

Flown from Delhi to Moscow in an IAF C-17, a tri-service contingent of the Indian Armed Forces comprising 75 all ranks participated in the grand military parade at Red Square, Moscow on 24 June 2020, commemorating the 75th Anniversary of "Victory of the Soviet People in the great Patriotic War of 1941-1945". The marching contingent was led by troops of the Sikh Light Infantry Regiment alongside airmen and sailors of the Indian Air Force and Indian Navy respectively.

Indian Defence Minister Shri Rajnath Singh was amongst the special invitees to the functions and later reviewed India-Russia defence cooperation with Mr Yury Borisov, Deputy Prime Minister of Russia. The Indian Defence Minister was accompanied by Dr Ajay Kumar, Defence Secretary who had discussions with his counterpart, Deputy Defence Minister, Col General Alexander Fomin.

Delivery of S-400 Systems

The Government of India has urged Russia to expedite delivery of the S-400 *Triumf* new generation advanced air defence system for which payments have been made in accordance with the contract signed in October 2016. Defence Minister Mr Rajnath Singh had reportedly brought this matter up during his three day visit to Russia in late June 2020. A number of other countries including

China and Turkey have ordered the S-400 system but India's urgent requirement follows its face off with China in Ladakh since May 2020. According to subsequent reports, the Russian Government "has assured India that it will maintain its military commitments in any event".

156 BMP 2/2ks for Army

The Ministry of Defence has placed an indent for supply of 156 BMP 2/2k Infantry Combat Vehicles (ICV) with upgraded features for the Indian Army. The ICVs will be manufactured by the Ordnance Factory Medak in Telangana, at an approximate value of Rs 1,094 crore. The BMP-2/2k ICVs are powered by 285 hp engines with a maximum speed of 65 kmph in cross country terrain. They will also have amphibious capabilities and designed to overcome slope of upto 35° cross obstacles of 0.7 metre. Induction of these 156 BMP 2/2K ICVs is planned to be completed by 2023. (*In the photo is a BMP-2 of the Indian Army in Ladakh*).

'Emergency order' for 72,000 SIG Sauer rifles

The Army has reportedly invoked emergency financial powers to procure an additional 72,000 SIG Sauer rifles, after clearance by the DAC. This is an addition to the 72,400 rifles of the same type which were ordered in a fast-track procurement (FTP) contract signed in February 2019. In March 2020, the Government of India

had also contracted to acquire 16,479 Israeli-origin Nagev 7.62mm light machine guns (LMG) for the Army. Earlier, the Indian Government had cleared production of 671,000 Russian-origin AK-203 Kalashnikov rifles at the Korwa Ordnance Factory in UP which has reportedly been delayed owing to recalculation of prices.

Indigenous small arms for CAPFs

The Home Ministry have been conducting discussions with 17 private Indian companies including Larsen & Toubro and Godrej for domestic manufacturing of small arms for the central armed police forces (CAPFs), so as to "promote self-reliance". According to an MHA spokesman, the private companies shortlisted by the MHA include L&T, Godrej, Vem Technologies, Kalyani Strategic, Shyam Arms Premier Explosives and HYT. During the discussions, representatives from the ITBP, BSF, CRPF, SSB, CISF NSG and Assam Rifles were in attendance.

Domestic air travel challenges

Minister of Civil Aviation Hardeep Singh Puri expects that the domestic market for air travel should normalise by end of the year, and stated that "unless 50-55 per cent of domestic flights restart, there's no business case for resuming international air services". Domestic flights had resumed on 25 May but airlines are currently permitted to only operate one-third of their total capacity.

According to the Minister "I will not say there is no demand. Even with restrictions imposed by different states, we have been able to operate around 25 per cent of what it was before the pandemic. Our scale of operations post-opening up is at par with other countries. So if quarantine measures in states are related, it (the operations) will increase very soon".

Vande Bharat flights

Under the *Vande Bharat* mission, Air India and some Indian private airlines have been operating repatriation flights to fly back Indian nationals who had been "stranded" in various countries as also Indians wishing to fly back to foreign countries for work or study. The DGCA had informed that scheduled international flights would be suspended till 31 July 2020 but, on a case by case basis, some international airlines would be permitted to restart services, with United Airlines identified as wanting to start daily flights between San Francisco/New York and Delhi.

TATAs to increase equity in Air Asia India

Although the TATA Group presently own 51% of Air Asia India, there are reports that they are in negotiations to buy out Air Asia Berhad's stake in this joint venture airline. This airline's cash flow, like that of most others has been majorly affected during the pandemic, causing severe financial problems.

SpiceJet converts Q400 into freighters

SpiceJet airline has converted three of its Bombardier Q400 passenger aircraft into freighters, and now has a dedicated fleet of eight such freighter aircraft. The three converted Q400 cargo aircraft will primarily be used for operations to smaller towns and cities of India.

AAI, BEL sign MoU

The Airports Authority of India (AAI) has entered into an MoU with Bharat Electronics Limited (BEL), "providing a platform for both the companies to collaborate and support each other to address the emerging global opportunities in the airport business, including those in the Asia Pacific region". AAI, as development partner, will render assistance to BEL in its domain of expertise to enable execution of the projects outside India by BEL. "Both the organisations will work in close co-operation with each other in the field of civil aviation, in both present and future projects handled by BEL".

Domestic flights to Ambala

Although the Air Force Station at Ambala is one of the oldest in the country, and home now to the IAF's latest combat aircraft, civil flights to this city have never taken place as this is only a three hour car journey from New Delhi. However, under the *Udaan* 3.0 scheme, a domestic airport in Ambala Cantonment has been mooted and similar to other defence airfields, could have a civil enclave. Some 4 acres in the Cantonment could be acquired close to the Air Force Station, which would possibly be the erstwhile Military Farms area.

Force accretion in the Andamans

According to informed sources in New Delhi, the long pending plans for "force accretion" and "military infrastructure development" at the A&N Islands have "gained a sense of urgency", after face off with the Chinese began in May 2020. The Andaman & Nicobar Command (ANC) which was established in 2001 is India's only 'Theatre Command' with all land, sea and air forces under the C-in-C, headquartered at Port Blair (*see appointments*).

The Indian Army reportedly has a Brigade Group with units at various locations in the Island archipelago which dominates the

Bay of Bengal, Malacca Strait and sea routes to South East Asia. The Navy has permanent warships based there, including LSTs to deploy AFVs as also three Naval Air Stations, INS *Utkrosh* at Port Blair, INS *Kohassa* at Shibpur in north Andaman close to Myanmar as also INS *Baaz* at Campbell Bay in southern Nicobar close to Sumatra. Both the Navy and Coast Guard have Dornier 228 MR aircraft based there while the Air Force base at Car Nicobar houses Mi-17 helicopters, with combat aircraft detached here from time to time.

Indian and US Navy's 'Passage Exercise' off Nicobar Islands

Sending an obvious message at the time of China's intransigence in Ladakh, the Indian and US Navy's carried out a "cooperative exercise" west of the Andaman & Nicobar Islands in the southern Bay of Bengal, classified as 'PASSEX' in Naval Parlance. While a number of warships participated in the exercise, IAF Maritime Jaguars, operating out of the air base at Car Nicobar, carried out simulated strikes with their Harpoon anti-ship missiles.

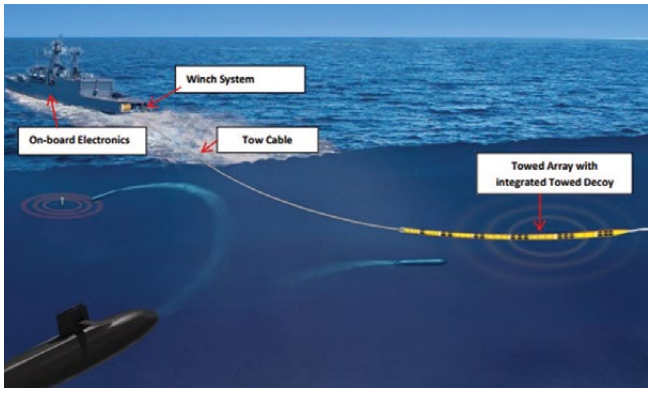
According to a US Navy statement, "the Nimitz Carrier Strike Group, commanded by Rear Admiral Jim Kirk, consisting of flagship USS *Nimitz* (CVN 68), *Ticonderoga*-class guided missile

cruiser USS *Princeton* (CG 59) and USS *Arleigh Burke*-class guided missile destroyers USS *Sterett* (DDG 104) and USS *Ralph Johnson* (DDG 114), participated in cooperative exercises with the Indian Navy in the Indian Ocean". The Indian Navy warships from the Eastern Naval Command under command of Rear Admiral Vatsayan, included guided missile destroyer INS *Rana*, stealth frigates INS *Sahyadri* and INS *Shivalik* and the missile corvette INS *Kamorta*.

India and Japan Naval Exercises

Emphasising their increasing bilateral military ties, Japan and India have been conducting annual military exercises since 2018 and at this time of India's face off with the Chinese in Eastern Ladakh, the recent Naval exercises in June are of particular significance. Indian and Japanese warships have recently carried out a PASSEX (passing exercise) near the Malacca Strait with the guided missile destroyer INS *Rana* and *Kora*-class missile corvette INS *Kulish* taking part alongside JS *Shimayuki* and JS *Kashima* from the Japanese Maritime Self Defence Force.

Indigenous Torpedo Decoy Systems



The Indian Navy has ordered Advanced Torpedo Decoy System *Maareech*, for deployment on frontline warships. Developed by DRDO labs (NSTL and NPOL) and Bharat Electronics Limited, prototype of this system was installed onboard a nominated naval platform and had successfully completed all user evaluation trials.

Rs 38,900 crore capital acquisitions approved

On 2 July 2020 the Defence Acquisition Council (DAC) in its meeting under the chairmanship of Defence Minister Shri Rajnath Singh accorded approval for capital acquisition of various platforms and equipment required by the Indian Armed Forces, totaling Rs 38,900 crore. These include Long Range Land Attack Cruise Missile Systems and Astra air-to-air missiles for the Indian Navy and Indian Air Force, the Pinaka missile system (*in photo*) BMP armament upgrade and software defined radios for the Indian Army.

BEML to supply Mine Ploughs

Bharat Earth Movers Limited (BEML) will supply 1,512 Mine Plough for T-90 MBTs at an approximate cost of Rs 557 crore. With induction of these mine ploughs, to be completed by 2027, "combat capability of the Army will be further enhanced" according to the spokesperson.

"Pandemic affects space missions"

ISRO Chairman Dr Kailasavadivo Sivan has admitted that all missions planned, including test flights for sending humans into space as earlier planned would be delayed owing to the Covid-19 pandemic. Although the re-scheduled timeline has not been worked out, "in our work strategy, many of the design and development activities happen in the private sector. Because of this "pandemic, these industries have not been able to operate at their optimum level. As a result, they are not in a position to supply the required subsystems for the missions by ISRO. So this will affect all our targeted missions over the next few months".

APPOINTMENTS

Air Marshal Vivek Chaudhari is AOC-in-C WAC

Air Marshal Vivek R Chaudhari took over as AOC-in-C Western Air Command on 1 August 2020. He was commissioned into the fighter stream of the IAF on 29 December 1982 and in his distinguished career spanning nearly 38 years, the Air Officer has flown a wide variety of fighters and trainer aircraft accumulating 3800 flight hours, including operational flying on MiG-21s, MiG-23MFs, MiG-29s and Su-30MKIs and was CO No.28 Squadron (*First Supersonics*).

He has held numerous important appointments as also commanded a frontline fighter base. As an Air Vice Marshal, he was ACAS Operations (AD) ACAS (PO) and as an Air Marshal, was Deputy Chief of the Air Staff. Prior to his present appointment, he was SASO, Eastern Air Command at Shillong.

Other IAF appointments

Air Marshal DK Patnaik is Senior Air Staff Officer (SASO) Central Air Command

Air Marshal J Chalapati is SASO Southern Air Command

Air Marshal JS Bedi is SASO Eastern Air Command

AK Srivastava is Director (Defence Business) BEML

AK Srivastava has assumed charge as Director (Defence Business) and nominated as Member of the Board, BEML Limited. Prior to this he was Chief General Manager, BEML Defence (Marketing). He is a graduate from IIT Kharagpur and joined BEML as an engineer trainee in 1987. In his professional career spanning over three decades in BEML, he has worked in various critical functional areas in the company, at different geographical locations.

Vice Admiral Biswajit Dasgupta is Chief of Staff, ENC

Vice Admiral Biswajit Dasgupta has assumed charge as Chief of Staff, Eastern Naval Command (ENC), Visakhapatnam. He was commissioned into the Indian Navy in 1985 and is a specialist in Navigation and Direction, has commanded four frontline ships including the missile corvettes INS *Nishank*, INS *Karmuk*, stealth frigate INS *Tabar* and the aircraft carrier INS *Viraat*.

Lt Gen Manoj Pande is CINCAN

Lieutenant General Manoj Pande has taken over as 15th C-in-C of the Andaman & Nicobar Command (CINCAN) at INAS *Utkrosh*. The ceremonial parade comprising personnel of the Army, Navy, Air Force and the Coast Guard was commanded by Commander Siddharth Raut. He later called on Andaman & Nicobar Islands Lieutenant Governor Admiral D K Joshi (Retd), and "discussed matters related to national importance, the security situation and preparation for fighting the COVID-19 pandemic".

Vice Admiral MA Hampiholi is Commandant INA

Vice Admiral MA Hampiholi took over as Commandant of the Indian Naval Academy at Ezhimala on 27 July 2020. Earlier, the Flag Officer was Director General Naval Operations and Principal Director Staff Requirements at Naval headquarters, before which he was Flag Officer Commanding the Western Fleet. The Flag Officer is a specialist in Anti-Submarine Warfare and has commanded Indian Naval Ships *Nashak, Magar* and *Talwar* while his shore commands include Commandant of National Coast Guard, Mauritius and Commanding Officer, INS *Mandovi* at Goa.

Mr Dinesh Kumar Batra is Director (Finance), BEL

Mr Dinesh Kumar Batra has assumed charge as Director (Finance) of Bharat Electronics Limited (BEL). He joined BEL at its Ghaziabad Unit in 1984 and in a career spanning over three and half decades, served the Company in various capacities at Ghaziabad, Delhi, Pune and Bengaluru. Prior to his elevation, he headed Internal Audit at BEL's Corporate Office, Regional Office-Delhi and Pune Unit as General Manager. Mr Dinesh Batra led the company's move into the Electro-Explosive segment including that to make India 'Aatmanirbhar' in Electronic Artillery Fuzes and other ammunition and had land allotted at Nagpur to set up an Explosive Integration Complex.

Kiran Dambala COO Tata-Lockheed Martin

Tata Lockheed Martin Aerostructures Limited (TLMAL) has appointed Kiran Dambala as chief operating officer (COO). Established in 2010, TLMAL is the single global source of C-130J Super Hercules empennage assemblies and employs 500 people. In 2018, the Company announced production of fighter wings at its Hyderabad facility.

Rémi Maillard appointed President Airbus India, Head South Asia

Airbus has appointed Rémi Maillard as President of Airbus India and Managing Director of South Asia region. He will succeed Anand Stanley who will move to Singapore as President, Airbus Asia-Pacific, both reporting to Christian Scherer, Chief Commercial Officer and Head of International of Airbus. "In his new role, Rémi be responsible for commercial aircraft sales and business development, and will manage Airbus› regional footprint, which includes engineering, innovation, customer support and services as well as training". Rémi will also oversee Airbus› defence and helicopters campaigns and boost the company›s ‹Make in India› programmes.

Defence Minister visits Ladakh

Defence Minister Rajnath Singh visited Leh on 17 July reviewing security situation in the Himalayan region, along with CDS General Bipin Rawat and COAS General Manoj Mukund Naravane. The defence minister visited Stakna forward areas, witnessed paradropping by special forces and was later briefed on the Army's deployment which includes T-90 MBTs and BMP-2 ICVs which have bolstered defences against China.

The Minister also visited Army units in the Pangong Tso area and later flew to the Kashmir Valley, visiting troops in the Kupwara area close to the LOC with Pakistan.

All Boeing Apaches and Chinooks delivered to the IAF

Boeing has completed delivery of all new AH-64E Apache and CH-47F(I) Chinook military helicopters to the Indian Air Force (IAF). The final five of the 22 Apache attack helicopters were recently handed over to the IAF at Air Force Station, Hindan. Earlier in March, Boeing handed over the last five of 15 CH-47F(I) Chinook heavy-lift helicopters to the IAF.

"Customer centricity, commitment to the modernisation and mission-readiness of India's defence forces are key values to our partnership with India," stated Surendra Ahuja, Managing Director, Boeing Defence India. "With this delivery of military helicopters, we continue to nurture this partnership and are fully committed to working closely with India's defence forces to deliver the right value and capabilities to meet their operational needs," Ahuja added.

India is one of 17 nations to operate the Apache and has the most advanced variant, the AH-64E Apache that is also flown by the US and many other countries. The AH-64E Apache is designed and equipped with an open systems architecture including the latest communications, navigation, sensor and weapon systems. It has an improved Modernised Target Acquisition Designation System that provides day, night and all-weather target information, as well as night vision navigation capability. In addition to classifying air and ground targets, the Fire Control Radar has been updated to operate in the maritime environment. It is uniquely suited to meet a commander›s needs, including reconnaissance, security, peacekeeping operations, and lethal attack, across myriad environments - without reconfiguration.

Twenty defence forces around the world either have Chinooks in service, or are on contract to receive them. The iconic tandem-rotor helicopter has been the "world's most reliable" and efficient heavy-lift helicopter for more than 50 years, allowing customers to operate in climatic (hot), altitude (high), and crosswind conditions that typically keep other helicopters grounded. The CH-47F(I) Chinook contains a modern machined airframe, a common avionics architecture system (CAAS) cockpit, and a digital automatic flight control system (DAFCS). Those innovations and technologies will help the Indian Air Force meet evolving mission demands, maximise interoperability, and reduce lifecycle costs.

The Indian Ministry of Defence finalised its order with Boeing for the production, training and support of 22 AH-64E Apache and 15 CH-47F(I) Chinook helicopters in September 2015. Later, India and the US signed a contract for the acquisition of six Apaches for the Indian Army during US President Donald Trump's visit to New Delhi.

Boeing's joint venture in Hyderabad, Tata Boeing Aerospace Limited (TBAL) has been producing aero-structures for the AH-64 Apache helicopter for both US Army and international customers. TBAL marks a major step towards the co-development of integrated systems in aerospace and defence in India. Boeing's suppliers in India are manufacturing critical systems and components for the Chinooks, including the crown and tailcone assembly by Tata Advanced Systems and the ramp and aft pylon by Dynamatic Technologies. Boeing today works with over 200 suppliers and partners in the country in support of 'Make in India' and 'Skill India.'

"Boeing Defence India provides holistic lifecycle solutions for government and defence customers in the country. Boeing delivers services that ensure high availability and mission-readiness of platforms to its defence customers at competitive costs through its investments in services infrastructure and building local capabilities and partnerships. With the induction of the Apaches and Chinooks, Boeing anticipates additional opportunities in rotorcraft training and sustainment", added Surendra Ahuja.

Boeing affirms its commitment to India

Defence Partnership

Boeing has highlighted advanced defence capabilities for the armed forces, partnerships to develop India's aerospace ecosystem and reiterated its commitment to invest in India to maximise the company's footprint. "An important part of our India strategy is ensuring our defence customers have the most advanced platforms and capabilities, supported by a services model that optimises mission readiness, high performance and safety," stated Salil Gupte, President Boeing India. "Another element of our strategy is to harness talent, innovation, engineering and productivity advantages that India offers to build a globally competitive aerospace and defence ecosystem that creates jobs and industrial capacity with Make in India."

Boeing is highlighting future investments to accelerate its 'Make in India' efforts and the capabilities being proposed for the Indian Armed Forces, specifically the next generation F/A-18 Block III Super Hornet fighter that brings "transformative capability and contemporary warfighter technologies to India. The F/A-18, on offer to the Indian Navy, is fully compatible with Indian Navy carriers and will boost the growing maritime and defence relationship between the United States and Indian Navy."

The commercial front

Boeing recently demonstrated its commitment to India and its developing aerospace and defence ecosystem by showcasing innovative commercial platforms, and services, including the 787 Dreamliner and 777X, at *Wings India 2020*. The partnership between India and Boeing has grown from strength to strength over the last 75+ years, with 3,500 people in India, and more than 7,000

people working with its over 200 supply chain partners. Boeing India employees serve communities and citizenship programmes to inspire change and have made an impact on more than 200,000 lives.

Boeing forecasts India will be the third largest global market for commercial fleet as the aviation market is resilient and the market will grow throughout 2020. Boeing forecasts that air carriers in India will need about 2,500 new commercial aircraft by 2040 with Boeing supplying "the most efficient, advanced aircraft and services to airlines in India to support the exponentially growing Indian commercial aviation sector." Boeing airliner operators in India include Air India, SpiceJet, Vistara: cargo operator Blue Dart. The company recently delivered the first Dreamliner 787-9 out of an order of six to Vistara: the longest 10 non-stop routes from India are flown in Boeing aircraft!

Upgrading the Ubiquitous IFG

Arming the Mountain Strike Corps


(Source : Internet)

'Ultima Ratio Regum' used to be inscribed on French cannons on the order of King Louis XIV, which literally translates as "The final Arguments of Kings". Rightly said, for artillery was, remains and will continue to remain, one of the most vital decider on the battlefield.

Since the Bofors imbroglio of the 1980s, no artillery guns were ordered for the Indian Army for over three decades, during which time the artillery arm faced major reductions with our SPG capabilities virtually demolished while towed artillery suffered. But for indigenous production of some pieces, our field artillery capabilities were degraded.

Light amongst the darkness however, and a backbone of our field artillery, has been the 105 mm IFG/LFG or Indian Light Field Gun. Used in quantity by the army during recent conflicts like Kargil, this gun maintains its dominance even today, having been introduced in the 1980s and can well contend being one of the most effective extant in terms of range vs weight of its class. The LFG Mk.2 has a reported range of 17.2 km which surpasses even its Russian equivalent D-30 122-mm field gun (15.4 km unassisted). Kargil was the debut for our Bofors but behind the shadows was the IFG, providing suppressive fire support to the advancing infantry and remained the most proliferant in this mountain war.

