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Aerospace & Defence Review

III/2020

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Aircrew getting into Jaguar two-seater (photo by Simon Watson)

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"Atmanirbhar Bharat Abhiyaan"

The Prime Minister has announced a special economic package and gave a clarion call for *Atmanirbhar Bharat,* noting that this package, taken together with earlier announcements by the government during the Covid crisis and decisions taken by RBI, is to the tune of Rs 20 lakh crore, which is equivalent to almost 10% of India's GDP. He said that the package will provide a much needed boost towards achieving *Atmanirbhar Bharat*.

The package will also focus on land, labour, liquidity and laws, will cater to various sections including the cottage industry, MSMEs, labourers, middle class, industries, among others. The details of the contours of the package would be provided by the Finance Minister, "in the coming few days."

Talking about the positive impact of reforms like the *Janadhan-Aadhar-Mobile* (JAM) trinity and others, brought about in the last six years, the Prime Minister said that several bold reforms are needed to make the country self-reliant, so that the impact of crisis such as the Covid, can be negated in future, and include supply chain reforms for agriculture, rational tax system, simple and clear laws, capable human resource and a strong financial system. These reforms will promote business, attract investment, and further strengthen *Make in India*.

The Prime Minister continued in that self-reliance will prepare the country for tough competition in the global supply chain, and it is important that the country wins this competition. The same has been kept in mind while preparing the package. It will not only increase efficiency in various sectors but also ensure quality. Highlighting their contribution to the country, the Prime Minister said that the package will also focus on empowering the poor, labourers, migrants, etc., both from organised and unorganised sectors. He observed that the crisis has taught us the importance of local manufacturing, local market and local supply chains. All our demands during the crisis were met 'locally'. Now, it's time to be vocal about the local products and help these local products become global, he said.

PM Modi's address to the Nation on 12 May 2020

"End the Lockdown … so as to Save Lives"

The coronavirus kills, on that there is no dispute. But the lockdown meant to soften the killing power of the virus might also be causing a large number of deaths, which might not immediately be linked to the virus or the lockdown but could end up being quite significant. It makes sense to end the lockdown and resort to test, trace and quarantine strategy, if the goal is to save lives. Swaminathan SA Aiyar pointed out in his column that an investigation by the *Financial Times of London* shows that excess mortality caused by the lockdown in Europe is about 40%.

FT looked at the number of people who died in March and April this year, as compared to the average for these two months of the past five years, regardless of overt causation. Excess mortality was as high as 60% in Belgium. But it was a low 12% in Sweden, which did not enforce a lockdown. Patients have either been reluctant to travel to hospitals for fear of contracting Covid-19 or found it impossible to reach hospitals or receive treatment.

It has been observed that traffic accidents and violent crime, also domestic violence, have registered a sharp decline thanks to the lockdown. Therefore, the number of those who die every day should be coming down.

But it is likely to have gone up on account of the collateral damage of fighting Covid-19. As our editorial argued, it makes sense to divide the country into containment regions – areas that pose the risk of spread of Covid-19, meaning individual residences of patients or clusters of residences if that is called for to identify a perimeter for control – and the rest where life resumes, albeit to the new normal of safety protocols at the workplace and during commutes.

Those who have been able to work from home reasonably efficiently should be encouraged to continue as they have been. Public transport capacity and shopping hours must be increased, rather than reduced as some states have been doing, to reduce crowding. India must get back to work at the earliest, to save incomes and lives.

From *The Economic Times*

China's syndromes

The recent skirmishes between China and India in Ladakh and Sikkim underline the need to understand Beijing's motives and respond to them appropriately so that mistakes — most notably in responding poorly to signals in the run-up to the 1962 border war — are not repeated. Since the Chinese have already moved a few kilometres into previously uncontested Indian territory, getting them to vacate and reverting to *status quo ante* can be done only diplomatically. Speculation on China's motives for this escalatory behaviour has so far focused on Beijing responding to India improving its border infrastructure, especially in upgrading and linking border roads to military bases further inland. But these upgrades have been going on for some time, and, despite this, significant asymmetry remains between the quality and sophistication of Chinese and Indian border infrastructure. It is possible that part of the provocation is on account of the recent move by the Indian government in closing the automatic route for Chinese investment. It is equally possible that this can be read as a warning that India, which has already tilted towards the US in the area of defence, should not join the Washington-led chorus of condemning China's handling of the Covid-19 pandemic, and desist from supporting the reinstatement of Taiwan's status in the World Health Organisation.