The IFG/LFG brings some major advantages to the Army in the northern and northeastern borders, albeit with lesser firepower than that of a 155 mm against well protected structures like steel reinforced bunkers. Mountainous terrain allows for only light artillery to be transported and the only other gun which can be airlifted by helicopters is the M777 ULH and possibly that designed by the Kalyani Group. The IFG/LFG can be positioned more quickly than the ULH, and because of the latter's limited numbers, the IFG/LFG must be deployed to cover most of the Indo-Chinese borders and those with Pakistan.

The IFG/LFG is of rugged design and coupled with its light weight (lighter than M777) is much more versatile in deployment through various means. The gun can be disassembled and transported on mules or underslung by helicopters (including the Cheetah) or air dropped along with para-gunners.

The most important factor is that the IFG/LFG is already in service with the Indian Army's Regiment of Artillery in quantity, is very affordable with virtually almost no logistical issues remaining.

Three decades have passed since this gun was first inducted and its replacement, if found, would take around another decade. Over the past 3 decades, the IFG has obviously aged and could use some upgrades. In this article, we'll look at some of these prospects, which would make a future gun complement the IFG rather than replace it.

(Mi-17 of IAF transporting an IFG/LFG at Tuting ALG. Pix: MoD)

One of the most vital factors in a modern artillery gun is its FCS or Fire Control System. To take the IFG into the next decades of the 21st century, a digital FCS is imperative, making it effective even in bad weather conditions as this can compensate for variables such as air density and wind speed and even forewarn wearing off the barrel and distortions owing to heat. BEL has designed an indigenous FCS for the FH-77B (Bofors) guns, which proved their worth during Kargil in 1999, accurately impacting on targets over great ranges but none such system exists for the IFG/LFG. Incorporating this system on the IFG should be priority, and since there are programmes to modernise other guns such as the L40/70, why not also the IFG/LFG?

An important advantage of the 105 mm IFG/LFG is its relatively long range, 17.4 km (E1) 17.2 km (E2), compared to contemporary guns like the British L118 105 mm (which gun shares a development history with ours) also having a max range of 17.2 km, the American derivative M119 having 11.5 km range for a standard M760 HE round and upto 19.5 km with a charge 8 (with RAP), the Russian D30 2A18 122 mm 15.4 km with a HE round and 21 km with a RAP. A common practice used by artillery units to increase range of the guns without any major changes to the gun itself, is to use ammunition like *Extended Range 105mm Base Bleed Projectile* or a 105 mm *Rocket Assisted Projectile* (RAP).

Base Bleed rounds can have significant impact on increasing of range (upto 30%), increasing the IFG/LFG's maximum range of 17km to 22–27 km. One cannot emphasise this enough! A RAP round is also very effective for increasing range: the D30 2A18 can shoot upto a 21.9 km using a RAP, compared with the original 15.4km while the M119 uses a M913 HERA (High Explosive Rocket Assisted) to significantly increase its range from 14.5 to 19.5 km.

HERA rounds are not only common in the 105mm field gun category, almost all NATO armies field HERA rounds to increase their 155mm howitzer range to 30 km. An indigenous production line of HERA rounds would not only help in increasing the 105 mm's range but also of any other 155mm we may procure (India bought 145 M777 ULH from US and it is reported that we would be using indigenous rounds for the gun). Since these are meant for the planned Mountain Strike Corps, such rounds would increase the area of lethality. The RAP could indeed increase the IFG/LFG's range to some 22 kms and the OFB is producing 155 mm HEER Base Bleed rounds but not for the 105mm IFG.

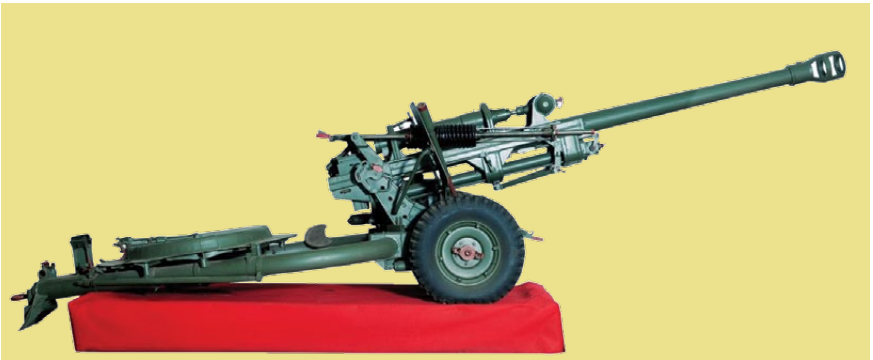
With increased range, accuracy or CEP (Circular Error Probability) becomes an important aspect in determining the capability of a gun. Unguided shells are good for 'smothering' enemy defences or static positions but in times of limited intel and/or close proximity of 'friendlies' and 'enemies', precision-guided shells become the vital factor. As of now, India does not manufacture any guided munitions of 105mm calibre so procuring Precision Guided Kits is an option. These kits transform unguided shells into guided ones, similar tactics were used during Kargil with Laser Guided Bombs kits. These kits are cheaper than the guided rounds themselves, can reduce CEP drastically. An unguided shell, like the M549A1 at 30km, has a CEP of 260m while with a PGK it becomes a mere 10m. A bunker at the end of a street will no longer be problem to hit for such an artillery gun. One such possible system has been developed by IMI with a CEP of 10m at 23 km which would be very interesting for an upgraded IFG/LFG.

There is also a completely revamped version of the IFG/LFG being offered by the Kalyani Group in cooperation with the Mandus Group, which is the *Garuda* 105mm Ultra-Light Field Gun. This has many commendable features, its weight is being less than 1000 kgs compared to the 3 tonne IFG/LFG, it can be fitted on any light tactical vehicle, has less parts than the original gun and best of all, features a digital FCS. Most recently the *Garuda* 105mm was seen at the 5th *Bhartiya Vigyan Sammelan,* Pune in 2017. The Kalyani Group has also tested new piston mechanism to absorb shock with a 40% reduction in recoil as in the *Garuda* 105. The complete gun mount weighs only 1500 kgs and can be mounted on armoured vehicles, but the Army has not yet formalised is requirement.

The last order of the IFG/LFG was for about 150 guns for the Mountain Strike Corps, even as an order for M777s was being worked out.

With about 2400 units of the IFG presently in service, it would be unthinkable to ignore its upgrade potential, as it is an obvious force multiplier.

Shwetabh Singh
(Twitter @singhshwetabh71)



The classic: 105/37 mm Light Field Gun Mk.II (LFG)

MBDA arms for the Indian Air Force

India's new generation Dassault Rafale combat aircraft will provide its Air Force not just with a fast and agile modern fighter but one that comes armed with a highly potent set of weapons from MBDA, unrivalled by any of India's neighbours.

The most advanced among these weapons is the Meteor beyond visual range air-to-air missile, widely recognised as a "game changer" in air combat. The Meteor is powered by a unique rocket-ramjet motor that gives this missile far more engine power, far much longer range than any other missile, which means it can "fly faster, fly longer and manoeuvre more than any other missile extant, giving Meteor the ability to chase down and destroy agile hostile fighters at the furthest of ranges."

India's Rafales will also be equipped with the SCALP deep-strike cruise missile also from MBDA. In combat, this stealthy weapon has repeatedly proven its unerring ability to strike and destroy hardened and protected targets deep inside hostile

territory, without need for the Rafale to enter inimical airspace. SCALP's operational effectiveness is based on three key factors: its high survivability owing to its long stand-off range, low observability and sophisticated mission planning system; its pinpoint terminal accuracy through its highly accurate seeker and target recognition system and its terminal effectiveness provided by the powerful tandem warhead and multiple detonation modes.

The IAF's Rafales will also be armed with the MICA, an air-to-air missile the Indian Air Force is familiar with as it is also part of the upgrade package for the IAF's Mirage 2000 aircraft. MICA is the only missile in the world featuring two interoperable seekers (active radar and imaging infrared) to cover the spectrum from close-in dogfight to long beyond visual range. Its ability to fly out to BVR in passive mode before the seeker locks on in the final stages of the end game has earned

MBDA Mistral on the HAL Light Combat Helicopter (LCH)

IAF Jaguar armed with the ASRAAM

it the nickname of being "a silent killer" as the target has little time to react or to deploy effective countermeasures.

Apart from the new weapons for the Rafale and Mirage 2000, the IAF is also receiving ASRAAM from MBDA as a key part of the IAF's Jaguar upgrade programme. The ASRAAM has a larger and more powerful rocket motor than other missiles in its class, giving pilots a key 'first shot first kill' capability to take uncertainty out of a potential dogfight. ASRAAM is also providing the IAF's Jaguar fleet with a step-change in air combat performance as part of the New Generation Close Combat Missile programme.

MBDA's Mistral missile has also been selected and integrated into the ATAM helicopter launch system for India's ALH and LCH helicopters. The Mistral ATAM system offers a high level of performance with unrivalled kill probability and with its fire-and-forget functionality, has a high ease of operation for very low crew workload.

MBDA has been working with the Indian industry for over 50 years in close partnership to build missile technologies in India, with over 40,000 MBDA missiles having now been produced in India. Recently, the formation of L&T MBDA Missile Systems Ltd., a joint venture between Larsen & Toubro and MBDA will see further development of Indian defence capabilities in the missile sector. Larsen & Toubro are already part of MBDA's global supply chain on several missiles, including the MICA and ASRAAM, and now looking to enhance India's missile industry's capabilities further through engagement in other major new missile programmes for India's Armed Forces.

Courtesy: MBDA

SNAPSHOT

Indigenous anti-ship missiles

Nirbhay cruise missile (photo: Vayu)

The devastating impact of anti-ship missiles was demonstrated for the first time in South Asia when missile boats of Indian Navy destroyed a number of Pakistan Navy vessels in Karachi harbour, firing Styx AShM on 5 December 1971. Over the next decades, India has acquired several new anti-ship missiles and has also achieved significant progress in indigenous development of anti-ship missiles development. These are briefly reviewed in this 'snapshot' .

BrahMos is a ramjet-propelled supersonic cruise missile jointly developed by Russia and India with sea skimming capability and can defeat air defence systems, striking the target high accuracy. Having a speed of Mach 3, the BrahMos can sink enemy ships in a single strike owing to its high kinetic energy. The missile can be launched from the ground, by ship or aircraft against both land and sea targets. According to recent reports, range of the BrahMos is to be increased to 600 km, and later to 800 km. While a submarine-launched version is already developed, a lighter version is being developed for launch from torpedo tubes in the anti-ship role. The lighter, air-launched version will enable Indian fighters to carry this weapon for long range missions. The hypersonic version being developed will surely become reality in the near future, and a game changer for India's Armed Forces.

The **Nirbhay** is a long-range subsonic cruise missile under development, with a range of more than 1000 km, flying at a speed of Mach 0.6. This platform has been test-fired and demonstrated its terrain hugging and sea skimming capability.

The Long Range Land Attack Cruise Missile **(LRLACM)** was unveiled at the recent DefExpo 2020. According to *Onmanorama* reports, this new system will have a range of 1000 km launched from a UVLM (Universal Vertical Launcher


(photo: MoD)

Module) and some 20 development flight trials are planned.

Existence of the **NASM SR** was revealed in 2018 when, in the Lok Sabha, Raksha Mantri Nirmala Sitharaman named this in the list of DRDO developments and those at other Indian institutions over the past three years (January 2016-December 2018). Initial details of this much speculated platform was unveiled at the DefExpo 2020.

This Naval Anti-Ship Missile project is possibly being developed for a number of platforms, having different ranges. 'SR', or Short Range, means that development of other longer range versions is expected as well. According to DRDO, the NASM-SR will be a 380 kg projectile with a maximum range of 55 km and used initially with Indian Navy Sea King helicopters, replacing the earlier Sea Eagle missiles. As the Sea King itself is on the final lap of its service life, it is rational that the new indigenous missile will be in service with future helicopters of the Navy.

The Indian Navy is currently procuring MH-60R helicopters for multi-role purposes and these will be equipped with Kongsberg Naval Strike Missile. Further, for the Indian Navy's IMRH acquisition, MBDA has pitched its Sea Venom which has a range of 25 km and also the Marte ER which can reach more than 100 km. The NASM SR could certainly be considered for these potent platforms. The long range version of the NASM SR will have a range excess of 150 km, enabling engagement of hostile targets from stand-off distances.

At the DRDO stand during Aero India 2019 were several posters of a one-tonne class medium range air launched cruise missile. Not much else was revealed about this **unnamed stealth missile** but seems this will have a low RCS body to avoid radar detection. A model of this missile was also seen with a scaled version of the LCA Mk. 2 and is featured in recent graphics of the ORCA as well.

The **Varunastra** is described as a long range anti-ship missile with cruising speed of 850 kmph. This low cost relatively light weight missile is being developed for neutralising smaller ships as a 'cost effective solution'. The missile weighs 225 kg, has a 108 kg penetrator and blast fragmentation warhead. The missile has very low RCS and a designed range in excess of 270 km.

The **Vel** is another low RCS platform being developed, a light cruise missile which weighs about 200 kg and can achieve speeds in excess of 270 km for employment against surface targets.

All of these indigenous anti-ship missiles are under current development and could take some time to mature, but once they enter service, India will be self-reliant in the field of anti-ship missiles.

Keep watching this space!

Sankalan Chattopadhyay
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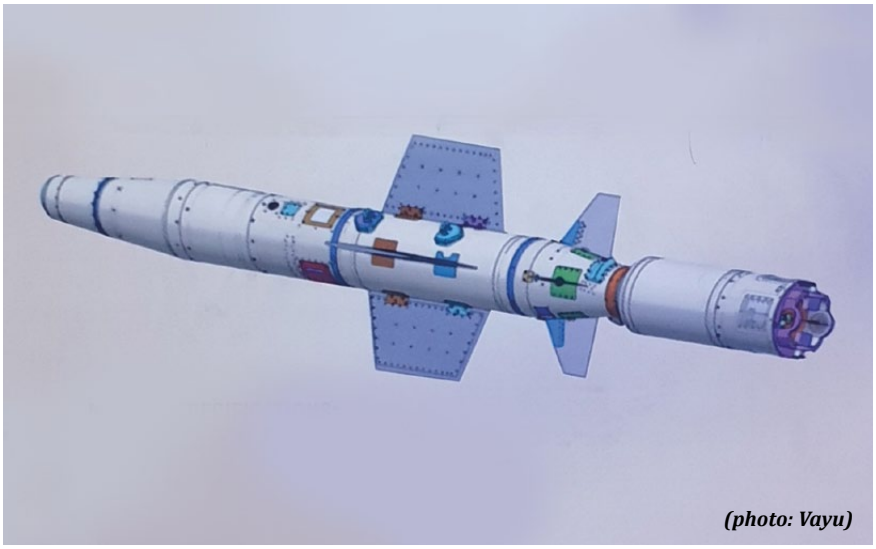
(photo: MoD)



(photo: Vayu)

Cover Story

Lion Cub to Vigorous Dragon

Metamorphoses of the Lavi into J-10

Perhaps the most intriguing of fighter aircraft development programmes in recent times is the ongoing story of the Chengdu J-10 which has excited much research and analyses by professional agencies and aviation aficionados alike. There have been persistent references to the Chinese having received help from the Israeli aircraft industry on early development of this Chinese multirole fighter, which programme was reportedly authorised by Deng Xiaoping in the 1980s to match the contemporary MiG-29 and Su-27 of the then Soviet Union and the F-15 and F-16 which were mainstay of the USAF.

Such development work was assigned to Institute 611 at Chengdu with Song Wencong reportedly its Chief Designer, who had earlier worked on the J-7 III. In a typical Chinese approach, they reached out to international institutions for assistance if not outright reverse engineering. The Russians were an obvious source, including the *Siberian Aeronautical Research Institute* (SibNIA) which later confirmed their

Artist's drawing of the Lavi

Rollout of the J-10 prototype at Chengdu

participation in the J-10 programme but only as "scientific guides", but some of their personnel later candidly admitted that the J-10 had been a "melting pot of foreign technology and its design was more or less derived from the Israeli IAI Lavi".

The Lavi development story is fascinating by itself. After the French had embargoed the delivery of more Mirage IIIs to Israel in 1967, the Israelis worked to make their own derivative, first the Nesher and then the Kfir which were produced in quantity to serve both the Israeli Air Force and meant for export. The Israelis thereafter switched to US-origin fighters, their A-4 Skyhawks being followed by increasing numbers of F-16s and F-15s but the indigenous industry also began development of the IAI Lavi (Lion Cub) of which three prototypes were built before the programme ceased, reportedly under US pressure.

The single-engined Lavi, incorporating composite materials, resembled the F-16 but included close coupled canards with advance quadruple-redundant fly-by-wire flight control systems. By late 1987 the Lavi programme had ceased but rumours abounded that the Chinese were 'interested' which aspect has been widely recorded since. As written by John W Golan in his book *Lavi: the United States, Israel and a Controversial Fighter*, "Israeli involvement in the J-10 appears to have begun at around the same time that China first opened diplomatic relations with Israel in January 1992 . . . Israeli contractors were engaged to provide the aerodynamic and structural outlines for the J-10. The Israeli influence on the J-10's design are unmistakable: a close-coupled, canard-delta arrangement; a single-engine fighter featuring a ventral engine inlet; twin ventral strakes; and an area-ruled fuselage……"

Again under US pressure, Israel soon enough ceased its involvement in the

J-10 seen with PL-12 active radar guided BVR air-to-air missiles, "considered comparable to the US AIM-120 AMRAAM and the Russian R-77"

The J-10s tandem-seating operation trainer

the cockpit. This configuration provides very high agility, especially at low speeds, and also reduces stall speed. A large vertical tail is present on top of the fuselage and small ventral fins underneath the fuselage provide for further stability. There is a two piece bubble canopy over the cockpit providing excellent vision for the pilot, with a zero-zero ejection seat provided, permitting safe ejection at zero altitude and zero speed".

A rectangular air intake ramp and a splitter plates in the first variant (J-10A)

J-10 programme and but in 2008 several interviews with Russian engineers returning from Chengdu had confirmed that "the J-10 benefited from significant, direct inputs from Israel's Lavi programme - including receipt of one of the IAI Lavi prototypes itself which resulted in extensive design and performance modeling, wind-tunnel testing and advanced aerodynamic design input . . ."

As for the critical power plant, the Chinese obviously did not have access to the American PW1120 engine and therefore adopted the Russian AL-31F turbofan engine which resulted in the new fighter becoming significantly longer and heavier than the aircraft it had been cloned from.

The first J-10 prototype was rolled out in November 1997, making its maiden flight on 23 March 1998. As per published sources, "the airframe appears to be constructed from metal alloys and composite materials, the large delta wing mid-mounted towards the rear of the fuselage, while a pair of canards are mounted higher up and towards the front of the fuselage, behind and below were located underneath the fuselage, providing air supply to the engine, but later variants incorporated a diverterless intake. Under the fuselage and wings are

J-10A of the August 1st formation aerobatic team at Dubai

It is estimated that some 350 J-10s are in service with the PLAAF

11 hard points, for carrying various types of weaponry and drop-tanks containing extra fuel, the maximum take-off weight (MTOW) being 19,277 kg. The missile armament includes the PL-12 AAM, LS500J PGMs and the K/JDC-01 FLIR targeting pod.

The final J-10A rolled off the production line in Chengdu in 2014 and was supplemented by the J-10S tandem seating operational trainer, followed by the J-10B which features a lighter and stealthier diverterless supersonic inlet, a longer nose radome possibly housing a more advanced radar and electro-optic targeting sensor (IRST) plus a new electronic warning or countermeasures pod atop the vertical stabiliser. This aircraft is powered by the Russian-origin AL-31FNM1 even as the Chinese are continuing efforts to develop their WS-10A turbofan engine, again with considerable reverse engineering.

In 2009, the J-10B was unveiled with a new fixed diverter less inlet (DSI), a flatter radome, an Infra-Red Search & Tracking Unit (IRST) and a holographic HUD. Although powered by the Russian AL-31FN (series 3) turbofan, it is believed that the domestic WP-10B engine has been selected for this version. The radar sensor is an X-band passive electronically scanned array (PESA) developed by No. 607 Technical Institute.

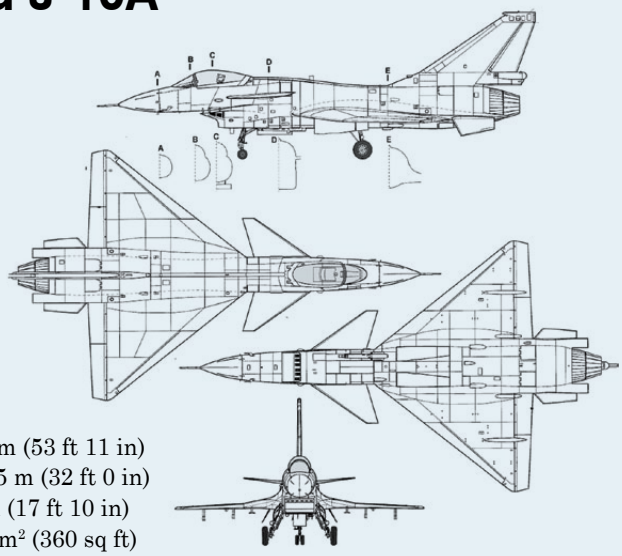
The first frontline J-10B unit was formed in 2015 and about the same time the first J-10C, equipped with an AESA radar developed by the 14th Institute, and manufactured with greater use of composite material and the WS-10B, made its maiden flight at Chengdu. This latest variant is equipped with an indigenous active electronically scanned array (AESA) fire-control radar and infrared-homing PL-10. The Block 02 J-10C has replaced the Block 01 J-10B on the production lines and probably all J-10 variants will be brought to the J-10C standard by 2022, and equipped with the PL-15 BVRAAM.

At this time, some 350 J-10s are in active service with the PLAAF, which type is also the mount for the PLAAF's *August 1st* formation aerobatic team.