Indeed, the fact that China has moved into both Ladakh and Sikkim suggests that this could well be part of a larger foreign policy objective. In the post-Deng era, China's growing economic clout has encouraged its leadership to adopt a more aggressive foreign policy. Since 2010, China has more or less had its way against Japan, Vietnam, and the Philippines with regard to territory in the South China Sea and the Yellow Sea. It is now pushing harder on Hong Kong, where protests have erupted afresh over a new national security law, and in Taiwan (though with less success). China has also sought to penalise Australia (through the imposition of penal

tariffs on specific products, an old tactic used earlier against the Philippines and Bolivia) for some of its recent anti-Chinese moves. Its actions in Ladakh and Sikkim appear to fit that pattern.

It is clear that China, which has earned grudging admiration for the pace at which it is recovering from the pandemic, will play an even bigger role in the post-Covid-19 world order. The question is whether the world will make room for a rising power, or whether there will be conflict, latent as in a Cold War or overt in terms of military action. The possibility of tension is underlined by the fundamental re-reading by the West of China's long-term direction, compared to the thesis when China entered the WTO in 2001 that it would become "normal" as it became more prosperous. Already, China has split and neutralised the EU by making overtures to Italy (though Belt and Road Initiative projects and other investments) and Germany (where China is viewed as favourably as the US). For a country that equates hierarchy with stability, in which each country knows its place, there is no question that China expects India to recognise and accept Beijing's growing military power, both on land and in the Indian Ocean, and in missile capability. This will increasingly test India's long-standing search for strategic autonomy, especially when the country's defence capability vis-a-vis China gets steadily more unbalanced.

From *Business Standard*

Don't succumb!

Beijing is bringing in a national security law in Hong Kong that effectively spells the end of the 'One Country, Two Systems' approach granting autonomy to the economic hub. Its move to integrate Hong Kong could lead to the US revoking the city's trade privileges; and possibly offering asylum to Hong Kong's dual passport holders thereby stripping the city of its best and brightest. That Beijing still decided to go ahead despite the risks involved – besides unilaterally declaring new administrative districts to incorporate disputed islands in South China Sea – indicates that it is willing to up the ante as a major revisionist power in the world system.

Alongside, Beijing is also stepping up the ante along the LAC. The confrontation began earlier in May in Sikkim and eastern Ladakh and has seen both sides send in additional troops to the forward areas. The situation is particularly tense at Galwan Valley with an estimated 1,200 Chinese soldiers pitching 80-100 tents and setting up bunkers much ahead of China's claim lines in the region.

Indian diplomats have rightly seen a connection between Chinese aggressiveness along the LAC and the broader trend of "wolf warrior" diplomacy that Beijing is currently showcasing. It is willing to hit countries like Australia with import bans, for example, when the latter legitimately broached the question of probing the Covid pandemic's origins. Since Beijing permits few imports from India in any case, pressure along the LAC may be its instrument of choice in coercing India to back its international positions, now facing flak from Western countries, and to accede to a China dominated order.

Thus, Beijing has been vehemently opposing Taiwan's participation at WHO – despite Taiwan's demonstrated success in containing Covid – and wants New Delhi to take its side. It may also want New Delhi to reverse its recent move closing the automatic route for Chinese investments. But New Delhi must firmly stand up to Chinese pressure. This is especially so since Beijing rarely gives any diplomatic quarter to New Delhi on issues important to India, such as Kashmir or terror. On the economic front too, China rarely adheres to reciprocity and has done little to mitigate the huge bilateral trade deficit by giving Indian investments or imports more access. A China-dominated Asian order would be disastrous. India should join cause with like-minded nations and entities, including Taiwan, and push for a rules based, multilateral order.

From *The Times of India*

Daring the Dragon

Chinese President Xi Jinping's call to the People's Liberation Army on 26 May to think about worst-case scenarios and to scale up battle preparedness has come at an inopportune moment during a face-off between China and India in Ladakh. Coming as it does from the highest Chinese authority, the message is a riddle, as is often the case with Chinese military-diplomatic signals. It appears more as provocative muscle flexing rather than a subtle attempt to make its neighbour strike a balance between its priorities, possibilities and vulnerabilities. The Chinese are clearly anxious about a new Cold War in the post-pandemic world and their foreign minister Wang Yi stated it in no uncertain terms, warning the US. In this context, any overture by India towards the US for a quasi-military alliance through the Quad will surely tilt the balance against China, militarily and economically.

But instead of offering India reasons to remain equipoised, the Chinese are merely offending India by focusing on its vulnerabilities. Every small border skirmish gets magnified and overstated in Indian media, particularly in the toxic electronic media with its hyperventilating, super-nationalist anchors. So, even if China is attempting to thwart India's border infrastructure construction in a benign stand-off, or it has grand plans to throttle India's new economic aspirations, it has done it the wrong way. A public opinion is getting created, which will force the government to strike a strong, muscular pose.

India, unfortunately, has not learnt from its own past follies or the history of its neighbour. The Chinese grew keeping their head low, turning the rhetoric down, avoiding bravado and working hard to get cats from all over to catch their mice, to quote Deng Xiaoping. So, instead of poking a creeping dragon with announcements that could be read as a statement of intent against Chinese imports, India ought to focus on building its economy. The government has so far done well to create capabilities on the LAC and to stand firm against Chinese incursions. India survived the last Cold War, despite being on the losing side; it should thrive during the next one with elastic diplomacy.

From *The Tribune*

OPINION

Admiral Arun Prakash urges that this is the

"Right time to usher in reforms in India's Armed Forces"

If we take the 2001 Group of Ministers Report as the starting point, the Indian state has taken 19 years to initiate the process of genuine national security reform, whose 'green shoots' are represented by the newly constituted Chief of Defence Staff (CDS) and Department of Military Affairs (DMA). Although unduly delayed, this move, by the NDA government represents the most significant development in the national security domain since Independence.

To put things in perspective, the Indian military has, for the first time, been accorded recognition in the edifice of the Government of India (GoI) and has thereby been empowered to take decisions that will shape its future. The first priority for the armed forces should be to squarely address certain fundamental incongruities that have stunted their capabilities vis-à-vis adversaries and impinged adversely on India's national security. While these anomalies are being rectified, the process of defence reforms should be set in motion and pursued with vigour.

But before proceeding further, let me deal with a seemingly trivial issue. The term CDS does not connote a 'rank'; it is a 'post' tenable by a General, Admiral or Air Chief Marshal. Therefore, the creation of a new rank-badge for the first incumbent was unnecessary. The new, maroon shoulder epaulette seems designed only for an army uniform and conveys an inappropriate message since the navy and air force wear their ranks on the sleeve.

Coming to a more substantive issue, if the relegation of Service Headquarters (SHQ) to 'attached offices' was an early 'act of commission,' which made the military subaltern to the bureaucracy, an equally damaging 'act of omission' was the failure to accord recognition to the armed forces of the Union in the new Constitution.

While Article 312 created the IAS and IPS as 'All India Services', the functions, responsibilities and status of the armed forces, and their Chiefs, found no mention in the Constitution of India or any Act of Parliament. Even the GoI Allocation of Business Rules (AoBR) have ignored them. This absence of recognition and lack of defined status has worked to the detriment of India's military in many ways.

The PIB note of 24 December and brief gazette notification of 30 December 2019, has added two more anomalies that can further complicate the already tangled arena of higher defence management.