Vayu Research Team

(Images from the internet and Vayu at Dubai Air Show 2017)

Chengdu J-10A



Specifications

- Length: 16.43 m (53 ft 11 in)
- Wingspan: 9.75 m (32 ft 0 in)
- Height: 5.43 m (17 ft 10 in)
- Wing area: 33 m^2 (360 sq ft)
- Empty weight: 9,750 kg (21,495 lb)
- Gross weight: 12,400 kg (27,337 lb)
- Max takeoff weight: 19,277 kg (42,499 lb)
- Powerplant: 1 × Saturn-Lyulka AL-31FN 3 afterburning turbofan engines, 79.43 kN (17,860 lbf) thrust (Thrust/weight: 1.15

Performance

- Ferry Range: 3,200 km (2,000 mi, 1,700 nmi)
- Combat range: 1,250 km (780 mi, 670 nmi)
- Maximum speed: Mach 2.2
- Service ceiling: 18,000 m (59,000 ft)
- g limits: +9/–3
- Wing loading: 381 kg/m2 (78 lb/sq ft)
- Instantaneous turn rate: 31+ degrees per second
- Roll Rate: 300+ degrees per second

Armament

- Gun: 1× Gryazev-Shipunov GSh-23
- Hardpoints: 11 in total (6 × under-wing, 2 × under-intake and 3 × under-fuselage) with a capacity of 7,000 kg (15,400 lb) for external fuel and ordnance
- Rockets: 90 mm unguided rocket pods
- Missiles:
  - Air-to-air:
    PL-8
    PL-9
    PL-10
    PL-11
    PL-12
    PL-15
  - Air-to-surface :
    PJ-9
    YJ-9K
- Bombs:
  Laser-guided bombs: (LT-2)
  Glide bombs: (LS-6, GB3, GB2A, GB3A)
  Satellite-guided bombs: (FT-1)
  Unguided bombs: 250 kg, 500 kg

Mandeep Singh Bajwa on

Facing the Dragon

(Boundaries depicted are not as per Government of India maps, image downloaded from Wikipedia for overview purposes only)

The Chinese Order of Battle: what we are up against

Just after the severe winter months, in May 2020 the Chinese were quick to reinforce their troops in the Aksai Chin area facing India's XIV Corps. Some of these additional forces had come in earlier as part of an "exercise" but was a pre-planned push to secure Indian territory, with reserves inducted to counter Indian deployment and prepared for offensive operations.

But what did the Chinese have in the area for border management before launching 'Operation Land-Grab' and what have they added? According to the *International Institute for Strategic Studies* London, before start of the confrontation, the People's Liberation Army (PLA) had three border-defence companies based close to those areas in the Aksai Chin. Two were drawn from the 362nd Border Defence Regiment, one being located at the 19th century Khurnak Fort on north bank of the Pangong Tso and the other at Spanggur Tso to the south.

The third was located at the Kongka La Pass near the Indian post at Gogra/Hot Springs, from the 363rd Border Defence Regiment. All these sub-units have patrolled the LAC, running into Indian patrols and were employed to make the initial intrusions. Border Defence Regiments are on par with regular troops in equipment (except for armoured fighting vehicles) communications and leadership. Their counterpart are our Indo-Tibetan Border Police which hold posts along the LAC and are backed by Army infantry battalions on hand and, in rotation from nearby camps.

There is also a Chinese motor boat squadron on the Pangong Lake itself. All these sub-units together would have numbered around 500–600 personnel. Reacting to the changed situation, it is likely that additional troops drawn from one or both of Chinese Border Defence Regiments' operational reserves have also been deployed to the area, raising the total PLA border forces in the area to some 1,000–1,500 personnel.

All that rapidly changed, with the PLA's 6th Highland Mechanised Infantry Division then forward deployed in the Chinese half of Depsang Plains. It consists

PLA armoured forces are now deployed in Eastern Ladakh

of the 7 Mechanised Infantry Regiment, 18 Mechanised Infantry Regiment and an armoured regiment. Combat support consists of a field artillery regiment, an air defence regiment, a combat engineer battalion, an electronic warfare battalion and a chemical, biological, radiological and nuclear (CBRN) defence battalion. The presence of the latter two units show how rapidly the Chinese have moved in the implementation of hybrid warfare concepts. Their divisional reconnaissance battalion is a small, lithe unit for scouting and flank protection tasks, with eighteen ZBD-04A infantry fighting vehicles armed with AFT-10 anti-tank guided missiles (ATGMs), considered as the Divisional Commander's eyes and ears, while the Division's HQ has an infantry company and air defence platoon for its protection.

Each mechanised infantry regiment/brigade has four mechanised battalions (up from the earlier three) and a tank battalion with 35 ZTZ-99A (Type 99) main battle tanks. There are eleven tanks in each of the three tank companies with two command tanks in the battalion headquarters. An artillery battalion with eighteen 122mm PLZ-07B self-propelled tracked howitzers is in direct fire support. Combat support is provided by an engineer battalion and a signal battalion. The backbone of the division are its mechanised infantry battalions of which it has eight.

The skies above the division's battle space are sought to be secured by the air defence cover provided by the integral Anti-Aircraft Artillery Regiment. This consists of a battalion of 24 GZ-09 PGZ-07 twin 35mm self-propelled (tracked) anti-aircraft guns and a battalion of 18 HQ-17 short-range air defence systems (tracked), a development of the Russian SA-15. This is meant to target all kinds of aerial threats including Cruise missiles, low-flying aircraft and short-range ballistic missiles. Six FN-6 MANPADS launchers comprising an air defence platoon are also attached to the Regiment. An aviation regiment provides the division with an integral air attack, aerial reconnaissance, airborne anti-tank and heli-lift capacity. This is provided by a squadron each of Harbin Z-9G armed helicopters, a licensed variant of the French Eurocopter AS365 Dauphin and Mi-17I transport helicopters, both units having six helicopters each.

ZTZ-99A main battle tank

PLZ-07B self-propelled tracked howitzer

HQ-17 short range air defence missile

Scene of confrontation: the Pangong Tso (Lake) is an endorheic lake in the Ladakh region of the Himalayas, at an elevation of 4,225 m (13,862 ft), 134 km long and 5 km wide at its broadest point, the lake extends from India to the Tibetan Autonomous Region in China, with some 60% of its length of the lake in Tibetan Autonomous Region.

PLA troops at high altitude

include weapon-tracking radars and tactical reconnaissance UAVs.

In a battlefield environment rich in enemy air assets i.e. when the adversary has a modicum of air superiority an independent air defence brigade could also come under command. This would field a battalion (24 systems) of twin-barrelled 35mm towed anti-aircraft guns for point defence of headquarters, gun positions and static installations like fuel dumps and ammunition depots. In addition, a unit of twelve FM-90 mobile short-range surface to air missiles, an unlicensed, reverse-engineered copy of the French Crotale SAM would form part of this reinforcement.

Combat support assets are available from the Group Army (equivalent to an Indian Corps) to boost the division's firepower and battle-survivability. These could include an independent artillery brigade with two battalions of PCL-181 155m/52-calibre truck-mounted howitzers (36 tubes) and another two battalions of PHL-03 300mm 12-tube long-range multi-barrel rocket launchers (36 systems). The latter is based on the BM-30 Russian Smerch system with a range of 650 kms and used to target strategic targets like command centres, major concentrations of troops, airbases, air defences, logistics hubs and engage in counter-battery fire missions. Force multipliers with this formation

PLA tank transporters moving AFVs along the bleak landscape.

The 4th Highland Motorised Infantry Division based at Aksu in Xinjiang comprises the 11 Motorised Infantry Regiment, 12 Motorised Infantry Regiment, a tank regiment, an artillery regiment, and anti-tank and anti-aircraft artillery battalions. This is the Chinese formation that our XIV Corps is encountering in the Galwan River Valley, Hot Springs/Gogra and the Fingers Area. The Division's motorised infantry regiments are equipped with tracked Type 86 ICVs (reverse-engineered Soviet BMP1 replicas) and WZ-551 6x6 APCs. In addition, there are eight relatively more modern VN-1 8x8 APCs armed with indigenous *Red Arrow* 10 ATGMs. The motorised infantry battalions follow the standard table of organisation with three companies, each of three platoons.

As one can note from this review, the PLA has deployed formidable mobile formations with tremendous firepower. The terrain in Ladakh (high-altitude mountain plateau) is ideal for such employment, however, plain, flat valleys in the region are bounded by steep ridges. Mobile forces can easily manoeuvre through the flat valleys and penetrate the gaps. However, if the adversary's forces hold the ridgelines in strength and dominate the passes tanks and mechanised infantry will find themselves being channelled into and decimated in armour killing areas. For any sizeable armoured force to make any headway, it is vital to secure the high ground flanking the proposed routes of advance. In effect that means that up to one-third of the attacking must dismount from their APCs, climb those hills, neutralise the occupying enemy and hold out against counter-attacks and air action.

The PLA Southern Xinjiang Military District reserve formations are normally based around the Taklamakan Desert, south of the Tien Shan mountains [from the internet]

PLA troops with anti-tank weaponry

According to observers, Chinese infantry has been noted in recent years to have become 'APC-ised' or too accustomed to moving and fighting in infantry combat vehicles to the detriment of traditional infantry skills in which their Indian counterparts excel!

[All images from the internet]

PLA tanks in high mountain terrain

Deploying Air Power against the Chinese

IAF Sukhoi Su-30MKI takes off from Leh

In hindsight, many strategic mistakes were made in conduct of the 1962 India-China war, by far the most serious being not using our then medium-sized but professional air force for offensive air operations. IAF Canberras, Hunters, Mysteres, Gnats, Ouragans and Vampires, flown by well trained and motivated pilots would well have interdicted Chinese lines of communication, strafed, bombed and rocketed their artillery batteries, troop concentrations, headquarters, supply columns and even advancing columns. Although combat air patrols and reconnaissance flights were flown by the IAF, they were forbidden from firing. Air Marshal MM Singh, then a Squadron Leader commanding No.24 Squadron with Vampires observed a strong Chinese column moving towards one of our forward defended localities in the Walong sector. He dived down and had the satisfaction of seeing them scatter in panic even though he did not fire a single round. It was galling for a professional fighter pilot to be thus hamstrung while troops on the ground were fighting for their lives.

However, the few IAF helicopters then played an important role in reconnaissance, casualty evacuation, supply dropping and communications. On 20 October 1962, Sqn Ldr Vinod Sehgal flew his Bell 47G to the Namka Chu to ascertain the ground situation as all communication had ceased with divisional headquarters in the very first hours of the war. Unaware that the Chinese had already occupied the helipad, he landed but was tragically killed along with his accompanying army signals officer. At this stage, our fighters could well have been scrambled from Tezpur to strafe and bomb the advancing enemy troops, causing casualties on the enemy and boosting morale

IAF Hercules at an advanced landing ground in Ladakh

of the Indian defenders. But the aggressive spirit so essential was sadly missing, and the government of the time irrationally worried over Chinese retaliation against civilian targets which inhibited the natural fighting spirit of the Indians.

IAF MiG-29 lands at Leh (photo by Dipak Das, MoD)

The Boeing AH-64E: the IAF has deployed its Apaches in Ladakh

Even so, the IAF's transport aircraft played a major role in 1962, transporting troops to far-flung areas, supplying posts dependent solely on air-drops, and in this manner the IAF was visible everywhere. Its An-12s operating from Chandigarh transported AMX-13 tanks to Chushul which made significant impact on operations in and around the battlefield.

Fast forward to 2020: While no air intrusions by the PLAAF have been reported, the IAF has been on full alert, with combat air patrols observed over eastern Ladakh, including night sorties. Air-superiority fighters including Su-30MKIs, MiG-29s, Mirage 2000s and Jaguars have reportedly been moved to operational bases in Kashmir, Punjab and Haryana. Bases at Srinagar, Avantipura, Pathankot, Adampur, Chandigarh, Halwara and Ambala have certainly been on high alert.

The newly received US-origin Apache helicopters armed with Hellfire missiles have been deployed in Ladakh to neutralise Chinese armour and mechanised infantry, while the also US-origin Chinook heavy-lift helicopters have been deployed for tactical troop movements, casevac and supply functions. Importantly, the Chinooks can rapidly deploy M-777 ultralight weight 155mm medium howitzers greatly adding to the punch and mobility of the Indian Army.

Strategic airlift is the IAF's forte. Employing C-17 Globemaster IIIs, C-130J Super Hercules, Il-76s and An-32s, tens of thousands of troops have been flown to Ladakh along with their weapons and equipment. A large share of the burden of logistically maintaining the additional troops inducted into the theatre with food, ammunition, medicines, tentage, housing and other supplies through the winter will inevitably fall on the IAF transport squadrons.

Quick-reaction surface to air missiles (SAMs) fielded by both the IAF and the Army have reportedly been positioned at strategic places for the air defence of installations, supply and ammunition dumps, command and control centres and troop and armour concentrations. Medium-range, mobile Akash missiles are also included in such deployment at high-altitudes.

Prime Minister Visits Ladakh

Prime Minister Narendra Modi addresses the Indian Army at Nimu on 3 July

The Prime Minister's visit to Ladakh on 3 July and his strong statements certainly bolstered morale of the armed forces and citizens of this Union Territory, though the public posturing perhaps indicated temporary failure of the military-level talks aimed at de-escalation and disengagement of forces. The rhetoric and the hard intentions displayed had their effect, and Special Representative-level talks thereafter seem to have resolved matters to some extent. There were subsequent reports, albeit carefully worded and guarded in nature, of some Chinese troop withdrawals and corresponding Indian disengagements.

Things could be improving, but what should we expect in the near future? The Chinese have laid claims to the entire Galwan Valley and dominating heights, their behaviour and moves even after some rearward move would have to be very carefully watched. Very definite and accurate reconnaissance and surveillance systems have to be put into place besides the use of human resources. Anything out of the ordinary will be suspect. For instance, in this sector, the Chinese have only a dirt track to move troops, vehicles and supplies. Macadamising i.e. black-topping of this road will indicate without doubt that the Chinese are repudiating any agreements made with us which is the reality of today.

As a matter of national policy, the People's Republic of China uses force and negotiations at the same time and India must be prepared to not just play the same game but beat them at it. A new

Indian Defence Minister Mr Rajnath Singh visited Ladakh and Jammu-Kashmir on 17-18 July 2020. He is seen in the picture with CDS General Bipin Rawat, COAS General MM Naravane, Lt Gen Harinder Singh and some Army and Air Force Officers, with a T-90 main battle tank and BMP-2 infantry combat vehicle in the background.

professionalism, a new ruthlessness must take root, we must learn the right lessons and modify our strategic imperatives. While the Chinese have always looked at the long term, big picture, our thinking is the exact opposite: short term and rather tactical in nature.

A number of Indian Army's reserve formations have been moved to Eastern Ladakh, and will remain there in the immediate future perhaps through the winter, such is the uncertainty of any agreement with the Chinese. This will immensely add to our logistics situation, financial and administrative loads, but we must be prepared for that. It must never be forgotten that in foreign policy as in war, there are no prizes for a runners-up.

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[This first appeared in The Indian Express, Chandigarh Edition]

Falcons over the Karakorams

A decade of 'Shaheen' air exercises

Shahin or Shaheen or Shaahiin or francicized Chahine (from the Persian: Shāhīn) is a name of Persian origin, referring specifically to the Barbary falcon utilized in falconry. ... In Persian, Shahin literally mean "like a king", "worthy of a king", "majestic" or "kingly".

The Air Forces of Pakistan (PAF or *Pakistan Fiza'ya)* and China (PLAAF or *Zhongguo Renmin Jiefangjun Kongjun*) have been carrying out air exercises coded *Shaheen* now for nearly a decade, beginning in March 2011, when for the very first time in history, the PLAAF had deployed fighters on Pakistan's soil, in the Punjab.

As recorded in *Vayu Issue III/2011* "A contingent of Chinese PLA Air Force comprising combat aircraft, pilots, technicians arrived at an operational base of the Pakistan Air Force. The exercise has been designed to share mutual experiences, hone professional skills, and accrue maximum benefits from the expertise of two air forces," according to the spokesperson, who did not disclose details about the types of aircraft involved, the missions performed, the location of the exercise or the total number of personnel involved.

Later, from images released, it appeared that PAF F-16s (*Falcons* of No. 9 Squadron) and JF-17s (*Thunders* of No. 26 Squadron) operated alongside J-10s of the PLAAF, probably at Sargodha or Shorkot Road in the Punjab. However other reports mentioned deployment of Su-27UBKs while others also referred to J-11s. The possible presence of F-16 Fighting Falcons during the exercise certainly evoked great concern in Washington DC as potentially

this had exposed sensitive US technology. Whatever, the symbolism of Exercise *Shaheen* demonstrated Pakistan's message in the backdrop of deteriorating relationships between Pakistan and the US. As opined by a defence analyst, "while the United States remains a critical source of arms to Pakistan, especially advanced weapons platforms such as the F-16, the politics behind US arms transfers to Pakistan and the strict terms that accompany the sales of weapons systems—a humiliating reality, in Pakistan's perspective, especially in light of the perceived special treatment India receives by the United States and international community in areas related to defense—have driven it further into the arms of China. When it comes to arms exports, Pakistan is China's biggest customer. Over 40 percent of China's arms exports are destined for Pakistan".

Shaheen II

Two years later in September 2013, *Shaheen* II was conducted in the Hotan Prefecture of China's northwestern Xingjiang Uyghur Autonomous Region. This three week-long air exercise was the first time that a foreign air force had exercised alongside PLAAF in Chinese airspace. While there was no official information regarding the type or number of participating aircraft from either side, Pakistani press reports had it that an unspecified number of Chengdu F-7PG and Mirage 5 aircraft had flown north from Pakistan over the Karakorams to Hotan for the Exercise. The Sino-Pakistani JF-17 Thunder which was then already operational with two PAF squadrons, however did not participate in this Exercise.

Hotan airfield, from where the exercise was conducted, is close to Ladakh and the Aksai Chin region, where a stand-off between Indian and Chinese forces had taken place in April 2013. The air base at Hotan is at an altitude 1,400 meters (4600 feet) above sea level having a single 3,200 meters (10500 feet) runway, and very familiar to the Pakistan Air Force which has ferried F-6s, F-7s and JF-17s from here to Pakistan, these aircraft earlier having been ferried to this base from Chengdu in Siuchan province. While China does not appear to have a permanent air force detachment at Hotan, publicly accessible satellite imagery routinely shows combat aircraft parked out in the open at the airfield, suggesting that they are deployed there as needed. Skid marks on the runway suggest that aircraft operate typically from Rwy 29 (landing from the east, taking off toward the west).

Satellite imagery in June 2013 had showed some J-11s at Hotan, these Chinese-copied versions of the Russian Sukhoi Su-27/30 being of particular importance considering the large numbers of the Su-30 in Indian Air Force service. The timing of the exercise was also significant with the agreement in place on the Kashgar-Gwadar road project as part of the Chinese 'belt and road' strategic plans.

Shaheen III

In May 2014 was conducted *Shaheen* III, a three-week long exercise which took place from the PAF base at Shorkot Road. The PLAAF sent Chengdu J-10s, their contingent led by Major General Zhan Houshun of the of the Chengdu Regional Air Force Command who later complemented the PAF, stating "We are deeply impressed by PAF's aggressive combat style and brave fighting spirit and greatly moved by the 'train as you fight' training principle and streamlined efficient training approach … we admire your superb and all round flying skill and outstanding tactical expertise. We have learnt a lot from you which will bring a whole new inspiration to the innovation and development of PLAAF's military training".

The PAF had reportedly deployed its JF-17 Thunders, Mirage III/5s and F-7PGs but significantly, none of its F-16s, perhaps as a result of US senstivities.

Shaheen IV

Fourth in the series of air exercises between the Air Forces of Pakistan and China, '*Shaheen*-4' took place in the first half of September 2015, but this time in an unusual area: Central Tibet. The first such air exercise had taken place in north-western Pakistan, the second in China's western Xinjing-Uygur region, around Hotan, the third in Pakistan's Punjab province, around Shorkot in May 2014. Although the PLA Air Force spokesman did not specify the exact location, it is leant that *Shaheen-4*, was held at several PLAAF air bases in Central

Tibet, north of Nepal and south-west of Lhasa, including Yinchuan air base.

While the PAF deployed elements of six fighter squadrons comprising JF-17s, Mirage III/5s and Shenyang F-7PGs apart from a KJ-200, the PLAAF had J-10As, J-11Bs, Su-27UBKs, F-7s and its own KJ-200 AEW&C aircraft taking part plus tactical transport aircraft and helicopters. During the exercise, the two arms were formed as '*Red Force*' and '*Blue Force*' and as Wang Xu, Professor of Pakistan Studies at Peking University said, "We can learn a lot from Pakistan's training philosophy and system and in preparing to fight terrorism in north-western China, such drills could boost China's capacity to tackle tough situations".

The PAF's Air Vice Marshal Mujahid Anwar Khan and PLAAF's Lt Gen Zheng Qun Liang represented their respective countries. These air exercises and other flying operations in Tibet obviously were followed closely by India and the IAF CAS made particular reference to this during his pre-Air Force Day Conference at New Delhi. "In the Tibet Autonomous Region, flying operations (of Chinese People's Liberation Army Air Force) have increased exponentially and their capability (has been) increasing throughout the year… we also have our assets, our infrastructure and are deploying our forces (along the border). Therefore, there is no need to worry," Air Chief Marshal Arup Raha stated.

Shaheen V

The fifth *Shaheen* air exercise took place in Pakistan over a near three week period, from 9 to 30 April 2016. According to Air Commodore Syed Muhammad Ali of the PAF, "a contingent of the People's Liberation Army Air Force (PLAAF) comprising combat aircraft, air defence controllers and technical ground participated in the exercise where the PAF deployed three different types of fighters, including the JF-17 Thunder.

Shaheen VI

Shaheen VI took place from 8 to 27 September 2017 and was conducted on a much larger scale, with the PAF and PLAAF carrying out intensive flying operations with their fighters, backed by AEW&C aircraft as also factoring intense ground based AAA, with surface-to-air missile and mobile radars. According to a spokesperson for the PLAAF, China had deployed "a wide range of aerial assets and troops, including J-8 and J-11 multirole fighters, Xian JH-7 fighter-bombers, KJ-200 airborne early warning and control system aircraft, surface-to-air missiles as also airborne troops".

of Pakistan-China military-to-military relationship, the key terms are "all-weather brotherhood, high-level mutual assistance and support, and deep-rooted strategic mutual trust".

Pointedly, the two "all weather friends" would appear to be addressing a common adversary, directly referring to "India's aggressive posture demonstrated by the air strike against target on Pakistan territory in the north and the face off against Chinese

Very interestingly, this time the Exercise took place at Korla (41°43'33"N 86°10'29"E) in China's Xinjiang province which is some 200 kilometers southwest from its capital Urumqi and in vicinity of the Tian Shan range, close to an important pass which once protected the ancient Silk Road.

The Chinese spokesman added that Pakistan had sent "an undisclosed number of JF-17 Thunders, J-7PGs and its own AEW&C aircraft including the Chinese-origin Shaanxi ZDK-03K for the exercise.