Firstly, the CDS, in the pay-grade of Cabinet Secretary/Service Chiefs, has been designated as 'Secretary DMA', which is a rung lower. This sets a wrong precedent and jeopardizes the status of Service Chiefs who are on par with the Cabinet Secretary. Secondly, having created a CDS it seems anomalous to retain the responsibility for, "Defence of India and every part thereof…" with a bureaucrat, the Defence


DRDO Bhawan

Secretary. Indeed, the Defence Secretary has been given even greater institutional responsibility by adding "…defence policy and preparation for defence," to his new charter. This goes against the very spirit of reforms and needs to be reviewed. The recognition of senior military appointment-holders as "functionaries of the GoI" will provide a legal basis for the discharge of their duties, and is an issue that needs to be pursued by the new DMA on priority.

This brings me to the second area of concern; India's failure to attain self-reliance in defence hardware. Dependence on foreign countries for weapon systems not only diverts our defence budget into their coffers but also undermines our strategic autonomy and freedom of action.

The main reason for the dismal failure of India's Defence Research and Development Organisation (DRDO) and massive defence-production complex, to achieve self-reliance, is three-fold. Firstly, the SHQs have been denied a say in the prioritisation of DRDO's projects, and the latter is free to spend its budget on technologies which often do not have relevance to the military's operational needs. Secondly, since no instrumentality exists for independent review and oversight of DRDO's projects, time/cost overruns, performance shortfalls and even failures go unaccounted for. Lastly, the armed forces, by focusing exclusively on 'current combat capability', have displayed indifference towards the indigenous defence industry and so contributed to the current stasis.

A key result area for the CDS must be to ensure that DRDO and the defence-production complex are put on the right track and provided motivation and guidance so that India can aim for self-reliance in defence by 2070. Apart from other policy changes, the GoI must be persuaded to appoint Service officers as CMDs/CEOs of DPSUs and to ensure military representation on the boards of directors of these units.

The most serious consequence of the military's isolation from MoD has been the huge delays imposed in the processing of cases; related to hardware acquisition, infrastructure and personnel-management. Each case, after being steered through multiple layers of MoD bureaucracy, is questioned all over again by its Finance Wing. Queries are sequential, repetitive and often raised to prevaricate.

Integration of SHQ with MoD has been sought for decades because bringing civil and military expertise under one roof would reduce file discussions and eliminate delays. These attempts have been firmly opposed by the bureaucrats, who insist that the status quo is quite satisfactory. Loosening the stranglehold of the bureaucracy and putative 'financial advisors' on the SHQs, through civil-military integration, should be an important objective of the DMA. Its attainment will have the most beneficial fallout for force-modernization and combat efficiency.

Finally, I come to the crux of the reform process – the evolution of 'unified' or 'joint' command structures. Contrary to the general impression, the GoI has not specified any deadlines for creation of what is called, 'Theatre Commands.' In fact, while embracing every other aspect of jointness at the earliest possible, the constitution of such commands, their span of responsibility and geographic boundaries must be decided after due consultation between the CDS, the Service Chiefs and their staffs. There are two other reasons for proceeding with due caution.

Firstly, we lack officers with the background or qualifications to function on the staff, and as 'component commanders' or Commanders-in-Chief, of a unified command and to operationally deploy its three service components. Creating a cadre of such officer's calls for re-shaping the system of professional military education followed in the armed forces. Important steps in this process will be to re-cast the Defence Services Staff College as the Joint Services Staff College and to alter syllabi of the service War Colleges so that their graduates are competent to fill billets in a unified HQ.

Secondly, once unified commands are created, the operational control of field forces would devolve from respective SHQs to the unified commanders. The Chiefs, having been divested of operational responsibilities, would, then, focus only on recruitment, training, and logistics. Since the critical transition from one system to the other could lead to degradation of operational capability, it must be preceded by adequate preparation and undertaken in phases. Creation of a Joint Staff HQ would facilitate the oversight of this process.

The armed forces, after decades of clamouring, have been accorded a historic opportunity to usher in change and reforms. It is imperative that this opening is utilized with sagacity and deliberate forethought. While making haste, it is important that the leadership gets it right the first time, for there may never be another opportunity.


Staff College Wellington

Air Marshal Brijesh Jayal has a message for the Chief of Defence Staff

"Please make haste slowly"

Creation of the post of Chief of Defence Staff (CDS) is rightly being billed as a major reform in the higher defence management of the country. While such a post identifies the senior-most armed forces' officer, its area of responsibility and authority varies significantly depending on the higher defence management model that a country wishes to adopt and the authority the elected government wishes to endow on the post.

Traditionally, such appointments are viewed with hope and expectations by some who wish to see a cohesive military machine and a degree of trepidation by others who worry of too much authority being endowed in the hands of one military leader. In India, the history of this conflict of ideas goes back a long way and in his recent book on Krishna Menon, Jairam Ramesh reveals how in the early fifties, Lord Mountbatten was pushing Pandit Nehru to appoint Thimayya as CDS, but Menon was opposed to the idea of giving too much importance in policy matters to a single military man. In one form or the other, this reservation on the part of the polity has continued.

The Kargil Review Committee tasked to investigate events leading to the Kargil intrusions had noted: 'India is perhaps the only major democracy where the armed forces' headquarters are outside the apex governmental structure. The chiefs of staff have assumed the role of operational commanders of their respective forces rather than chiefs of staff to the Prime Minister and Defence Minister'. It observed that this had introduced an element of command culture in otherwise staff areas of long term planning and strategic issues impacting negatively on them.

The Group of Ministers that reviewed this report, however, shied away from proposing the integration of the service headquarters with the ministry of defence (MOD) but proposed appointment of a CDS. Due to lack of consensus within the entire civil-military spectrum, this proposal continued to linger until the PM made a surprise announcement from the ramparts of Red Fort.

With the creation of a new department of military affairs (DMA) in the MOD with the CDS also its Secretary, and with the service chiefs continuing with their commanders' role, we have now opted for a unique higher defence management model not practised in other democracies. There is hence merit in laying the foundations of the organisation with its systems and processes in place, before wading headlong into the deep end. This is in the context of the defence secretary's statement that the DMA has to hit the ground running and show tangible outcomes in a hundred days!

With the defence secretary responsible for defence policy, preparation and capital acquisitions, the CDS' role appears to be limited to bringing about some jointedness in nearly every area of functioning of the three services including formation of Joint/ Theatre Commands. Some of these may be desirable objectives, but there are historical reasons why these and others have defied resolution. These sensitivities need to be heard and factored in discrete deliberations and discussions amongst major stakeholders — not through public statements. This is because apart from parochial reasons that can be addressed administratively, there are sensibilities peculiar to the military profession where much of the strength of each arm comes from its own ethos, culture, comradeship and other such intangibles that make for the cohesion and strength of a fighting force.

One could argue that since the first announcement, things have moved at a pace that may not only be too rapid for the Indian administrative system to cope but may inject an element of confusion in the otherwise very structured and regimented ranks of the armed forces if not handled sensitively. There is every reason for the nation to be conscious of the sensibilities of the profession of the armed forces and introduce change progressively and constructively without in any way interfering with military preparedness. This needs a staff approach and not a command one. It is perhaps worth making haste slowly.

Whither self-reliance in defence hardware?

India's political establishment seems to have utterly failed to appreciate the need for self-sufficiency in military hardware. Consequently, no roadmap or grand strategy has ever been drawn up for attaining autonomy in defence production, writes Admiral Arun Prakash (retd).

In a clear declaration of his priorities, Prime Minister Narendra Modi had launched the laudable 'Make in India' campaign within weeks of election to office in 2014. Aimed at making India a "global design and manufacturing hub", the initiative targeted 25 sectors, with the triple objectives of creating jobs, increasing the growth rate of manufacturing and enhancing the contribution of manufacturing to India's GDP. Over the past six years, apart from an initial spurt in FDI, the indicators in respect of all three stated objectives have disappointed.