At end of the exercise Chinese Colonel Wu Qian named their counterparts as being really of "Iron Pak" and that in terms

troops at Doklam in the east". In this perspective, this iteration of the *Shaheen* exercise assumes added significance: If either China or Pakistan decides to provoke India into taking military action against one of them, in all likelihood it is possible that the "two-front war" that then COAS General Bipin Rawat had warned his troops to be ready for, could well become a reality.

Shaheen VII

This seventh edition of exercise *Shaheen* had a maritime element. This took place at the PAF base at Mauripur (Karachi) from 3 to 21 December 2018. The PLAAF flew their J-10s and J-11s while the PAF operated Mirage Vs, JF-17s and J-7PGs, "aimed at realistic training in various environment including over the sea." The PAF's Deputy Chief of the Air Staff (Operations), Air Marshal Muhammad Haseeb Paracha was responsible for the Exercise.

JF-17 Thunders, F-7PGs and Mirage III/Vs, AEW&C aircraft and supporting ground personnel.

The context was significant. A few weeks earlier, on 5 August 2019, the Indian Government had revoked the special status granted to Jammu & Kashmir under Article 370, which triggered strong reaction from both Pakistan and China. Interestingly, some weeks earlier, in the first two weeks of July 2019, Indian Air Force Su-30MKIs had exercised with French Air Force Dassault Rafales and other aircraft at Mont-de–Marsan in southern France to "improve the level of interoperability of French and Indian air crew in air defence missions and ground attack".

Shaheen VIII

Shaheen VIII was conducted from 23 August to 6 September 2019, from the air base at Hotan (37°06'N 80°01'E), not far from the Indian border in Ladakh. "Multiple types of fighters, surface-to-air missiles and radar installations from the two air forces took part in the mock battles", according to Chinese People's Liberation Army Air Force. There were large force engagements, some 50 fighters taking part including PLAAF J-10s, J-11s, J-16s, Su-30s, JH-7s and KJ-500AEW&C aircraft. The PAF participated with their

Hotan airbase in Xinjiang, China

And now a scenario: the real thing?

From 5 May 2020, the hitherto 'quiet' line of actual control (LAC) monitored by the Indian Army against Chinese intrusions in eastern Ladakh, virtually 'exploded', with over a hundred thousand troops, armoured fighting vehicles, heavy artillery, and other means of war arrayed by both sides in this high altitude terrain (*see articles in this Issue*). In support of the land forces, the Indian Air Force has deployed combat aircraft, armed helicopters, transport aircraft, drones, surveillance radar and surface-to-air missiles both in the Ladakh region and elsewhere in Kashmir and northern Punjab against all contingencies.

The Pakistan Air Force has been very active as well, with their air combat exercise *High Mark* taking place in mid-June 2020, exercising their F-16s, JF-17s J-7PGs and Mirage III/5s, including operations from the high altitude airfield at Skardu (35°17'25"N 75°38'40"E)

at 2,230 metres (7,320 feet) above sea level. Unconfirmed reports had Chinese J-10s briefly deploying at Skardu as also a PLAAF Ilyushin Il-78 aerial tanker.

There are regular airline services to Skardu being flown by Pakistan International Airlines (*see PIA B-737 with 'The Silk Route' painted on the fuselage*) while PAF fighters are regularly detached to Skardu (*see JF-17 outside a blast pen*).

The Indian Air Force has long targeted the Skardu airfield ever since the first Kashmir war in 1948, again in 1965 and then 1971, using its Tempests, Canberras and Hunters to make the runway inoperable.

During the 1999 Kargil operations, the PAF had detached F-16s to Skardu even as IAF Mirage 2000s and MiG-23BNs were engaging enemy ground targets just across the LOC. There was no aerial engagement then but tensions are high and fighters remain on alert in the summer of 2020.

Vayu Research Team

[Images from the Internet]

Face Off !

Indian and Chinese forces in Eastern Ladakh

According to various sources, both open and assessed from analyses done by international military observers, the Indian and Chinese Armies facing each other in Eastern Ladakh have been identified:

People Liberation Army (PLA's) Western Theatre Command (WTC)

This largest of China's Theatre Commands, the WTC is responsible for the entire Tibet and Xinjiang regions which have varied and challenging geographical terrain including vast deserts and high mountains. The WTC's responsibility includes internal security in the restive regions of western China and the southern borders with India. In 2017, the WTC was commanded by General Zhao Zongqi a veteran of the war against Vietnam, commander of the 14th Group Army, having earlier commanded the 52nd Mountain Brigade in Tibet.

Headquartered at Chengdu, the WTC also includes a Joint Operational Command with headquarters at Lanzhou, with the Strategic Logistics Support Force having subordinate centres in each theatre including one at Xining. The WTC can deploy subordinate PLA and PLA Air Force (PLAAF) units, and request additional forces from the CMC if required. Each theatre will require time to fully transition from the Army dominated MR headquarters to establish joint commands, gain familiarity between the services, as well as train personnel in their new joint positions.

Units identified in the WTC include

1st Technical Reconnaissance Bureau at Chengdu, Sichuan

15th Engineer Brigade at Dazi, Lhasa.

52nd Mountain Infantry Brigade at Nyingchi, Tibet

53rd Mountain Infantry Brigade at Nyingchi, Tibet

54th Mechanised Infantry Brigade, at Lhasa, Tibet

308th Independent Artillery Brigade at Linzhi

6th Mechanised Infantry Division, at Hotan, Xinjiang

8th Motorised Infantry Division, at Wusu, Xinjiang

11th Motorised Infantry Division at Urumqi, Xinjiang

'Red Army' Division, Kuqa County at Xinjiang

An Artillery Brigade at Urumqi, Xinjiang

An Army Aviation Brigade at Korla, Xinjiang

651st Independent AAA Brigade at Bayi Nyingchi

Supplementing these formations are Border Defence Regiments including the 1st and 2nd at Shannan City on the India-China LAC and China-Bhutan Border, 3rd at Shigatse, 4th at Chayu, Linzhi, 5th on the China-Nepal border, 6th at Shigatse (and Nathu La), 1st and 2nd Independent Battalions at Shigatse, 3rd at Beibeng, 4th at Nanyi, 5th at Shannan and the 6th along the China-India LAC.

Indian Army's Northern Command

The Northern Command, raised in June 1972 with its headquarters at Udhampur, is arguably the most operationally active of all the Indian Army's operational commands, with three Corps, the XIV, XV and XVI.

The Srinagar-headquartered XV Corps is the oldest and has been involved in continuous action since 1948 both on the line of actual control (LOC) along Pakistan Occupied Kashmir (POK) from the foothills of Jammu to the north western periphery and has three Infantry Divisions plus Independent Brigades in its order of battle.

XVI Corps, with headquarters at Nagrota, is perhaps the largest Army Corps in the world, with five Infantry Divisions, guarding the LoC in Kashmir as also the sensitive borders on the south west Jammu-border with north western Punjab.

XIV Corps 'Fire & Fury' was raised after the 1999 war in Kargil and is headquartered at Leh with responsibility for the frontiers not only with Pakistan-occupied Kashmir but the Ladakh sector where borders with China are live. XIV Corps has 3rd Infantry Division for the defence of north east Ladakh, 8th Mountain Division for guarding the Kargil sector while the independent 102nd Mountain Brigade is responsible for the ultra -high altitude Siachen glacier area.

Uniquely XIV Corps has an Independent Armoured Brigade (254) headquartered at Leh as also an Independent Infantry Brigade as reserve. During May-June 2020, in a massive reinforcement move, two Mountain Divisions, one from Northern Command reserve and the other as Army Headquarters reserve, were steadfastly moved to Eastern Ladakh, reinforcing XIV Corps with major accrement of artillery, air defence and armoured assets. Amongst these are advanced surface-to-air-missiles and T-90 main battle tanks.

"Potential PLA Operations in the Indian Strategic Direction"

The primary border areas under dispute are the Chinese-occupied Aksai Chin in the west and Arunachal Pradesh in the east which is a state of India. Even through China and India have conducted combined "Hand-in-Hand" (携手) counter-terrorism exercises on a small scale and have established high-level dialogue on border issues to alleviate tensions, there remains tension between the two countries over Chinese activity in the border regions as well as the Indian Ocean. The WTC would have to coordinate operations with the responsible command for naval operations against India. The WTC focuses on relevant campaign scenarios to train troops for potential combat operations. PLA publications detail several campaigns that the WTC could conduct including Anti-terrorism Stability Maintenance operations to combat internal unrest; Joint Border Counter-attack Campaigns to defend against an attack and regain lost territory; Mountain Offensive Campaigns and Joint Fire Strike Campaigns usually supporting another campaign, but also an independent campaign.

China is rapidly improving infrastructure in the Sino-Indian border region as part of development plans for Tibet as well as to prepare for possible defensive or offensive operations. China has constructed roads to and along disputed areas, along with additional airbases, landing strips and logistics sites to support military deployments and operations.

India has continuously improved transportation infrastructure in its controlled areas, and plans additional infrastructure construction to support its military and paramilitary forces along the border. India has also deployed additional forces to the border regions since 2012.

The Sino-Indian disputed borders are actually isolated high-altitude regions with difficult terrain and weather conditions presenting problems for troops, weapons and equipment. Ground combat could occur mainly along roads which normally follow valleys or ridges, limiting support and cooperation between forces operating on different axes. The lack of cross-terrain mobility limits the ability of ground forces to conduct penetrating or outflanking operations against enemy forces. PLA publications stress airmobile landings in the enemy rear area to overcome the restricted terrain and enemy defensive positions. Special operations forces available to the WTC would represent highly qualified units to operate in the enemy rear area to disrupt operations and attack vulnerable lines of communications. The high-altitude reduces aircraft performance and lift capabilities, and increases maintenance requirements on equipment in general, although the thin air increases the range of projectiles and shrapnel. Weather conditions would mostly limit air operations to June through September. The 1962 Sino-Indian War was fought in October and November without air support. Cold high-plateau regions place increased requirements on engineering and support operations, and the thin air is difficult for the troops even after acclimation. This situation reduces unit combat capabilities and increases non-combat losses. Training new recruits could affect an operation depending on the timing. New recruits would likely achieve a minimal operational capability to conduct small unit combat by late spring, which should be adequate for the restricted terrain which will limit maneuver and dictate primarily small unit operations. Depending on the timing of the crisis, the PLA could decide to delay mobilisation of soldiers in the WTC to retain full combat capability of units.

Interestingly, the Aksai Chin border terrain mock-up at the Qingtongxia CATTB depicts mostly Chinese occupied territory with only a small portion of Indian controlled terrain. This appears to indicate a focus on a Joint Border Counterattack Campaign in response to an Indian military incursion. However, the exact purpose of the large terrain model is unclear. The border counterattack campaign was originally considered an Army offensive campaign, although some PLA books now refer to it as a joint campaign. This campaign includes initial border defense actions with a transition to the offense to regain lost territory and restore the situation.

The two mountain brigades and independent mechanised brigade are the closest ground forces to Arunachal Pradesh, although the 13th Group Army trains in mountain warfare and could deploy as needed. While no PLA forces are permanently garrisoned in the Aksai Chin area, it is likely that the mechanized infantry division in Hotan would deploy to this area. Air and missile strikes would support the ground operations to annihilate and expel invading enemy forces depending on the weather, or as in the Sino-Indian Border War operations could consist of mostly ground operations.

The PLA would conduct a Mountain Offensive Campaign or possibly a Joint Fire Strike Campaign if Beijing issued orders for offensive operations. A Joint Fire Strike campaign would support the border counterattack or mountain offensive, but could also represent an independent campaign. The terrain, weather, and difficult engineering and comprehensive support conditions restraining the deployment and sustainment of forces could make a joint fire strike appear more advantageous to a mountain offensive, which would require a substantial advantage in the correlation of forces for the attacker operating under terrain and weather restrictions. As an independent campaign, a joint fire strike could represent punitive strikes against key Indian targets. A joint fire strike campaign is a long-range precision strike by long-range rocket, missile and air forces with the objective to destroy important enemy targets, paralyse the enemy's operational system of systems (integrated force grouping), weaken the will to resist and destroy war potential, or create conditions for other operations. The Chinese leadership could well conclude that conducting precision strikes against key Indian targets was preferable to conducting difficult offensive ground operations where the defender has an advantage.

(From 'China Brief Volume 17 Issue:1 Courtesy: Kevin McCauley)

Metal Dragons at High Altitude

China's Armour in Ladakh

The Sino-Indian stand-off in June 2020 took an ugly turn when 20 soldiers of the Indian Army lost their lives in brutal face off with PLA members. According to open sources, China had earlier also moved mechanised and armoured forces into the Ladakh region and even though precipitous mountainous country is not an ideal place for such conflict, there are several areas which can be considered as terrain for a decisive encounter.

So what can the Chinese Army deploy here? There are five Armoured Fighting Vehicles types that they can deploy in high altitude mountain warfare against Indian forces.

ZTZ 99A

ZTZ 99 is the most advanced main battle tank presently deployed by the PLA, which was developed to counter advanced MBTs from the West and Russia. Development history of this tank goes back to the late 80s and has its origins from the Type-90 II platform, from which the Type-98G itself was developed and ultimately entered service as the Type-99A. The tank is equipped with a 125 mm smoothbore gun which can fire APFSDS, HEAT and HE-FRAG as well as anti-tank guided missiles. According to Chinese media, the new domestically developed APFSDS can penetrate more than 700 mm of RHAe armour at ranges of upto 2000 meters thus enabling it to counter a wide range of armoured threats. This composite armour is also protected by Explosive Reactive Armour plates, the GL-5 active protection system giving it extra protection from incoming enemy anti-tank missiles. Along with the new fire control system, navigation system, data-link and a battlefield management system, the ZTZ 99A has hunter killer capability as well. As part of PLA's 76 Group, these MBTs have been recently seen in exercises in the Tibetan Plateau.

ZTZ 96A

While the Type-99 tank is spearhead of the Chinese armoured forces, the Type-96 is its backbone. Like the Type-99, this third generation MBT was developed in the late '80s, the definitive Type-85-IIM inducted under the new name. Equipped with a 125 mm smoothbore gun, it can fire similar ammunition as the Type-99 but according to reports, its firepower does not match that of the Type-99.

The Type-96A is a further upgraded variant which can be deployed at high altitudes and is powered by a 780 hp engine, this platform too protected by explosive reactive armour. These tanks as part of China's 72 Group have also been observed during recent exercises in Tibet.

ZTQ 15

The Type-15 light tank was developed specifically for operations in the environment and terrain where PLA MBTs have problems in operation and are specially designed for

mountain warfare. The ZTQ 15 replaces decade old Type-62 light tank, based on the Type-59 main battle tank which itself was a licensed version of the Soviet T-54.

The ZTQ 15 weighs 33tonnes and is equipped with a 105 mm rifled gun and very 'effective' against lightly armoured infantry fighting vehicles. In a programme recently aired on China's CCTV, the tank's new 105 mm APFSDS ammunition can defeat 500 mm of rolled homogeneous armour, the tanks themselves also reportedly equipped with new generation explosive reactive armour. A 1000hp engine gives this tank much needed mobility in high altitude, mountainous terrain and narrow valleys where it is virtually impossible for heavier tanks to operate. This light tank has been seen in several military exercises in Tibet and recent reports have it that the People's Liberation Army Navy/Marine Corps are to induct this AFV to augment their firepower.

Type-63A

This is an amphibious armoured fighting vehicle, an upgraded version of the legacy Type-63 version. The 20 tonne AFV is equipped with 105 mm rifled gun replacing the old 84 mm calibre gun thus significantly enhancing its firepower. The APFSDS fired through the gun can defeat rolled homogeneous armour equivalent to 400 mm. The Type-63A has a new fire control system, digital fire control computer, integrated commander sight with laser rangefinder input, and new optics for a range of operations.

ZBD-04A

This is an infantry fighting vehicle which resembles the Russia BMP-3, armed with a 100mm rifled gun with a co-axial 30 mm cannon. The very high rate of fire enables the tank to quickly engage lightly armoured platforms and can use its co-axial 7.62 mm machine gun against infantry. The rifled gun can fire anti-tank guided missiles as well.

The ZBD-04A is an upgraded platform of ZBD-04 and has adopted several modifications, also equipped with applique armour. This tank type has also been identified in high altitude regions of Tibet.

There are several other armoured fighting vehicles which can be deployed during a serious confrontation but the above identified AFVs are those which the PLA will definitely employ if the situation on the Ladakh front gets out of control.

Sankalan Chattopadhyay
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"Flanker to Flanker"

How to tell the PLA Sukhois apart!

A a news item dated 1 June 2020, had *Chinese fighters flying 30-35 kms from Eastern Ladakh, India watching closely*. The flight of Chinese fighters some 100-150 kms from the LAC, operating from PLAAF bases at Hotan and Gargunsa, and continued that "the IAF was keeping a watch on such movements".

On 26 May, a twitter user *@detresfa,* who specialise in IMINT/OSINT, showed at least 4 Chinese *Flankers* (most likely J-11s) deployed at Ngari Gunsa dual use airport as tensions between India and China were increasing. On 2 June, another twitter user *@RupprechtDeino,* who specialises in PLAAF equipment, reported the presence of more aircraft at Hotan including some J-16s. Not long after, the Indian Air Force deployed its own *Flankers* (Su-30MKIs) in this theatre.

As more and more *Flankers* are airborne on both sides of the LAC, one can reasonably ask as to how many *Flankers* do both sides operate and which variants? This article aims to help!

The PLAAF has over the last two decades, evolved considerably and is now equipped primarily with local variants of the *Flanker*. The Chinese *Flankers* trace their lineage to the Su-27SK, which was export version of the Su-27 for China and Vietnam (SK = *Sereeynyy Kommehrcheskiy* or Customer Version). The Su-27SK had a higher MTOW (33,000 kg) compared with baseline Su-27s with a reinforced landing gear but avionics were 'downgraded'.

In the first half of the 1990s, China bought 48 Su-27s from Russia in two batches, which included 36 Su-27SKs and 12 Su-27UBKs. This was followed by negotiations for local co-production of Su-27SKs, but simultaneously a deal for Su-30s was also being negotiated between China and Russia. An initial order of 40 was placed and followed by another batch of 40, with first 10 Su-30MKKs being delivered by December 2000.

In July 2002, talks were reportedly on concerning possible sale of 30 Su-30MK2s, a naval derivative of Su-30MKK with a new radar, modified HUD and to be integrated with the Kh31A AShM. The deal was finally signed in August 2003 for 24 Su-30MK2s.

Shenyang J-11

With negotiation for local production conclusive, the Chinese contracted in 1996 for licenced manufacture of about 200 Su-27SKs to be known as the Shenyang J-11, with Russian avionics, radars and engines. The PLAAF received an initial batch of Russian built Su-27SKs and then CKD kits for further production which began in 1998, but stopped after some 100 aircraft were built. These were the original J-11As, however the PLAAF was reportedly not satisfied with these.

In mid-2002, the upgraded J-11B was revealed, powered by an indigenously developed engine, the WS10 (as opposed to the AL31F on J-11As which, were also retrofitted and then removed again on J-11Bs), radar (Type 1474), avionics, material modifications etc. The Russians reportedly offered the Su-27SKM in 2003 but this was rejected.

Around 120 J-11Bs were produced but according to Russian sources, these were done illegally without licence rights, not uncommon in China. Just as the J-11was based on the Su-27SK, the Chinese designed a trainer variant from the Su-27UBK called J-11BS, which is also combat capable.

J-15

While the PLAAF was laying foundations for a modern air force with J-11A/Bs and Su-30MKKs, the Navy (PLANAF) also wanted to adopt the Type. Earlier, China had acquired a Su-33 prototype (T-10K-3) from the Ukraine in the early 2000s and used the structure of this prototype, combined with experience with the J-11Bs, utilising its avionics, to create the J-15 *Flying Shark*, well seen on Chinese aircraft carriers. Approximately 60 were manufactured and the PLAN's carriers *Liaoning* and *Shandong* have a complement of 26 and 36 J-15s respectively and around 36 similarly on the third aircraft carrier under construction.

The J-15A was a further development of the J-15, reportedly with a catapult gear. The J-15S is the twin seat variant and a dedicated EW variant has also been developed (the J-15D).

Alongwith development of J-11Bs, a naval variant was also produced, the J-11BH and a subsequent trainer version, the J-11BSH, but although used by PLANAF, these are not carrier capable.

The latest J-11 variant is the J-11D which is equipped with the IRST, an AESA radar, improved WS-10A engine, range of new weapons like the PL-10, PL-21 etc. This first flew in 2015, and is supposedly in the same league, if not better than, the recently procured Su-35s. However, this programme's future is uncertain.

Su-30MKK

While the single seater Su-27SK gave rise to the J-11 family, the Su-30MKK (multirole) and Su-30MK2 (maritime strike) were being closely studied by the Chinese. The twin seater Su-30MKK, a close cousin of the IAF's Su-30MKI, shares some features of the Su 35, but differs from the MKI in many different ways, particularly the TVC, canards etc.

J-15D

J-16

From the Su-30MKK, the Chinese evolved their latest multirole *Flanker*, the J-16, which also included features from the other twin seater, the J-11BS. Making its debut in 2017, the J-16 reportedly has an AESA radar, better IRST, is powered by the WS10B and can be equipped with a variety of weapons including PL-8, PL-10 air-to-air missiles, super and subsonic anti-ship missiles, satellite guided bombs, cruise missiles and electronic counter measurse. Around 128+ J-16s have been produced, this variant touted as "the Chinese counter to the F-15E Strike Eagle".

Among other variants, the most recent (and again most mysterious) is the J-16D, a dedicated EW variant with wing tip EW pods, but without an IRST and internal cannon present on the baseline J-16.

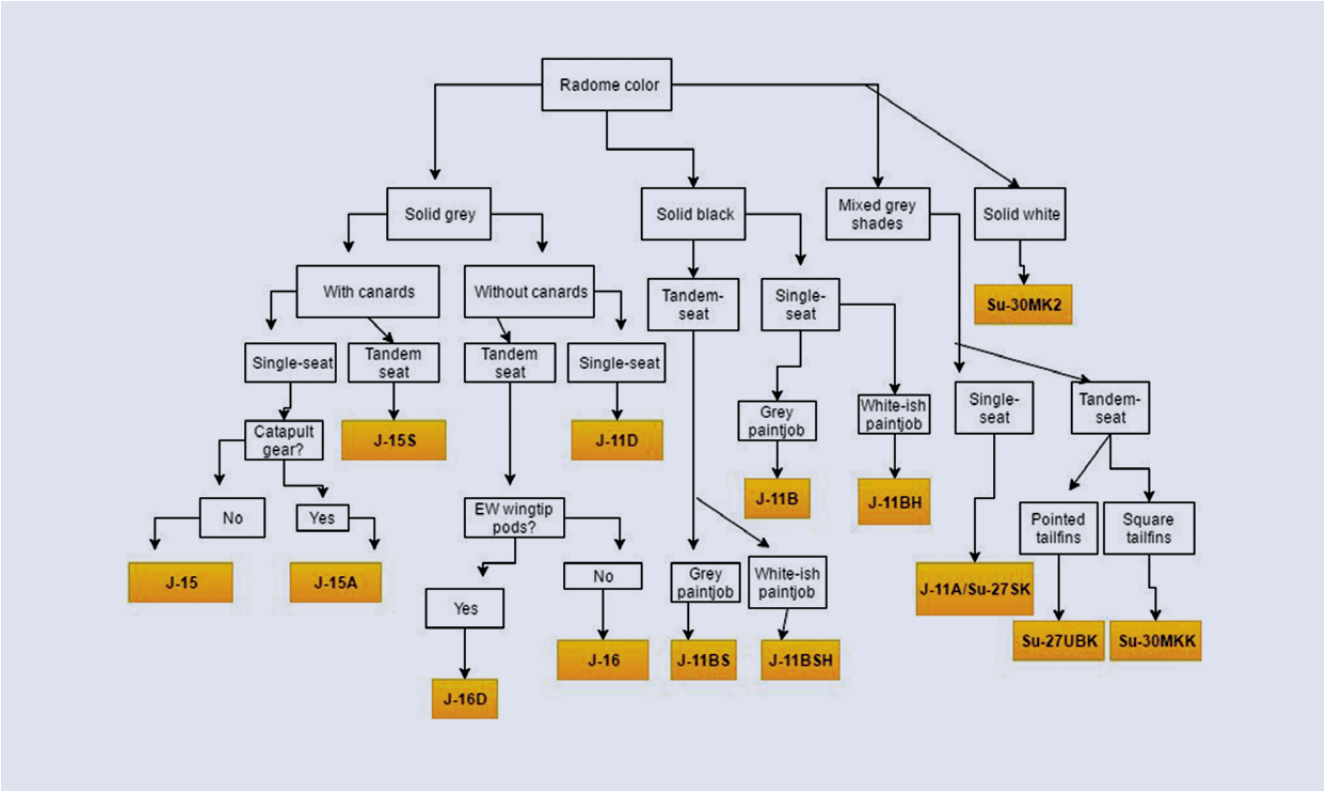
Su-35S

The PLAAF has also received 24 Su-35S fighter from Russia over the 2016–18 period, and were offered more batches of this Type in 2019, even though the Russians have been cautious about China reverse engineering these as well. China was particularly interested in the Su-35's engine for their J-11Ds. Naturally with so many variants present, anyone would be confused and wonder how to actually distinguish between these variants: so here's a neat little diagram to help!

The PLAAF's backbone

The J-11Bs along with J-16s, will form the backbone of PLAAF over the next decades, with other *Flanker* variants continuing to support them in coming times. It is the PLAAF's own confidence with the *Flanker* family that would decide upon their numbers and deployment even as the Chinese industry is developing next generation fighters, the J-20 and J-31, whose eventual capabilities will certainly have been based on their experience with the *Flanker*.

Shwetabh Singh (Twitter @singhshwetabh71)



Su-35s to join Rafales in Egypt

According to TASS news agency, the Komsomolsk-on-Amur Aircraft Plant (KnAAZ) has begun production of Su-35 multi-role fighters for Egypt. Over two years back, in March 2018, the Russian arms trade company Rosoboronexport had signed a contract with Egypt for the supply of over 30 Su-35 fighters in 2020-23. Egypt will be the second foreign customer for the Su-35, after China which has received 24 fighters and is considering another batch. The Egyptian Sukhoi Su-35s will operate alongside Dassault Rafales, Egypt also having ordered 24 of the French fighters.

Meanwhile, Egypt has signed for significant numbers of other aircraft and helicopters, from both the USA and Russia including 46 AH-64D Apache helicopters. Earlier, two major orders were placed for 46 MiG-29M and two-seat MiG-29M2 fighters and for 46 Ka-52E combat helicopters. All the MiG-29Ms have since been delivered and the Ka-52E contract will be completed this year.

Japan to procure 105 F-35 JSFs

The US State Department has approved a possible FMS to the Government of Japan of 105 F-35 Joint Strike Fighter aircraft and related equipment for an estimated cost of $23.11 billion. The Government of Japan has requested to buy 63 F-35A Conventional Take Off and Landing (CTOL) aircraft, 42 F-35B Short Take-Off and Vertical Landing (STOVL) aircraft, and 110 Pratt and Whitney F135 engines which includes 5 spares.

F-35 production slows

Lockheed Martin has "temporarily slowed production of the F-35 Lightning II as it seeks to mitigate the impact of COVID-19 pandemic on its supply chain". On 23 May it announced reduction of manufacturing schedule for its fifth-generation multi-role stealth fighter at Fort Worth, Texas. According to a company press release, "the new work schedule 'divides' each shift into three groups. On a rotation, each group will work for two weeks and then will have a week off… The alternate schedule allows Lockheed Martin to staff the production line to meet a slower workflow resulting from supplier delays. In addition, it provides work rhythm that retains the expertise of the talented workforce and provides opportunities to adjust work to better support production."

Japan's F-3 future fighter programme

In their plans for replacement of the present indigenous Mitsubishi F-2, the Japanese *Acquisition, Technology & Logistics Agency* (ATLA) are looking at collaboration with UK and US agencies. Design and Development of the F-3 will coincide with the UK's Tempest development activity, as well as US efforts to develop sixth-generation capabilities. Japan's future fighter will be an all-new, clean sheet design, which rules out a collaboration with

Lockheed Martin that involved updated version of the F-22, using technologies from the F-35. The Japanese have already invested significant resources into developing advanced fighter technologies and are planning to place emphasis on the *Future Fighter's* ability to work alongside unmanned aircraft.

According to ATLA, "we recognise that technologies related to unmanned air vehicles using artificial intelligence are rapidly developing, and various unmanned equipment is being used internationally. We will have enough growth potential to accommodate advanced technologies such as manned-unmanned teaming accordingly as technologies mature" *(image of artist's concept)*.

Su-30SM as N-bomb carrier

According to Piotr Butowski, the renowned expert on Russia's aviation industry and its air arms, the Russian Air Force has been practing N-bomb delivery by Sukhoi Su-30SMs of the 120th Independent Fighter Aviation Regiment based at Domma, east of Lake Baikal. In April 2020, the Russian defence ministry announced that "crews of Su-30SM fighters from the Eastern Military District's aviation unit destroyed simulated well-fortified targets of at a training ground in Transbaikalia". Sometime later, pictures of a Su-30SM fighter with an IAB-500 bomb suspended on the rear centreline pylon appeared on the Russian internet, together with images of the bomb explosion. The IAB-500 (*Imitatsionnaya Aviatsionnaya Bomba,* "imitating aerial bomb" of 500kg, 1,102lb class) was developed in the early 1970s and is externally almost identical to the tactical nuclear bomb of this period, the RN-24 (*izdeliye* 244N).

RAAF Hawk replacement plans

The Australian Government have reportedly begin the search for a new advanced jet trainer to replace the 30+ BAE Systems Hawk Mk.127s operated by the Royal Australian Air Force. A request for information for the Air 6002 Phase 1 requirement was issued on 1 June, according to which "aircraft performance and mission systems that bridge between the pilot training system and fast jet conversion courses will be critical….the future lead-in fighter training system will be expected to remain relevant to its role in training fast jet aircrew and supporting joint force training, to be adaptable to those needs as they evolve, to be affordable, and to be safe out to an indicative timeframe of 2050".

A lead contender could be the Boeing-Saab T-7A Red Hawk *(in picture)*. On order for the US Air Force, the type has "the flexibility to evolve as technologies, missions and training needs change". Leonardo could pitch in with its M-346 as "a competitive and no-risk solution compared with the alternatives", while the Korean T-50 "is reviewing the Australian request".

ESCAN radars for Typhoons

Airbus has been awarded contracts for the development, supply and integration of 115 ESCAN Radars for the German and Spanish Eurofighter Typhoon fleet. This entails the delivery and integration of 110 Captor-E radars for Germany and an initial batch of 5 radars for Spain, to be delivered by 2023. The new sensor will equip Tranche 2 and Tranche 3 Eurofighters as well as new aircraft.

Joint RAF-Qatar Typhoon Squadron

The Royal Air Forces' No.12 Squadron, based at Coningsby, Lincolnshire will begin to train Qatar Emiri Air Force pilots "as they prepare to receive their first aircraft in 2022". In December 2017 Qatar signed a contract with BAE Systems for 24 Typhoons, with the deal including personnel training and a six-year support package. Including precision-guided weapons from MBDA and nine BAE Hawk advanced jet trainers, the contract was for some $7.5 billion. The composite RAF squadron sports a special tail livery depicting the flags of both nations. Qatar's minister of state for defence affairs, Dr Khalid bin Mohammad al Attiyah, stated that the effort represents an "alignment of vision and strategy in building for a stable and prosperous future for both nations and the world".

A-50U AEW&C modernisation

Upgrade of operational Beriev A-50 early warning aircraft to the A-50U version began in 2011, the modernised A-50U having the Shmel-M mission system developed by Vega, a new computing system with digital signal processing instead of the previous analogue type. The rotary radar antenna with mechanical scanning is retained, the data presentation system at the operators' stations improved using LCD screens instead of CRTs while navigation and communication systems have also been changed.

The aircraft continues with the same D-30KP2 engines as in the earlier version, the only external difference being the absence of auxiliary fins near the main landing gear nacelles on the A-50U. The A-50s are operated by the Aviation Squadron of Long-Range Radar Surveillance Aircraft, part of the 610th Combat Application and Flight Crew Conversion Centre (610 TsBP PLS) at Ivanovo Severnyi (North).

KC-130J Tanker for USMC

Lockheed Martin has recently delivered the first KC-130J Super Hercules tanker assigned to Marine Aerial Refueler Transport Squadron 452 (VMGR-452), the Marine Forces Reserve squadron at Stewart Air National Guard Base, New York.

Modernisation of Luftwaffe IFF Systems

As part of modernisation of all NATO's IFF identification systems to the new standard, Hensoldt are equipping 90 of the Luftwaffe's Tornados with its Mode 5-capable LTR 400 transponder. An initial order for the delivery of 42 systems "worth several million euros" has been placed by Panavia Aircraft GmbH, the industrial consortium for the development of the Tornado.

Boeing E-7A Wedgetails for RAF

Boeing as prime contractor for the RAF's E-7A Wedgetail procurement programme has announced expansion of the industry team. The platform, which will be designated Wedgetail AEW1 in RAF service, will operate from RAF Waddington, Lincolnshire from 2023, replacing the Boeing E-3D Sentry AEW1 after its retirement in December 2022. STS Aviation Services will undertake the work at its Birmingham Airport facility in the West Midlands, converting five Boeing 737 Next Generation (NG) commercial airliners into what Boeing calls a "modern airborne battle management fleet". Leonardo will lead contracting effort from its site in Luton, Bedfordshire, with Thales UK acting as a subcontractor and deliver a domestically produced Defensive Aids System (DAS) for the RAF's future AEW&C fleet (*in photo are RAAF aircraft).*

Specialist MiG-31 'Kinzhals' in Russian Far East

Again, according to Piotr Butowski, the Russian Air Force has based MiG-31Ks at Anadyr airfield on Chukotka, Russia's Far Eastern Federal District. The *Kinzhal* is a combination of the MiG-31 aircraft, which has been in service since 1983, and the *Iskander* surface-to-surface missile, which was developed by the Machine Building Design Bureau. In 2018, President Putin revealed that the *Kinzhal* system can deliver "nuclear and conventional warheads over a range of over 2,000 kilometres [1,243 miles]" and that the missile flies "at hypersonic speed, ten times faster than the speed of sound". In related news, in September 2018 test flights of an anti-satellite (ASAT) system *Burevestnik* or Storm Petrel, which also uses MiG-31 as a platform, began at the aircraft industry's test centre at Zhukovsky, outside Moscow.

Third C-390 for the Brazilian Air Force

Embraer has recently delivered the third multi-mission medium airlift C-390 Millennium to the Brazilian Air Force (FAB), the aircraft operated by the *First Troop Transport Group* (1st GGT). Similar to the first two aircraft delivered in 2019, this too will perform aerial refueling missions.

PAF JF-17 exercise from Skardu

According to PTV, the Pakistan Air Force has recently deployed JF-17 Thunders at Skardu, carrying out air exercises in the Gilgit-Baltistan region during the third week of July. According to reports "the PAF CAS, Air Chief Marshal Mujahid Anwar Khan visited PAF Base Qadri at Skardu and witnessed various operational activities, including rapid deployment of fighter aircraft and combat support elements". He was also briefed on the ongoing infrastructure development works at the air base *(see article in this Issue).*

Australia orders Triton RPA

The Australian government has ordered an additional Northrop Grumman MQ-4C Triton Remotely Piloted Aircraft System, bringing its fleet to three. The RAAF's Triton and P-8A Poseidon will operate in complementary manner "to deliver comprehensive Maritime Patrol and Response capability." Australia's 12th P-8 Poseidon aircraft was delivered in December 2019.

GA-ASI to upgrade RPS and GCS for ANG

General Atomics Aeronautical Systems (GA-ASI) has been awarded a $12.1 million contract to upgrade MQ-9 Block 1 and Block 5 Remotely Piloted Aircraft and Block 25 Dual Control Module Ground Control Station (DCMGCS) and Block 30 Ground Control Station (GCS) for the US Air National Guard (ANG). This includes kits for High-Definition (HD) displays and Barrett Asymmetrical Digital Datalink Computers (BADDC), as well as Multi-Intelligence Smart Processing (MISP).

Team Tempest "on track"

In spite of disruptions caused by the coronavirus pandemic lockdown, the programme to develop the British-led future combat air system "remains on target". Formally launched during the Farnborough Air Show in 2018, 'Team Tempest' draws together leading UK defence industry players BAE Systems and Rolls-Royce, and the UK arms of Leonardo and MBDA, working in concert with

the Ministry of Defence (MoD) and the Royal Air Force's Rapid Capabilities Office.

This group has also been working with the MoD to advance the planned involvement of international partners Italy and Sweden, a trilateral meeting between the governments taking place (online) in May. According to BAE Systems Air "Throughout the lockdown period, we have continued to work in collaboration with the MoD and our *Team Tempest* partners, and have been able to minimise any impact on our work, … and are confident that any short-term delays can be mitigated as we continue to progress according to the original timescales outlined in 2018 – and ultimately achieving initial operating capability in 2035."

Boeing's 'Loyal Wingman'

The Royal Australian Air Force (RAAF) is to get three prototypes in the *Loyal Wingman Advanced Development Programme* (LWADP) a highly capable but affordable UAV. The aircraft's maiden flight is scheduled later in 2020, following ground and taxi testing. The Airpower Teaming System is designed to be flown alongside other platforms, with advanced control, communications and manned/unmanned teaming technologies also enabling it to undertake missions autonomously. The 8ft 5in-long (2.6m) modular nose cone has a volume of more than 52ft³ (1.47m3) and an open electronics architecture to let operators quickly change payloads such as intelligence, surveillance and reconnaissance cameras. During development, the manufacturer had developed a 'digital twin' of the Loyal Wingman to help model structures, systems, capabilities and lifetime maintenance requirements.

New Russian supersonic airliner planned

Sources have it that development of a new civil supersonic airliner has begun at Zhukovsky by the Central Aerohydrodynamic Institute, the Central Institute of Aviation Motors, and the Siberian Aeronautical Research Institute. According to Director General Andrei Dutov, creation of a commercially-successful supersonic aircraft is a "big challenge … but it is necessary to find effective solutions to the problems of high levels of noise and sonic shock, increase the fuel efficiency of powerplants, and reduce harmful emissions". The Russians intend to create a concept and full programme for the aircraft, including gathering scientific and technical resources, enabling manufacturers to start technical design work by 2022. Preliminary drawings have a twin-tailed configurations with centrally-mounted engines being examined. The aircraft would need to cruise at some 1,100kt (2,000km/h) for which new engines combining high thrust with economic efficiency, will be vital.

The Aerion AS2

Aerion has revealed final design configuration for its AS2 supersonic business jet, with a 79ft-span (24.08m) delta-shaped wing, gradually swept leading edge and reverse taper trailing edges. This wing shape moves away from the supersonic natural laminar flow design, an area of engineering that Aerion has pursued since it began investigating technology for its supersonic business jet. Two of the aircraft's three engines are embedded within reshaped and repositioned nacelles mounted under the wing length of the fuselage is reduced from 170ft (51.82m) to 144ft 11in (44.17m), with a more serpentine look. The rear fuselage has been revised, with the T-tail replaced by a lower mounted horizontal tailplane and powered by GE Aviation Affinity medium-bypass engines.

Premature retirement of Airbus A380 fleet

The Covid-19 pandemic has had devastating effect on the world as inevitably also on global air travel, with airlines massively impacted since early months of 2020. Certainly the most dramatic decision is Air France withdrawing its entire Airbus A380 'super jumbo' fleet from service with immediate effect, in May 2020. According to the Air France/KLM Group spokesperson, phase out of the A380s was to take place from 2022-23 as part of the fleet rationalisation strategy, "making the fleet more competitive, continuing to transform with more efficient and high performance aircraft, significantly reducing environmental footprint and so on". The financial consequences of the premature A380 phase out is estimated at Euro 500 million.

Lufthansa has also announced major reduction of its A380 fleet to eight by middle of the decade while Qatar Airways has announced withdrawal of all A380s by 2024. Etihad Airways are considering early retirement of the type.

Airbus in ATTOL flight tests

Following an extensive two-year flight test programme, Airbus has successfully concluded its Autonomous Taxi, Take-Off and Landing (ATTOL) project, in which Airbus carried out

autonomous taxiing, take-off and landing of a commercial aircraft through fully automatic vision-based flight tests using on-board image recognition technology – a world-first in aviation.

Over 500 test flights were conducted, some 450 of those flights dedicated to gathering raw video data, to support and fine tune algorithms, while a series of six test flights, each one including five take-offs and landings per run, were used to test autonomous flight capabilities.

21st ARJ21 for Chengdu Airlines

On fourth anniversary of ARJ21's operation with Chengdu Airlines, its 21st aircraft was received at Shanghai on 28 June 2020. This ARJ21 (B-605N) has an all economy-class cabin configuration.

More ATR 72-500s for Hi Air

Fledgling South Korean airline Hi Air, which was established in December 2019, has purchased two more ATR 72-500s to be supplied from the Company's asset management portfolio and complements Hi Air's existing fleet of two ATR 72-500s. HyungKwan Youn, the Ulsan-based carrier's chief executive, stated that these will support a domestic network expansion with five new routes.

Bombardier CRJ Series sold to Mitsubishi

Bombardier of Canada has completed sale of its CRJ Series aircraft programme to Mitsubishi Heavy Industries, Ltd (MHI) of Japan for approximately $550 million, "subject to post-closing adjustments and the assumption of liabilities by MHI related to credit and residual value guarantees and lease subsidies amounting to approximately $200 million". Through this sale, MHI has acquired the maintenance, support, refurbishment, marketing, and sales activities for the CRJ Series aircraft, including the related services and support network located in Montréal, Québec and Toronto, as also its service centres located in Bridgeport, West Virginia, and Tucson, Arizona plus the type certificates.

Signs of revival, amidst cuts

There are some early signs of revival and a number of airlines have announced re-start of scheduled air services. Ryanair and Iberia both plan to start from July 2020 and in the USA, Delta was to expand Latin American and Caribbean services in June from its main hub in Atlanta, while United will restart 40 long-haul routes from July. The International Consolidated Airlines Group (IAG) plans to remove 12,000 posts and media reports cited 5,100 could go at American Airlines, 3,000 at Ryanair and 3,000 at Virgin Atlantic. On 28 May 2020, easyJet announced a planned cut to 30% of its workforce, around 4,500 jobs. The grave situation has led to hefty state aid for some airlines. The federal German government's WSF economic stabilisation fund provided the Lufthansa Group with €9bn, with the Air France-KLM Group, Alitalia and Norwegian the other carriers to have received bailouts.

"Thousands laid off"

The global pandemic has had massive impact on the aerospace industry, with thousands of employees laid off. In late May 2020 Boeing announced 12,000 job cuts in the US, of which 6,770 are what the company called "involuntary layoffs". In the UK, Rolls-Royce will cut 9,000 positions, mainly at its Derby HQ. As Rolls-Royce CEO Warren East said: "Our airline customers and airframe partners are having to adapt and so must we." Paul Everitt, CEO of the UK aerospace trade association ADS said: "This signals a very difficult period for Rolls-Royce, its employees and its extensive UK supply chain. The crisis is having a major impact on aerospace companies who provide high value, long-term jobs in all regions and nations of the UK, putting thousands more jobs at risk."

Production of Boeing 737 MAX resumed

Boeing has resumed 737 MAX production at its Renton facility. Production was paused in January 2020 as the Federal Aviation Administration (FAA) continued to review the changes to approve flights. Boeing has introduced new initiatives to improve assembly efficiency and address quality control issues, including standard toolkits and processes for each work position. It is hopeful of securing FAA approval in the coming months before steadily increasingly production. Although, more than 200 orders have been cancelled, many airlines are still committed to the aircraft.

Upgraded H145S

The Airbus H145S, five-bladed medium twin-engined helicopter has been EASA certificated with deliveries beginning in September. The upgrade gives the H145 an additional 150kg of useful load because of the new bearing less main rotor, which increases lift maximum take-off weight by 100kg, Approval from the EASA for the new variant has been announced and US certification will follow later this year, with validation of the H145M military variant due in 2021. Assembly of the new standard (D3) is under way at the Donauworth facility in Germany earmarked for the Norwegian emergency medical services operator *Norsk Luftambulanse.* Airbus Helicopters is also offering the upgraded rotor as a retrofit, with around 80 kits ordered to date; work on the initial helicopter to gain the modification will begin in the fourth quarter.

Airbus Helicopters for Japan Police

Airbus Helicopters has an order for five new rotorcraft from Japan's National Police Agency, comprising a single H225 heavy-twin and four H135 light-twins. These will be in addition to the 22 Airbus Helicopters presently in service with the force, as well as three examples on order. The assets will be used for "wide-ranging law enforcement missions" by the Japanese.

Leonardo AW159 Wildcat fires Thales Martlet

First successful firings of the Thales 'Martlet' Lightweight Multirole Missile (LMM) from Leonardo's AW159 Wildcat helicopter have taken place. The firings were conducted as part of the UK MoD's Future Anti-Surface Guided Weapon (FASGW) programme which "demonstrated the integration of the Martlet onto the AW159 platform", a major milestone for the programme and will enable entry into service with the Royal Navy in late 2020.

Rostec/Russian Helicopters Mi-8AMT Arctic helicopter

Arctic version of the Mi-8AMT helicopter has completed flight-tests and 'procedure of acceptance' by the Federal Air Transport Agency *(Rosaviatsiya)*. The rotorcraft's main features include a unique system for heating transmission parts, designed by JSC *National helicopter Centre Mil & Kamov,* which provides for quick start of engines in extremely low temperatures. The system for heating transmission parts is complemented by an improved system for thermal protection of the cargo cabin and special thermal insulation shutters in sliding doors and cockpit doors.

First Ansat for EMERCOM

Kazan Helicopters have delivered the first Ansat helicopter to Russia's EMERCOM agency, at Kasimovo north of St Petersburg to be used for transporting staff, cargo and medical equipment in the cabin or underslung. Yuri Pustovgarov, Kazan Helicopters' managing director, stated that "the Ansat's light weight, manoeuvrability, agility and a high degree of readiness enable the type to address a wide variety of tasks, including those in an urban environment". Delivery of the Ansat to EMERCOM is part of a wider modernisation of helicopter operations in Russia. Some Ansats have been handed over to various city regions, including Moscow, Volgograd, Tver, Pskov and Nizhny Novgorod.

500th Longbow Fire Control Radar

The Longbow Limited Liability Company (LBL), a joint venture between Northrop Grumman Corporation and Lockheed Martin has recently delivered the 500th APG-78 Longbow Fire Control Radar (FCR) for the AH-64 Apache helicopter. This follows a five-year indefinite delivery/indefinite quantity (IDIQ) contract in January by the US Army, enabling rapid post-production support services of Longbow FCR to international customers. Deliveries of the Longbow FCR will continue through 2028 driven by several new international customers seeking advanced fire control radar capabilities. The Qatar Emiri Air Force was the recipient of this 500th FCR unit.

8,000th R-R engine from Dahlewitz, Germany

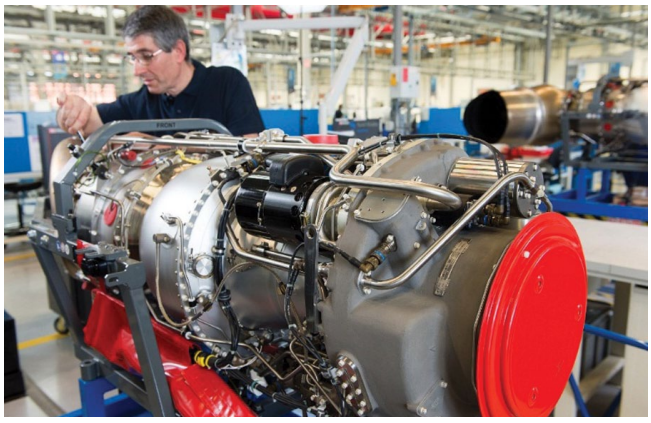
Rolls-Royce has delivered the 8,000th engine produced at its site in Dahlewitz, Germany. The BR725 engine will be shipped to Gulfstream Aerospace Corporation in Savannah, Georgia, USA, to power its business jet, the G650ER. Alongside production of the BR725, a range of business jet engines including the BR710

and Pearl 15 engines, as well as the Trent XWB for the Airbus A350, are assembled at the facility. The Dahlewitz site is also where development and testing facilities are located for Rolls-Royce's new power gearbox for the UltraFan demonstrator programme.

Safran support for German and Norwegian NH90s

Safran Helicopter Engines has signed a support contract with the NATO Helicopter Management Agency (NAHEMA), to support 276 NH90 engines owned by BAAINBw (Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support) in Germany and the Norwegian Defence Materiel Agency (NDMA). The RTM322 engines will be supported by Safran's Global Support Package (GSP) under NAHEMA management.

Safran support for Dutch Cougars



Safran Helicopter Engines has signed a multi-year contract with the Royal Netherlands Air Force to support its Makila-powered AS532U2 Cougar Mk.II helicopter fleet. The contract formalises a Maintenance, Repair, and Overhaul (MRO) agreement to support over 40 Makila 1A2 engines until their end-of-life.

BAE tests APKWS

BAE Systems has successfully completed test firing of its APKWS laser-guided rockets from a tactical configuration ground-based weapon system. The proof-of-concept testing demonstrated the flexibility of APKWS rockets to deliver standoff precision strike capabilities for ground forces, "providing a unique solution for engaging targets with greater range than small arms fire and without the need for air support".

LM PAC-3 MSE successful test

A Lockheed Martin PAC-3 Missile Segment Enhancement (MSE) interceptor recently detected, tracked and intercepted a tactical ballistic missile target in a test at White Sands Missile Range, New Mexico. "This test verified missile software and hardware component upgrades that enable future performance of the PAC-3 MSE interceptor to keep pace against expanding threats of today and tomorrow".

Kuwait orders PAC-3

The US State Department "has made a determination approving a possible Foreign Military Sale to the Government of Kuwait" of eighty-four Patriot Advanced Capability (PAC-3) Missile

Segment Enhancements (MSEs) and related equipment for an estimated cost of $800 million. The PAC-3 Missile is a small, highly agile, kinetic kill interceptor for defence against tactical ballistic missiles, cruise missiles and air-breathing threats, destroying the target by direct impact.

IRIS-T SLS qualified by Swedish Army

The Swedish Army has qualified its new GBAD system (EldE 98) including IRIS-T SLS missile launchers and interceptors made by Diehl Defence, firings carried out at the Vidsel test range, Sweden. The interceptors were launched in 'Lock on' before launch and 'Lock on' after launch mode against drone targets, and "all ground launched IRIS-T missiles intercepted the drone targets".

Raytheon Missile Defence Radars for Saudi Arabia

Raytheon Missiles & Defense have received a $2.3 billion Missile Defence Agency production contract for seven gallium nitride (GaN)-based AN/TPY-2 radars as part of the Terminal High Altitude Area Defence (THAAD) system, designed to protect against incoming ballistic missile threats. The contract is part of FMS to the Kingdom of Saudi Arabia.

MBDA's MMP missile for BLOS engagement

LynkEUs, an MBDA coordinated project, has been selected by the European Commission as part of the new *European Defence Industrial Development Programme* (EDIDP). LynkEUs is the first

technological and industrial contribution to the objectives of the *Permanent Structured Cooperation* (PESCO) *Beyond Line Of Sight* (BLOS) capability project, approved in November 2018 by the EU Defence Ministers. The LynkEUs project is managed in close partnership with the French, Belgian and Cypriot armed forces. The project seeks to define an initial operational concept for a European BLOS capability and provide an opportunity to identify and test emerging solutions of potential value for future upgrades to the capability, and will be validated by a test campaign.

NGC's Firebird capability flights

Northrop Grumman has recently completed a series of mission-focused engagements, including integration and testing of the Overwatch Imaging's TK-9 Earthwatch sensor. The sensor was integrated in one day as part of ongoing capability flights validating the wide range of missions that the Firebird system can perform for government and commercial customers. The Firebird demonstrated several data collection missions, including wide-area surveillance, pattern of life monitoring, route clearance, search and rescue, high-value subject tracking, hostage recovery, and fire hotspot detection. Four 10+ hour manned flights were conducted with 100 percent aircraft availability for day and night operations.

Milrem Robotics Type-X RCV

Milrem Robotics and John Cockerill Defense have showcased the Type-X Robotic Combat Vehicle with the Cockerill Protected Weapons Station Gen. II (CPWS II) to select military forces from around the world. The Type-X vehicle chassis is a revolutionary design for a mobile modular multi-mission vehicle that provides platform for a family of 'unmanned armoured vehicles'. The Type-X weighs less than 12-tonnes, enabling rapid deployment into combat zones, either by parachute or heavy lift helicopter.

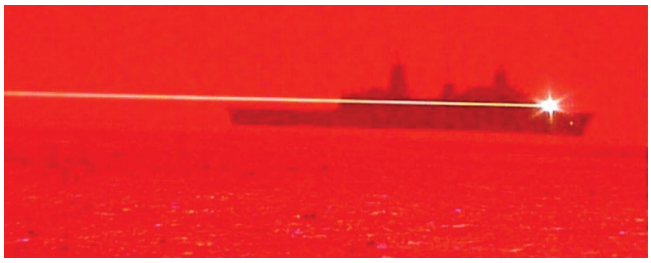
50,000 Artillery Precision Guidance Kits from NGC

Northrop Grumman have announced their surpassing the production and delivery of 50,000 Precision Guidance Kits (PGK) for 155mm artillery projectiles. The company recently signed a $137 million modification to its base contract for PGK production with the US Army and US Marine Corps to produce additional precision guidance kits.

Safran's E-NYX NVG

Safran Electronics & Defense has received the first orders for its new E-NYX wide field-of-view night vision goggles (NVG). "Combining extremely light weight with enhanced reliability, robustness and performance because of its expanded 47° field of view, E-NYX has been selected by two NATO countries that recently confirmed their plans to join the *Takuba Task Force*. E-NYX is Safran's Enhanced multirole NVG, draws on the full range of expertise in portable optronics (electro-optical equipment) and image intensification built up over the last 30 years by Safran and its strategic partner, Theon Sensors.

Laser Weapon System demonstrator tests



The US Navy's amphibious transport dock ship USS *Portland* (LPD 27) successfully disabled an unmanned aerial vehicle (UAV) with a Solid State Laser - Technology Maturation Laser Weapon System Demonstrator (LWSD) MK2 MOD 0 on 16 May. The LWSD is a high-energy laser weapon system demonstrator developed by the Office of Naval Research and installed on the *Portland* for an at-sea demonstration.

Austal USA Delivers 12th *Independence*-class LCS

Austal USA has delivered its 12th *Independence*-class Littoral Combat Ship (LCS) to the US Navy, from the company's shipyard in Mobile, Alabama. The future USS *Oakland* (LCS 24) is the second ship delivered by Austal USA to the US Navy in 2020, following the delivery of USS *Kansas City* (LCS 22) in February.

RR/MTU propulsion systems for RN Type 31 Frigates

Rolls-Royce is to supply complete MTU propulsion systems for five new Type 31 general-purpose frigates for the Royal Navy. The order comprises 40 engines and generator sets to be used for main propulsion and on-board power generation, the MTU Callosum propulsion control and monitoring system and Integrated Logistics Support (ILS). Each new frigate will be powered by four MTU 20V 8000 M71 engines, delivering over 8,000 kW.

On-board power will be provided on each vessel by four MTU generator sets based on 16V 2000 M41B units, each delivering in excess of 900 kW.

Upgraded Phalanx CIWS

The Royal Australian Navy's latest upgrade of the Mark 15 Phalanx Close-in Weapon System (CIWS) has achieved Initial Operating Capability. Delivered on schedule, the upgraded capability is being progressively rolled out until late 2023 across the RAN's destroyers, amphibious ships and new supply tankers.

US Navy contracts for RR

Rolls-Royce has secured recent agreements with the US Navy for ship engines, propulsion components and services valued at up to $115.6 million, which includes 16 new MT7 gas-turbine engines for Ship-to-Shore Connector Landing Craft. The MT7 engine is produced in Indianapolis, in the US, and is a variant of the Rolls-Royce AE 1107C engine powering the V-22 aircraft and is a member of the Rolls-Royce AE family of engines.

BAE Systems VLS Canisters for USN

The US Navy has awarded BAE Systems contract to produce multiple types of Vertical Launching System (VLS) canisters at a value of $955 million. The initial contract was awarded in February, followed by contract modifications of $99 million and $43 million received in March and May respectively. Options on the contract include additional canister types for future Navy production requirements.

Karachi Shipyard gun boats, tugs for PN

The Pakistan Navy has contracted Karachi Shipyard & Engineering Works (KS&EW) to build stealth gun boats and tugs, with the signing ceremony taking place at the Ministry of Defence Production.

The gun boat will have "stealth features, armour protection and is capable of achieving high speed, indigenously designed by the Pakistan Navy." Additionally, 2 tugs designed to operate in rough weather and capable to conduct salvage operations are be constructed.

Seen in the photo are Managing Director Karachi Shipyard & Engineering Works (KS&EW), Rear Admiral Ather Saleem, Director General Munitions Production, Air Vice Marshal Muhammad Qaiser Janjua. Maj General Akif Iqbal, Additional Secretary Defence Production and Rear Admiral Ovais Ahmed Bilgrami, Deputy Chief of Naval Staff (Operations).

Keel laying of Pakistan's 'Milgem'-class corvette

Keel laying ceremony of the first *Milgem*-class corvette for the Pakistan Navy took place at Istanbul Naval Shipyard (INSY), Turkey. The contract is for corvettes for the Pakistan Navy with

Transfer of Technology (ToT) and had been signed with ASFAT (the Turkish state owned Defence Firm) last year. The contract entails construction of two corvettes in Turkey plus two at Karachi Shipyard & Engineering Works (KS&EW). "Construction of corvettes in Pakistan is aimed at providing impetus to local ship building industry and further enhance KS&EW capabilities'.

Leonardo maintenance contract with Danish Navy

Leonardo has signed a twenty-year framework agreement with the Danish Defence Acquisition and Logistics Organisation (DALO) providing for logistics support and the possible future upgrade of the seventeen 76/62 Super Rapid Gun Mounts in-service with the Danish Navy's *Iver Huitfeldt*-class frigates, *Thetis*-class Inspection Ships and *Knud Rasmussen*-class Inspection Ships. The 76/62 Super Rapid (SR) gun mount is a lightweight, rapid-fire naval gun which delivers performance and flexibility in all air defence and anti-surface roles, particularly in an anti-missile role.

GE powers USS Zumwalt

The US Navy has taken delivery of the USS *Zumwalt*, its first full-electric power and propulsion ship. GE's Power Conversion business was the designer and provider for the high-voltage system (HV), propulsion drive trains consisting of multiphase converters and Advanced Induction Motors (AIM) for this DDG 1000-class of futuristic destroyers.

UAE's *Hope Probe* to Mars

On 20 July 2020 *Al Amal,* or 'Hope Probe', weighing 1.3 tonnes was launched via the H-2A space launch vehicle from Japan's Tanegashima spaceport, "cheered by hundreds of scientists and the UAE's leadership as the upper stage containing the probe separated from the launch rocket." The solar panels will charge the batteries of the spacecraft for its 495 million kilometer journey to Mars even as within some hours, the ground segment at Mohammed bin Rashid Space Centre in Dubai communicated with the *Hope Probe.*

China's Mission to Mars

On 23 July China launched its probe to Mars, Tianwen-1 which was carried by a Long March-5 rocket lifting off from the Wenchang launch site in Hainan province. The onboard rover, which is designed for a life of 90 Mars days is to carry out exploration and research on geomorphic land forms.

Communicating the past with determination

Dassault Aviation becomes Patron of the Order of Liberation

Eighty years after General de Gaulle's historic appeal of 18 June, Dassault Aviation was honoured in support of the French Order of Liberation. To formalise this patronage, a meeting was held at the Chancellery of the Order of Liberation, between General Christian Baptiste, national delegate of the Order, and Eric Trappier, Dassault Aviation Chairman and CEO.

On 18 June 1940 General de Gaulle had broadcast his call to resistance after France was left destroyed and defeated. He continued the fight and restored the honour of the nation by being part of the victorious side. As of 1958, he went on to achieve tremendous progress, notably in the areas of the constitution, economy, diplomacy and defence. On 16 November 1940, General de Gaulle had created the Order of Liberation to reward individuals or military and civilian groups (Companions) for their distinguished deeds in the liberation of France.

Today, the Order pursues "the mission of developing the spirit of Defence through the achievements of French Liberation Companions and Resistance Medal awardees." There are many similarities between De Gaulle's work and Dassault Aviation and although years and generations have passed, they remain firmly rooted in the identity of our company, our management and our teams."

Marcel Dassault was an engineer, an aviation genius, detained with his family and deported because he refused to collaborate with the occupying regime. After the war, he adopted the name Dassault, the alias given in the Resistance to his brother, General Paul Bloch; who was appointed Grand Chancellor of the Legion of Honour by De Gaulle in 1946. Marcel Dassault was also a great industrialist, who recreated his family business after the Liberation with his engineers from the 1930s, many of whom had distinguished themselves in the fight against the enemy. General de Gaulle also left a European legacy, a legacy of French-German cooperation, with the

Elysée Treaty. One must pursue these efforts to build European strategic independence so that together, countries in Europe can take control of their future while remaining sovereign.

The FCAS (*Future Combat Air System*) project is part of this process, to give participating European countries the benefit of proprietary military systems. Because as the General taught, "unless we have our own resources, there is no freedom of action. And sovereignty is pure illusion. We are therefore working with our German and Spanish partners to prepare the future of combat aviation in Europe. We are proud of our prime contractor role on the New Generation Fighter (NGF) of which the first demonstrator phase was launched in January. This programme will enable us to continue the great aviation adventure for the sovereignty and independence of France in the context of a Europe that protects."

Dassault Aviation is a flagship French industry which innovates continually, from the post-war Flamant to Ouragan, Mystère, Mirage, Falcon, Rafale and nEUROn, and now the NGF of tomorrow.

Like General de Gaulle, "never tired of waiting in the dark for a glimmer of hope, we trust in our lucky star, our talisman, this four-leaf clover returned to Marcel Dassault after the hell of the concentration camps, as a symbol of hope preserved and a venture to pursue. True to our predecessors, we must continue the work they began over a century ago, with the same determination and energy, to ensure the sovereignty of French and European wings."

Dassault Aviation

Developments in the Saab hemisphere

Gripen Production started in Brazil

Saab Aeronáutica Montagens (SAM), Saab's first aerostructures plant outside of Sweden for the new Gripen E/F fighter, reached another important milestone with the start of production. This site builds sections of Gripen, which will then be delivered to the final assembly facilities at the Embraer plant in Gavião Peixoto, São Paulo, Brazil and to Linköping, Sweden.

In 2014, Saab signed a contract with Brazilian government for the development and production of 36 Gripen E/F aircraft. In September last year, the first Brazilian Gripen E aircraft was delivered to start the flight test programme. Now another milestone is reached, as Gripen production starts at the SAM plant, which is located in São Bernardo do Campo, a city in the metropolitan area of São Paulo in Brazil.

The tail cone and front fuselage of the single-seat version of the Gripen fighter are the first aerostructures to enter into production at SAM. Subsequently, the aerodynamic brakes, rear fuselage, wing box and front fuselage for the two-seater version will also be manufactured at SAM.

Latvia and Estonia order Carl-Gustaf M4

Saab has received orders from the Latvian and Estonian Armed Forces for deliveries of Carl-Gustaf M4, which will take place

in 2021-2024. Carl-Gustaf M4 is the latest version of the portable, shoulder-launched, multi-role weapon system. It gives users a wide range of engagement options and allows troops to remain agile and effective in any scenario. Since the launch in 2014, Saab has signed contracts with thirteen different nations for the Carl-Gustaf M4.

Surface Ship and Submarine firings of Lightweight Torpedo

Saab has, together with the Swedish Defence Materiel Administration (FMV) and Swedish Armed Forces, conducted first tests with the Saab Lightweight Torpedo (SLWT) from a corvette and a submarine. The tests are the first of its kind for the new torpedo and were undertaken during February and March 2020 at sea ranges outside Karlskrona, on Sweden's east coast

in the Baltic Sea. The tests were conducted from a *Gotland*-class submarine and from a *Visby*-class corvette. The purpose of the firings was to verify that the torpedo can be safely launched from the vessels, which also included verification of the integration on the vessels as well as SLWT's target seeker.

Order for Gripen Support and Maintenance Operations

Saab has received an order from the Swedish Defence Materiel Administration (FMV) on behalf of the Swedish Armed Forces to provide support and maintenance services for Gripen from 1 July 2020 to 31 March 2021. The total order value amounts to MSEK 687.

Israeli successes

LORA firing trials by IAI

Israel Aerospace Industries (IAI) has completed a dual operational firing trial with LORA (Long-Range Artillery Weapon System), a precise ballistic strike missile. The trial was designed and performed under COVID-19 restrictions as part of IAI's work plan, which includes demonstrating the capabilities of the advanced system to customers.

Held in the open sea, the trial included the launch of two long-range LORA missiles to a pre-defined hit point at sea. The complex trial included two scenarios to test and demonstrate LORA's advanced capabilities, the first involving a short-range launch to 90 km and the second to a long range of 400 km. In its ground version, the weapon system was deployed on a ship at sea to comply with the safety requirements of trials of this type. The missile was launched from an operational system that comprises a command trailer and a ground launcher. Under both scenarios, the missile was launched to its trajectory, navigated its course to the target, which was hit with utmost precision.

Developed by IAI's MALAM division, LORA is a sea-to-ground and ground-to-ground system which comprises a long-range ballistic missile, a unique launcher, a command and control system, and a ground/marine support system. The LORA system provides ballistic assault capabilities for multiple ranges with a precision level of 10 meters CEP.

Germany renews Service Contracts for IAI Heron 1

Airbus Defence and Space and the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) have signed a renewed service contract agreement for Heron 1 unmanned aerial systems (UAS) in operation in Afghanistan and Mali.

In Afghanistan, Heron 1 operations were extended in March 2020 for the period June 2020-May 2021, having logged more than 46,000 flight hours in over 4,100 operational flights. Also in March this year, the German Air Force passed the milestone of 10 years of Heron 1 operations in Afghanistan, with the first operational flight on 17 March 2010.

In Mali, Heron 1 services have also been extended for the period August 2020/July 2021 (with an option for August 2021/July 2022), having logged more than 11,500 flight hours in over 1200 operational flights. The system's first flight in Mali goes back to 1 November 2016 after the first service contract was signed in July 2016.

UVision's Hero-30 Lethal Loitering Systems

UVision Air Ltd has revealed that its high-precision, light-weight man-pack portable Hero-30 system is already in use by various IDF units. The Hero-30 have been procured by the Israel MOD and put to operational IDF forces use, after proving its highly advanced capabilities in an extensive process of evaluation, tests and trials, meeting strict IDF technical and operational requirements.

UVision's Hero-30 clears NATO Navy trials

UVision Air Ltd's high-precision, light-weight portable Hero-30 loitering munition system has been evaluated by a NATO Navy and "proved its remarkable capabilities". The systems demonstrated abilities of high-precision strikes, tracking and lock-on on a moving target in various operational naval scenarios and mission-abort capabilities. The trials demonstrated the Hero-30 versatility and adoptability to various missions in a maritime environment.

Rafael and Mesko to co-produce Spike SR ATGM

Israeli company Rafael Advanced Defense Systems Ltd. and Polish company Mesko, a PGZ company, will co-produce the shoulder-launched Spike SR (Short-Range) ATGM, as part of Poland's *Pustelnik Programme.*

The Spike SR is an advanced Fire & Forget missile, for ranges exceeding 2000 meters. The missile is simple-to-use and requires very short training. Spike SR is man-portable, weighing only (10kg), for day and night use, capable of defeating any type of armoured vehicle or MBT. Spike SR is totally disposable, a feature that enables the soldier a higher level of mobility and maneuverability after firing.

Spike SR is the smallest member of the well-established, combat-proven Spike ATGM Family. Spike is in service in 34 countries, including 19 NATO nations, with over 34,000 missiles already supplied and more than 6,000 fired in tests and combat.

The SPIKE SR missile is designed for different ground combat scenarios, for the tactical maneuvering forces, platoon-level and for Special Forces. The Spike SR has unique operational characteristics that enable a high level of operational readiness. It can be carried easily by a solider without affecting maneuverability, enabling simple, intuitive and quick operation, with only a few seconds from "cold-start" to launch, in a variety of operational and environmental scenarios.

The missile's lethality is achieved by a tandem HEAT warhead with precursor charge that defeats Explosive Reactive Armour (ERA), allowing the main warhead to achieve its full penetration of Rolled Homogeneous Armour (RHA). With a high-hit probability in all scenarios and ranges, the missile can operate in severe weather conditions (from -35˚C to 55˚C) and in complex combat scenarios, such as engagement of fast-moving targets.

Rafael in strategic partnership with Australia's Naeco

Rafael Australia has announced a $1.3 million strategic industrial partnership with Australian company Naeco Pty Ltd, a Brisbane-based precision engineering small business specialising in thermal management. This industrial cooperation between the two will have two firms come together to export these advanced cooling systems, as part of Rafael's global supply chain, to provide its customers with state-of-the-art defence solutions.

Elbit demonstrates USV capabilities to the UK MOD

Elbit Systems UK has completed a series of Anti-Submarine Warfare (ASW) trials with the UK MoD. The trials were delivered via Dstl›s (Defence Science and Technology Laboratory) Progeny Framework, exploring how autonomous systems can support future ASW operations. Elbit Systems UK used its Seagull USV (Unmanned Surface Vehicle) for these trials, with the US L3 Harris providing the sonar. The Seagull, Elbit System's multi-mission, multi-sensor USV demonstrated the autonomous ASW utility to the UK MoD, across the entire trials period, utilising its 'ASW Toolbox' solution throughout to show how the abilities of this system to offer a force multiplier for ASW operations.

Elbit integrates a mini-UAS Onboard the Seagull USV

Elbit Systems is expanding operational capabilities of the Seagull Unmanned Surface Vessel (USV) beyond Anti-Submarine Warfare (ASW) and Mines Countermeasure (MCM). Trials conducted recently were dedicated to the integration of a mini-Unmanned Aerial System (UAS), onboard the Seagull USV, further enhancing its intelligence gathering capabilities. The shipborne mini-UAS is capable of point water recovery and a takeoff weight of up to 15kg. The visual feed generated by the mini-UAS can be transmitted to the land based control unit of the Seagull USV and to the Combat Management System (CMS) of additional vessels.

Heavy transport helicopter in long-haul operations

Sikorsky CH-53K inflight refuelling with KC-130J

The CH-53K King Stallion heavy transport helicopter has successfully completed several inflight refuelling tests with a Lockheed KC-130J Super Hercules tanker of the US Marine Corps. Lasting several hours, the test flight took place at the beginning of April off the east coast of the United States. Newly developed, the latest member of the Sikorsky family of CH-53 transport helicopters has passed another major milestone.

Inflight refuelling has also been defined as an essential capability for the *Bundeswehr's* new heavy transport helicopter, or STH. In response to the current *Bundeswehr* request for tenders, Lockheed Martin subsidiary Sikorsky and Rheinmetall have joined forces to offer Germany the top-performing CH-53 K, "the most advanced, most intelligent helicopter on the market today." In particular, the CH-53K's advanced fly-by-wire flight control significantly reduces strain on the crew during inflight refuelling operations. The ability to refuel in mid-air is a requirement for covering long distances without having to make intermediate stops, and substantially expands the CH-53K's operational flexibility, so can be redeployed to distant areas of operation, for instance, and remain aloft for extended periods. The helicopter can carry more personnel and materiel for longer distances and under more challenging operational conditions than any other aircraft of its kind.

Besides the same tanker aircraft, in future the *Bundeswehr* inventory will include the C-130J made by Lockheed Martin. The cargo hold of the C-130J is designed to use the 463L-standard air cargo pallets, which the CH-53K can also transport. Using the same pallets in the fixed wing aircraft and transport helicopter offers immense advantages when it comes to loading and unloading materiel. This interoperability reinforces in a fundamental way military cooperation between France and Germany: at Évreux in Normandy, the two nations are currently creating a joint fleet of C-130J/KC-130J transport aircraft. The use of standardised air freight pallets also enables interoperability with other transport planes in Europe such as the A400M, a decisive advantage during joint operations.

In the meantime, full-scale production of the CH-53K has begun at the Sikorsky plant in Connecticut, as planned, with 31 aircraft currently at different stages of completion. The first USMC CH-53K squadron is expected to be operational by 2023/24. In Germany the CH-53K is now in the running for the Bundeswehr's *Schwerer Transporthubschrauber STH* procurement project; the decision as to which heavy transport helicopter to buy is expected to come at the beginning of 2021. The first aircraft could – as required – be delivered starting in 2024, thus enabling a seamless transition from the current CH-53G fleet, coupled with training of personnel and putting the necessary logistics in place necessary for operating in Germany. By this time, the CH53 helicopters supplied to the USMC will already be fully operational, and Marine flight crews and maintenance technicians able to draw on their experience to assist in initial training of *Bundeswehr* personnel. The transition from the CH-53G now in service with the *Bundeswehr* to the new STH fleet of heavy transport helicopters is to be complete by 2032.

Progression of the Airbus A400M

Automatic Low Level Flight certification

The Airbus A400M new generation airlifter achieved a new decisive milestone after the certification of its Automatic Low Level Flight capability, offering a 'unique in its class capability for a military

transport aircraft'. The certification campaign was performed above the Pyrenees and central France and involved operations down to 500ft, including transitions from low level flight to other operations like aerial delivery.

Simultaneous Paratrooper Dispatch certification

The Airbus A400M has successfully achieved certification of the simultaneous paratrooper dispatch capability to complete full industrial development of the type's paratrooping deployment capacity, with a maximum dispatch of 116 paratroopers using both side doors (58+58). The certification fight test, completed in May 2020, in coordination with the French Armament General Directorate (DGA) and supported by the French and Belgian Armed Forces, involved an extensive paratrooping campaign of more than 1,000 jumps along with the implementation of new capability development methodologies based on recording and 3D modelling of paratrooper jump trajectories.

Spanish A400M fleet expands

As more Airbus A400Ms join the Spanish Air Force's fleet of aircraft, this military service is working to expand the capabilities of its next-generation airlifter while further increasing mission diversity.

The A400M is a "big jump" for the military service according to Colonel Melecio Hernández, Commander Wing 31 of the Spanish Air Force. "It means that we will be able to reach farther destinations; provide support to our air force, our deployments and the rest of the air forces; and we will better serve our nation in our international commitments," he explained.

Spanish Air Force A400Ms are used for logistics missions, supporting operations in Africa, the Middle East and Italy. In addition, they have been deployed as part of NATO training exercises. "For sure, the A400M is a great platform, but we have to improve our capabilities," added Hernández. This includes planned outfitting for medical evacuation (medevac) missions, as well as air-to-air refuelling of the Spanish Air Force's Eurofighter combat aircraft, with more capability campaigns set to follow. In total, the Spanish Air Force has ordered 27 A400Ms from Airbus, of which eight have been delivered to date.

French Air Force A400Ms in service

The French Air Force became the first operator with the Airbus' A400M in 2013. Since then, this aircraft has taken a leading role in this service's counterterrorism and humanitarian efforts,

among other high-profile missions. According to Benoît Paillard, "the French Air Force's A400M Programme Manager, the next-generation airlifter's introduction has revolutionised the way tactical transport aircraft are operated – both within France and on deployments outside the country."

The A400M has been in service in the fight against terrorism, including support for Operation *Barkhane* (formerly Operation *Serval*) – an anti-insurgent campaign in Africa's Sahel region – and Operation *Chammal* in the Middle East. The French Air Force also deployed the A400M for humanitarian and disaster relief activity in the aftermath of Hurricane *Irma*, which devastated the Caribbean region in 2017 and on the Indonesian island of Lombok following a 6.9-magnitude earthquake in 2018. The French Air Force has ordered a total of 50 A400Ms from Airbus.

Boeing Military Aircraft Updates

400th V-22 Osprey delivered

The Bell Boeing V-22 team recently delivered its 400th aircraft, a CV-22 for US Air Force Special Operations Command. The first production V-22 was delivered on 24 May 1999 and deliveries today are under the Multi-year Procurement III contract valued at $5 billion. That contract runs through 2024 and includes variants for the Marines, Air Force, and Navy, as well as the first international customer, Japan.

The CV-22 variant performs special operations missions, including infiltration, extraction, and resupply, unlike conventional aircraft. The Marine Corps variant, the MV-22B, provides transportation of personnel, supplies, and equipment for combat assault, assault support, and fleet logistics. The Navy variant, the CMV-22B, is replacement for the C-2A Greyhound for carrier onboard delivery missions.

First F/A-18 Block III Super Hornets

Boeing has delivered the first two F/A-18 Block III Super Hornets to the US Navy for flight testing, a single-seat E model and a two-seat F model.

The US Navy will use the aircraft to familiarise pilots with the advanced cockpit system's new 10-inch-by-19-inch touchscreen display and test the capabilities delivered with enhanced network capability. In addition to these enhancements, the Block III configuration adds capability upgrades that include longer range, reduced radar signature and an enhanced communication system. The fighter's life also will be extended from 6,000 hours to 10,000 hours. In 2019, Boeing was awarded a contract from the Navy for 78 Block III Super Hornets. Boeing and Navy test teams have also flown conformal fuel tank prototypes.

Morocco orders 24 AH-64E Apaches

Morocco is the 17 th country to acquire the Boeing AH-64 Apache with a contract for 24 of the helicopters recently signed. Boeing has delivered nearly 2,500 Apache helicopters to 16 nations to date, including the US, Netherlands, Greece, United Kingdom, Japan, India, Singapore, South Korea and Saudi Arabia. Deliveries to Morocco are expected to begin in 2024.

The AH-64E Apache is latest configuration of the attack helicopter. It is designed and equipped with an open systems architecture including the latest communications, navigation, sensor and weapon systems. It has an improved Modernised Target Acquisition Designation System that provides day, night and all-weather target information, as well as night vision navigation capability. In addition to classifying ground and air targets, the Fire Control Radar has been updated to operate in a maritime environment.

2,500th AH-64 Apache delivered

Boeing has recently delivered its 2,500th AH-64 Apache helicopter, an E-model Apache for the US Army, from the company's production line in Mesa, Arizona. The first production AH-64, an A-model Apache, rolled off the assembly line on 30 September 1983 and was delivered by then McDonnell Douglas to the US Army in January 1984. Today, Boeing is producing and delivering AH-64E helicopters to a growing list of customers around the world.

"The Apache has built an impressive legacy of success, and is well-positioned to bring relevant technologies and capabilities that defence forces require today and in the future," stated Kathleen Jolivette, vice president of Attack Helicopter programmes and senior Mesa site executive. "Company teammates and suppliers worldwide are focused on assembling, delivering and supporting US and global customers working to deter aggression and defend freedom. Apache is ready to have a key role in the future of multi-domain operations."

Today's E-model Apache features integrated technologies including communications and navigation capabilities to enhance situational awareness and coordination; a new, faster multi-core mission processor for advanced systems integration; and maritime capability in the Fire Control Radar for watercraft detection and identification along with a shorter engagement timeline. The helicopter's improved drive system includes a split-torque face gear transmission, a 701D engine and composite main rotor blades that ensure the Apache succeeds as a highly stable aerial weapons-delivery platform.

Indonesia for 8 MV-22 Block C Ospreys

The US State Department has made a determination approving possible Foreign Military Sale to the Government of Indonesia of eight MV-22 Block C Osprey aircraft and related equipment for an estimated cost of $2 billion.

Also included are twenty-four AE 1107C Rolls Royce Engines; twenty AN/AAQ-27 Forward Looking InfraRed Radars; twenty AN/AAR-47 Missile Warning Systems; twenty AN/APR-39 Radar Warning Receivers; twenty AN/ALE-47 Countermeasure Dispenser Systems; twenty AN/APX-117 Identification Friend or Foe Systems (IFF); twenty AN/APN-194 Radar Altimeters; twenty AN/ARN-147 VHF OmniDirectional Range (VOR) Instrument Landing System (ILS) Beacon Navigation Systems, etc.

‘Tigers’ and ‘Lions’

Four decades of NATO AWACS operations

Now for more than three decades, the NATO E-3A AWACS (Airborne early Warning And Control System) aircraft have continued to play a vital role in international defence. The impressive career of this remarkable aircraft makes it interesting to zoom in on to have a look at their home base, Geilenkirchen in Germany.

History and status

The *NATO E-3A Component* unit at Geilenkirchen air base is located on the German-Dutch border, close to the Allied Joint Force Command centre in Brunssum. Originally 18 aircraft were acquired from Boeing which were delivered from 1982 onwards, (*their complex systems primarily integrated at the Dornier airfield at Oberpffanhofen, near Munich, also visited by high powered Indian defence ministry officials*: *Ed*).

Over the years, one AWACS was lost owing to bird strike during take-off from Preveza air base in Greece (1996) while

another three E-3As have been put into storage as they were not included in an upcoming up-grade plan reportedly because of technical and budgetary reasons.

The current fleet of 14 NATO AWACS aircraft has been up graded with a digital cockpit under the *Diminishing Manufacturing Sources Replacement of Avionics for Global Operations and Navigation* (DRAGON) programme which incorporated a new identification friend or foe system and upgraded weather radar. In December 2019, a Final Lifetime Extension Programme (FLEP) was worked with Boeing which will allow NATO to operate the AWACS until 2035, by when a new Airborne Early Warning system should be available. The FLEP incorporated new communications and networking capabilities, including new *Have Quick* radios, new encryption equipment, new operator consoles, upgraded mission computing, expanded data capacity and increased bandwidth for satellite communications.

The structure

The NATO E-3A Component consists out of two flight squadrons: One (*Tigers)* and Two (*Lions)*. Together with the six Royal Air Force E-3D AWACS aircraft based at Waddington in the UK, these constitute the NATO Airborne Early Warning & Control Force (NAEW&CF), reporting directly to the NATO Supreme Allied Commander Europe (SACEUR), currently under

General Tod. D Wolters USAF. Although not in the same command, the NAEW&CF aircraft regularly cooperate in joint tasks with AWACS units from the USAF and the French *Armée de l'Air*.

The task and mission of the AWACS force is to "deliver ready, responsive Airborne Early Warning, Battle Management and Command and Control capability to operational commanders in support of the North Atlantic Council (NAC) approved taskings". To execute the mission in daily operations of the NATO E-3A Component, the unit uses a number of Forward Operating Bases (FOB).

E-3 Operations

Critical role of the NATO AWACS force cannot be exemplified more than with the knowledge that they were engaged in the Gulf crisis and Iraqi war during the nineties and also various Libyan missions, enforcing weapons embargo and no-fly zones. Their operational tasks included those during the war in the Balkans, surveillance missions over the USA shortly after the 9-11 attacks as also monitoring flights over Afghanistan. Presently, operations of the NATO AWACS aircraft include "Assurance Measures", which are to support Europe's eastern flank countries following the Crimean conflict and war in the Ukraine, *Global Coalition* flights to counter threat of the IS in the Middle East and *Operation Sea Guardian* concerning Mediterranean maritime situational awareness, counter-terrorism capabilities at sea and to enhance capacity building. These *Assurance Measures* flights are part of NATO's "Readiness Action Plan" to respond swiftly – and firmly – to all security challenges.

Exercise and training

The NATO AWACS force, with some 1400 personnel based at Geilenkirchen, regularly participate in exercises, including the multinational Combined Air Operations (COMOA) in various scenarios. These include such European exercises, in which the E-3A contributes as a High Value Asset (HVA), are Scandinavian *Arctic Challenge*, the Dutch *Frisian Flag* and Greek *Iniochos*.

The standard E-3A AWACS aircrew complement consists of the pilot-in-command, first pilot and flight engineer. Under the Tactical Director within the cabin are several terminals for operators of the Surveillance and Weapons system plus several airborne technicians. The crew complement is about 15, but when additional efforts are required, these can go up to 33. Fifteen NATO nations supply the required personnel to the NATO E-3A Component, which is reflected in the multinational composition of the flight crew. Continuous training is essential to establish commonality in communication, as well as in procedures and working processes.

So as to keep the cockpit crew current with aerial refuelling skills, NATO AWACS permanently deploy two to three US Air National Guard KC-135 tankers on detachment at Geilenkirchen. The ANG units rotate every two weeks and flying under the *Esso* call sign, provide training capacity for aerial refuelling at day light or night-time conditions (*image below*).

Photos and text by Peter ten Berg

North Macedonian Air Wing

NATO's Newest ARM

Located at Skopje, capital of North Macedonia, the young Republic's sole military airbase Petrovec AFB, is the military section of Skopje's International Airport. The airbase houses the BHS (*Borben Helikoperski Skvadron*, Combat Helicopter Squadron) and the THS (*Transporten Helikoperski Skvadron*, Transport Helicopter Squadron) as well as a Pilot Training Centre and Technical Maintenance Centre. The squadrons are placed under the Air Wing, part of the Joint Operational Command of the Army of the Republic of North Macedonia (ARM). The country has gone through turbulent times in recent decades but disputes from the time of the Former Yugoslav Republic have finally been settled and funds invested for personnel and equipment.

The early days

North Macedonia had declared itself independent from Yugoslavia after a referendum in September 1991 and at that time adopted the name 'The Republic of Macedonia'. The beginning of the North Macedonian Air Wing was humble, the first President of the Republic of North Macedonia Kiro Gligorov having formed the armed forces of the Republic in April 1992. Two months later, on 10 June, the first aircraft was an UTVA-75, leased from the *Makedonski Vozduhoploven Sojuz* (North Macedonian Aeronautical Union), this date now declared a national holiday of the republic.

Pilot Training Centre

In 1995, flight training began at Petrovec AFB when the Air Wing received four fixed wing, Czech-built Zlin-242s trainers. However, the elementary flight training was

erratic and structured training began only in 2001, but stopped in 2010 when the North Macedonian MoD signed an agreement with ELMAK (Elbit North Macedonia) for pilot training. Elbit Systems, the Israel international defence electronics company had offered a programme to train and qualify helicopter pilots for the North Macedonian Air Wing and Police. The centre now operates four Bell 206B3s and five Zlin Z-242s with also Mi-24 and Mi-17 full mission helicopter simulators, but all PTC facilities and the entire fleet belong to the Republic of North Macedonian.

Before cadets arrive at the PTC, they would have been through a Government selection process and English language tests. Shraga Yaari, Director of the PTC, described the course for candidates, "Those that successfully pass the selection process of the MoD go through a selection procedure at the PTC, tests taking place both on ground and in the air. During flight screening, candidates fly for some ten hours on the Zlin. Once the elementary flight training is completed, candidates assistance to fly another 35 hours on this type before many to be basic training stage and transition to the Bell 206B3.

COIN missions

In the very year that the PTC was founded, the Republic of North Macedonia was invaded by insurgents from the ethnic Albanian National Liberation Army (NLA). At that time, the Air Wing was relatively new and incapable of any counter insurgent (COIN) missions. So as to combat the adversaries, its fleet was vastly expanded in a short period, with the Ukraine delivering four Mi-8MTs, ten Mi-24V attack helicopters, two Mi-24K photo-reconnaissance helicopters and four Su-25 fixed wing ground attack aircraft while Greece provided the Macedonian defence forces with two UH-1H Huey utility helicopters.

After several months of battle, the *Ohrid Framework Agreement* was signed in August 2001, which ended the armed conflict and in the years that followed, the Air Wing began modernisation of its fleet and reorganisation of its force. This led, among other things, to decommissioning of all Su-25s in 2004, the former Greek Hueys also taken out of service. One of the helicopters was flown to Greece for major overhaul but was not returned because of financial problems, the other aircraft stored at the platform of the BHS waiting to be overhauled, something that will probably never happen. In 2003, an Antonov An-2 bi-plane was bought to conduct paratrooper operations but this went into storage in 2012.

Overhaul of Mi-24/Mi-17s

The first major overhaul of the rotor fleet was done by the Israel-based Elbit Systems and completed some four years after transfer of the former Ukrainian helicopters to Macedonia.

This upgrade took place in two stages. After the *Jasmin* basic stage in 2004, the advanced phase *Alexander* was completed in 2009. The *Jasmin* update invited, among other things, the installation of both mechanical and electrical systems for the ANVIS/HUD, adaptation of new navigation and IFF systems plus cabin modification. The *Alexander*-phase was more comprehensive and involved various new equipment for radio communication plus moving digital displays, ILS and installation of Forward Looking infrared (FLIR) cameras, the electro optical-payload positioned on port side. The helicopters now had IFF-equipment to NATO and International Civil Aviation Organization (ICAO) standards.

In April 2005, the Air Wing had two *Jasmin*-updated Mi-24Vs as well as two Mi-17 helicopters, the update including Helmet Display and Tracking System (HDTS) Aviators Night Vision Head-Up Display (ANVIS/HUD), the North Macedonian Air Wing being one of the first Mi-24 users to operate at night. However, owing to financial constraints, the entire fleet was not upgraded, and the Mi-24Ks phased out and just two Mi- 24Vs went through the *Alexander*-phase, other helicopters receiving the *Jasmin*-mod.

On 10 June 2016, a contract for overhaul of four Mi-8/17s and six Mi-24s was signed with Elbit Systems, the entire overhaul planned to take two years and was conducted at Skopje Air Base.

The initial contract was for overhauling of six Mi-24s, however only two helicopters were actually done, '209' and '210', both helicopters receiving the *Jasmin*-upgrade.

The commander proudly continues his story: "The original paint scheme of our aircraft was developed in 2006 and was done by members of the Air Wing. The original, Russian paint scheme, with stains and blue underside, had no tactical advantage and as we operate low level, a camouflaged underside was necessary. The markings are now more visible, with a small detail on sides of our Mi-24Vs: a shark-shaped head on both sides. As soon as the helicopter is in flight, with the landing gear retracted, the aircraft transforms into becoming a shark – an effective and attractive adjustment for the *Night Thunders Squadron*"!

Accession to NATO

On 17 March 2020, NATO Secretary-General Jens Stoltenberg informed the on ratification of North Macedonia's accession to NATO. Still, with its relatively low defence budget, North Macedonia sees little opportunity to purchase and maintain fighters, but by joining NATO, the country can rely on its allies to perform air policing operations.

The Future

Now that its aircraft fleet is operational there is a new problem - that of a shortage of pilots! At this time, the Air Wing has 40 operational and combat-ready pilots, 15 of which are posted at headquarters. Apart from shortage of flight crew, the Wing also faces major financial hurdles and shortage of equipment. After years of decline in funds received by the North Macedonian armed forces, some small investments have lately been made.

The 2018 budget was 14% more than budget of the preceding year and plans made to increase defence budget by 0.2% of GDP for the following three fiscal years (2019-2021), with the objective of meeting the NATO targets of 2% by 2024. In the current year the total budget for the ARM was 168 million euros (1.39% of the North Macedonian GDP). The coming years will reveal how the Air Wing will develop, in terms of equipment, but time is running out for a tender for a new helicopter fleet.

The PTC operates five Czech-built Zlin 242s trainers. The fixed wing aircraft are housed in their own hangar at Petrovec AFB

The parliament of North Macedonia has already decided that the purchase of a new platform will start three years before the determined deadline, the choice probably being on a Western-origin type. The Colonel substantiates this: "The strategic aspect of North Macedonia is shifting towards the West, becoming a NATO member would therefore limit our options to place an order in Russia."

Article and photos: Sven van Roij

The NATO Multinational MRTT Fleet

First A330 MRTTs arrive

In the Netherlands, the two McDonnell Douglas KDC-10 air-air-refueling aircraft are nearing the end of their operational life. One of the two KDC-10s was retired at the end of 2019 and the second KDC-10 will be retired at the end of 2020 or early 2021. These tanker aircraft will be replaced by the Airbus A330 Multi Role Tanker Transport (MRTT).

An international consortium, the *Multinational MRTT Unit (MMU)* will receive eight A330 MRTT aircraft, of which five will be based at Eindhoven AB in the Netherlands as their Main Operating Base and the remaining three aircraft based at Cologne Bonn Airport. These aircraft will become part of the NATO Multinational MRTT Fleet (MMF).

The MMU is multi-national, comprising the Netherlands, Germany, Belgium, Luxembourg, Norway and the Czech Republic and every country will pay for and get a number of flying hours. The A330 MRTT is truly multirole besides its main role as tanker, these aircraft can be used in the passenger and cargo transport role, or in the MEDEVAC role and of the eight aircraft delivered, at least one A330 will be available in the MEDEVAC role.

Mixed flight line, with example of the A330 MRTT, KDC-10 and C-17 Globemaster III

The A330 MRTT aircraft will be able to refuel all NATO aircraft with a fixed boom for the F-15s, F-16s, F-35s; and two hose systems for refueling the Mirages, Rafales, Gripens and Eurofighters. This will make the A330 more flexible than the KDC-10s with only their boom.

At Eindhoven Air Base, the European Air Transport Command (EATC) fulfills a coordinating role in allocation of NATO resources regarding transport and air-refueling.

In mid-July 2020, the first A330 MRTT aircraft (with Dutch registration T-055) was officially delivered by Airbus and accepted by the MMU. One day later this first A330 MRTT (T-055) was flown from Getafe in Spain to Eindhoven in the Netherlands, and after landing, received the now traditional water-shower by the Eindhoven Fire Department.

Photos and text:
Joris van Boven & Alex van Noye

Historic Test Flight of SpaceX Crew Dragon

For the first time in space history, NASA astronauts have launched from American soil in a commercially built and operated American crew spacecraft on its way to the International Space Station. The SpaceX Crew Dragon spacecraft carrying NASA astronauts Robert Behnken and Douglas Hurley lifted off end-May 2020 on the company's Falcon 9 rocket from Launch Complex 39A at NASA's Kennedy Space Center in Florida.

"Today a new era in human spaceflight begins as we once again launched American astronauts on American rockets from American soil on their way to the International Space Station, our national lab orbiting Earth," stated NASA Administrator Jim Bridenstine. "I thank and congratulate Bob Behnken, Doug Hurley, and the SpaceX and NASA teams for this significant achievement for the United States. The launch of this commercial space system designed for humans is a phenomenal demonstration of American excellence and is an important step on our path to expand human exploration to the Moon and Mars."

Known as NASA's SpaceX Demo-2, the mission is an end-to-end test flight to validate the SpaceX crew transportation system, including launch, in-orbit, docking and landing operations. This is SpaceX's second spaceflight test of its Crew Dragon and its first test with astronauts aboard, which will pave the way for its certification for regular crew flights to the station as part of NASA's Commercial Crew Programme.

"This is a dream come true for me and everyone at SpaceX," stated Elon Musk, chief engineer at SpaceX. "It is the culmination of an incredible amount of work by the SpaceX team, by NASA and by a number of other partners in the process of making this happen. You can look at this as the results of a hundred thousand people roughly when you add up all the suppliers and everyone working incredibly hard to make this day happen."

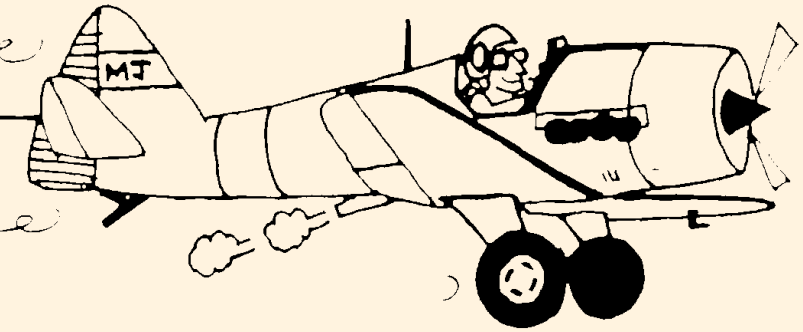
The programme demonstrates NASA's commitment to investing in commercial companies through public-private partnerships and builds on the success of American companies, including SpaceX, already delivering cargo to the space station.

NASA's Commercial Crew Programme is working with SpaceX and Boeing to design, build, test and operate safe, reliable and cost-effective human transportation systems to low-Earth orbit. Both companies are focused on test missions, including abort system demonstrations and crew flight tests, ahead of regularly flying crew missions to the space station. Both companies' crewed flights will be the first times in history NASA has sent astronauts to space on systems owned, built, tested and operated by private companies.

On Thursday, March 19 and Friday, March 20, SpaceX teams in Firing Room 4 at NASA's Kennedy Space Center in Florida and the company's Mission Control in Hawthorne, California, along with NASA flight controllers in Mission Control Houston, executed a full simulation of launch and docking of the Crew Dragon spacecraft, with NASA astronauts Bob Behnken and Doug Hurley (front) participating in SpaceX's flight simulator.

Courtesy: NASA, Photo: SpaceX

Ancient Aviator Anecdotes



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

Hawker Tempest Mk.IIAs at Hakimpet (photo: SAS Archives)

The above digitalised title refers to No.58 Pilots Course's forthcoming 68th anniversary on 30 August 2020. The course commenced in February 1951 at No 1 AFA Ambala and covered an 18 month training period on Tiger Moths and Harvard IIBs. The 50 of us flight cadets, straight out of school and college, along with one naval aviator, had an attrition rate of 40%. Only 30 of us were commissioned as Pilot Officers and received our wings, along with our naval course-mate, on 30 August 1952 at Begumpet from AVM Subroto Mukherjee (then DCAS). 14 of us new pilots went to CTU Hakimpet for fighter conversion on Spitfire Mk IXs and Tempest IIAs while 17 proceeded to TTW Agra for twin-engined conversion after which we all were posted to our first squadrons. The very last member of our course to retire from the air force did so in 1988.

68 years after graduation, ten of us survive (as on date of writing!), while 21 have gone ahead: gone yes but certainly not forgotten are our coursemates, seven of whom we lost in flying accidents and 14 of whom passed on owing to natural causes. PK Chitnavis : TK De : BK Dhiman : JP Gupta : OP Gupta (Dakota) : Hari Singh (Dakota) : KD Hoon (Toofani) : GS Iyer (Chetak) : Jaganath Rao : HN Koul : RN Kaul : AJ Maitland : KK Malik : VBR Misra : YP Mehta : MS Rane : VK Singh (Vampire) : S Sen : MN Singh : RP Vashisht (An-12).

To this list must be added the name of Lt Jayachandra IN, a pioneer pelagic pilot who tragically was our first post-commission fatality in a Tempest IIA accident in Hakimpet in November 1952.

The ten surviving air veterans (aged 88-90) are disbursed over six cities in two countries (see below)

•	Wg Cdr MW Tilak	(4331)	Perth, S. Australia
•	Gp Capt SL Tandan	(4334)	New Delhi
•	A V M DE Satur	(4339)	NOIDA
•	Wg Cdr RL Badhwar	(4341)	Gurugram
•	A V M CV Parker	(4346)	Hyderabad
•	Fg Offr S Bhat	(4352)	Gurugram
•	Sqn Ldr RC Mariano	(4357)	Adelaide, S. Australia
•	A V M MK Rudra	(4358)	Hyderabad
•	Gp Capt SC Saxena	(4359)	NOIDA
•	Gp Capt ML Khanna	(4360)	New Delhi

While the internet keeps us in touch, single malt keeps us active!

Members of our course flew every aircraft type in the inventory of our air force from 1951-88, covering piston/ jet, single/twin/ multi-engine and rotary wing platforms in all the roles of air power. From this course came two test pilots, 11 QFIs, 10 COs, one Air Attache, four air officers, two AI Captains, one pioneer professor in aviation law and the sole recorded successful bail-out from a Tempest. This PC participated in both the 1965 and 1971 Indo-Pak wars and one member earned an MVC in the latter. We have had two major reunions: a boisterous '*Bees Saal Baad*' in 1972 at New Delhi and another a decade later. As numbers gradually depleted, anniversaries were marked by smaller and more sedate get-togethers of surviving members, families, widows and children. On the occasion of our coming anniversary, and through this memorial tribute, I send my good wishes to all my surviving coursemates with a message to "Keep Walking"!

The Pilot as a Writer

Our air force shares a year of birth with this writer, hence we both grew up through the Raj-era, World War II, Independence and the Partition. My first 18 years (1932–50) were spent in Gujarat, Madhya Pradesh, Bihar, Uttar Pradesh and Bengal. Books were a constant companion in our itinerant family's travels and I became an avid reader at an early age. A desire to write then developed, encouraged no doubt by the inheritance of maternal genes, as my mother was a prolific writer. In 1947 while in school at Allahabad and, influenced by the sight and sound of aircraft from nearby Bamrauli, I had my very first article, titled 'Aeroplanes' published in *The Leader* a local newspaper and received my first cheque of Rs 7! Three years later, while in college in Kolkata, the set of books which was the prize for winning an essay competition, included one on military aviators of WW II.

The next 35 years (1951–1986) were equally nomadic while serving as a fighter pilot at 12 air bases in various operational and training appointments in WAC and TC. My writing was confined to the weekly letter to the young lady I courted for five years and married in 1956. Like all my colleagues we raised our two children and built a house during these frequent postings. My first writing in the IAF developed while attending the 1960-1961 staff course at DSSC Wellington. Thereafter it was intermittent and restricted to articles on military aviation and flight safety. In 1973 I was the air force representative of a three-member joint services team to draft our armed forces very first JSSD Manual Vol I on Service Writing. I had joined the air force to fly and enjoyed every minute in the air from Tiger Moths to Jaguars with a wonderful 10–year tenure on that most magnificent aircraft, the Hunter.

In 1985-86 the air force opened up an option for me to take premature retirement. I owed the IAF a great deal but, having paid the debt in toto, was happy to separate, move on and retain very fond memories of my years with the air force.

The past 34 years from 1986 to date continue to be a most stable and productive period. Learning and its application never cease and my post–retirement tenures in the corporate and academic worlds, were equally rewarding. We now had the time, freedom and opportunity to follow our own interests from the comfort of our own home. We travel extensively though I am now 'downgraded' from cockpit to cabin! Most important is the time I can now devote to freelance writing. In 2014 I published a book titled 'Airlooms' which was a collection of 65 articles written from 1961 onwards. Over the past six years I have scripted 75 of these Anecdotes under my AAA column which appear periodically in both print and electronic media.

For the most part reader response has been gratifying though a few tend to confuse these personal memories of an aviator with air force history. This writer is no historian and neither are his recollections of people or events history per se, though a few might possibly bring life to history and vice versa. In fact, to my grandchildren these anecdotes appear as "the story of grandpa's life in instalments" (!!).

Mention of family reminds me to share some happy news. In the 65th year of our marriage, we are to become great grandparents in a few months time. This is being written during the lockdown and no one really knows what a post Covid-19 world will be like. We wonder if our plans to make our very last flight abroad later this year will fructify? If they do, it will not only enable us to meet-and-greet our very first great grandchild but also give this old pilot something new to write about!

The beautiful profile of a Hawker Hunter is seen in this photo by Peter Steinemann

25 Years Back

From Vayu Aerospace Review Issue IV/1995

"Erosion of Defence Capability"

There is general disquiet in the corridors of South Block on the "erosion of defence capability" since 1989. From that year "there have been no significant upgrades of existing equipment, nor induction of new weapons platforms". A key official in the Defence Ministry supports this point by adding that in terms of percentage of gross domestic product, estimated real defence expenditure in 1995-96 "is the lowest since1961-62", the period just before the Chinese border war took place.

Senior Air Force commanders say that the only state-of-the-art aircraft in their armoury "are the two Mirage 2000 squadrons and the MiG-29s." According to them, "the lack of airborne early-warning (AWACS) and mid-air refueling capability are crippling limitations on the force." While most refused to comment on political formations, it was interesting that all who did so claimed that "the BJP is the only party that appreciates the need to support our defence forces." The Congress has apparently (at least within the armed forces) lost the "nationalist platform to its major rival".

Severe cash crunch for Indian Airlines

Indian Airlines "liquidity position has come to a very alarming stage". The Airline had been incurring losses since 1989-90 and by 1994-95, the losses had touched a staggering amount of Rs 960 crores. While the "cash deficit" in the current year is mainly outcome of the acquisition of 30 Airbus 320 aircraft in the last few years, "which has tremendously increased the debt servicing liability", it is admitted that "continued losses from operations have further aggravated the cash situation". Instead of much higher utilisation, IA's A320 aircraft "are, by and large, under utilised".

More Dornier 328s for VIF

Continuing with the recent spree of granting aircraft import licences, the Ministry of Civil Aviation has allowed Hyderabad-based VIF Airways to bring in another six airliners in the below 50-seater capacity. VIF have already contracted for the new generation Dornier 328 regional airliners with the first aircraft flying on scheduled service out of Begumpet (Hyderabad) airport since May 1995.

The committee led by Anil Baijal, the JS, has however deferred a decision on allowing import of aircraft by East West, NEPC, Pushpaka Aviation, Patel Airways, Classic Airlines and Golden Aviation. East West had sought five more Boing 737-400s and NEPC two 50-seater aircraft.

Kargil Airport

The second highest civil airport in the country, at an altitude of 9,500 feet, is to be commissioned at Kargil (J&K) for commercial use barely two months after the work started on the project. Union Minister for Civil Aviation Ghulam Nabi Azad alongwith DGCA, HS Khola and other officials of the Airports Authority of India (AAI) visited this airport recently to inspect the work.

People of this strategic border town have been demanding airlinks for the past few years, delegations of political leaders from Kargil meeting the Prime Minister in this regard. The airport is also essential for the socio-economic growth of the region as the area has tremendous tourism potential.

Air India MCLR panel

The Air India Board has formed a three-member committee for technical evaluation of proposals for the *Medium Capacity Long Range* requirement from Airbus Industrie, Boeing and McDonnell Douglas. The MCLR aircraft manufacturers are competing for Al's medium medium-term plan (1995-2002), which envisages more than doubling of its fleet from the present 26 aircraft to 54 aircraft. The plan seeks to induct MCLR aircraft from 1997-98 onwards and aims at phasing out its entire fleet of Boeing 747-200s.

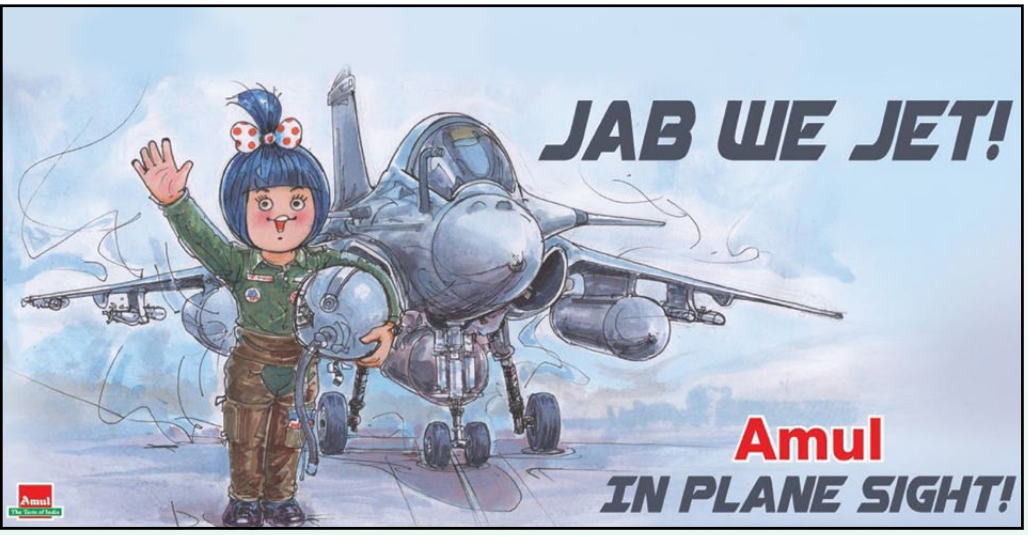
Apache Longbow for British Army

30 months after the British Army formalised its attack-helicopter requirement, which saw a vigorous marketing and political contest between Westland/McDonnell Douglas for the Apache, British Aerospace/Eurocopter for the Tiger II and GEC/Bell for the Cobra-Venom, the Westland/ McDonnell Douglas WAH-64D Apache Longbow won the competition. All the AH-64Ds will be equipped with the Lockheed Martin Longbow millimetre-wave (MMW) target-acquisition radar. The AH-64Ds will be fitted with a mixture of imaging infra-red and radio-frequency-guided Hellfire air-to-surface missiles.

Pakistan Air Force seeks Mirage 2000-5 ?

The continuing saga of F-16s for the Pakistan Air Force appears to be heading towards a resolution of sorts with the United States Administration offering to sell the 28 stored F-16A/Bs, built for Pakistan but, because of the Pressler Amendment, under continued storage for some years, to Indonesia. However, with the possibility of receiving more F-16s getting virtually extinct, the PAF has reportedly decided instead to acquire the French Dassault Mirage 2000-5.

Tale Spin



(Yet another example of Amul's advertising brilliance)

Aandhi Aiye!

In October 1953, when the first French-origin fighters joined the IAF, their French name 'Ouragan' was bit of a tongue twister for the Indians and so the then Defence Minister translated this to the nearest Indian equivalent. Thus, 'Toofani' came into being. Now, 67 years later, the Ouragan's great grandchild ('plane') has joined the IAF. 'Rafale' means 'strong gust' in French and whether or not this is a tongue twister for the Indians remains to be seen but, following the six decade tradition, this 4.5 generation omni-role fighter too might well be named as 'Aandhi' in IAF service.

Raksha Mantri ji, how about that?

Inspired by the Rafale

Just as they did across the Radcliffe line in the 1980s, enthusiastic Pakistanis, bewitched by the F-16 Fighting Falcon, pride of the PAF, gaily painted their buses and trucks with

images of the fighter, now the Rafale too has greatly enthused farmers across the border to name their tractors as such. This is a matter of understandable pride.

But this can go too far. What is not enviable is that a 'Rafale'-branded pan masala which an enterprising businessman, taking advantage of the prevalent Rafale–mania, has promoted in a video showing a purported Rafale (it was actually an animated F-14 Tomcat of the US Navy!) There was a flurry of reaction including from the health department which noted that there was no 'statutory warning as mandated by the *Meals Security and Requirements Authority of India* (FSSAI)' on the packet. This genotoxic habit amongst many sections of Indian society has been frowned upon and even banned in many States.

But the Rafale has come to stay in any which way!

One Flag, One World

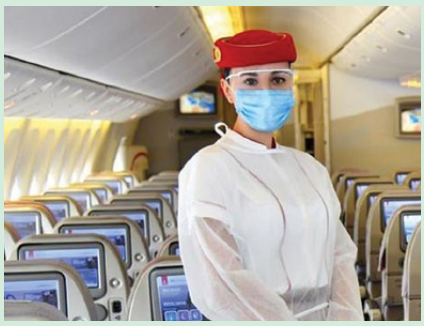
The Covid-19 pandemic continues to rage across the globe, with the aviation and leisure industry most drastically affected.

Every continent is enduring the virus even as researchers are working 24x7 to find a vaccine to stem the spread. Covid-19 has also 'inspired' wry humour, as seen in this flag depicting a face mask and advising everyone to wear one before moving out of their homes.

Is there some message in that the United Nations flag is of the same, light blue colour?

Is that my Captain?

The pilot in command and his first officer on an airliner's flight deck are well recognised by the stripes on their shoulders. So that no one makes a mistake, an enterprising airline has now given their pilots face masks with appropriate seniority stripes as well.



And what of the cabin crew?

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