Past elections have shown that, while the Indian voter may detest "policy paralysis", he is quite susceptible to being swayed by catchy and aspirational slogans. Politicians, therefore, make liberal use of catch-phrases, not just for garnering votes, but also, as placebos to assuage the peoples' disappointment in other spheres. The time has come, for the Indian voter, to look beyond political sloganeering and ask why India's landscape is littered with so many stalled projects, and why planned developmental goals and objectives, are so rarely met.

The answer, one suspects, is to be found in the harsh reality of flawed policy formulation, coupled with absent mechanisms for policy implementation as well as programme oversight. Thus, if many of the PM's lofty aspirations for the nation remain unrealised, it is, clearly, his cabinet colleagues and/or civil-servants who should be held to account for their lackadaisical approach or non-performance.

Against this backdrop, the PM's latest exhortation to his countrymen, to strive for an 'Atma Nirbhar Bharat' or 'self-reliant India', in the midst of the grave health and economic crisis wrought by COVID-19, has mystified many. It has also left sceptics wondering whether this indicates a retrograde lurch towards the old days of *swadeshi*, or 'import substitution' and an autarkic economic mindset as manifested by India's refusal to sign up on multilateral trade agreements.

Given the uncertainties of the global economy and increasing trend of trade protectionism, arguments for and against self-reliance, as a recycled policy maxim, could go on forever. However, the one area in which *Atma Nirbharta* or autarchy is unarguably vital is India's underperforming defence production sector. In this context, it is heartening to note the reforms, announced by the finance minister. That they come in the midst of a mortal struggle recently against COVID-19 should be seen as evidence of the government's resolve to convert this 'crisis into opportunity', and one must refrain from carping.

The abject failure of our government-owned Defence Technology and Industrial Base (DTIB) to attain self-reliance in weapon systems represents, not just security vulnerability, but also a colossal missed opportunity. Thriving arms, aeronautics and shipbuilding industries could have made a dramatic contribution to the success of PM Modi's 'Make in India' campaign; by spawning a complex of ancillaries in the MSME sector, by skilling our youth and creating jobs for them and by positioning India amongst the world's weapon exporters.

There is huge irony in the fact that India, the world's second-largest arms importer also happens to possess one of the world's largest DTIBs, comprising the huge Defence Research and Development Organisation (DRDO), with its large cadre of talented scientists and network of 50 laboratories, backed by the production facilities of nine Defence Public Sector Undertakings (DPSU) and 41 Ordnance Factories. The complex has been churning out an array of military hardware, including warships, fighters, tanks, missiles, radars and aero-engines, proclaimed as "indigenous".

Lamentably, the core of each indigenous platform, essentially its engine (whether diesel, gas-turbine or nuclear), guns, missiles and radars, as well as key electronic components like microprocessors, magnetrons and travelling-wave-tubes, are all of foreign origin. Representing 60-70 percent of the platform's cost, these vital components render the availability and effectiveness of our weapon-systems, in war, contingent on support from foreign sources of uncertain reliability.

India needs to introspect how, starting from a similar base in the 1950s, the defence industries of Brazil, Turkey, South Korea and Taiwan has left India miles behind! China's military-industrial complex, which took wing in the 1960s after Beijing's doctrinal breach with the Soviets,

has stunned the world by its ingenuity, innovation and productivity. Today, China is engaged in rapid serial production of modern aircraft-carriers, destroyers, nuclear submarines, stealth aircraft and hypersonic missiles amongst much else.

India's political establishment seems to have utterly failed to appreciate the need for self-sufficiency in military hardware. Consequently, no road-map or grand-strategy has ever been drawn up for attaining autonomy in defence-production. Since the 1960s, India has poured billions of dollars into Soviet/Russian coffers for weapon purchases, often helping keep their bankrupt corporations afloat. But no Indian statesman has ever thought of leveraging these huge transactions to acquire advanced technology for India's laggard DTIB. Exactly the same play-book is being re-enacted in the American context. The past decade has seen us purchasing over 20 billion dollars' worth of US military hardware, but not an iota of technology has been either demanded by India – or offered by the USA.

Prominent amongst DRDO's many failed/overdue undertakings are the meandering Tejas fighter, the Arjun battle tank and Kaveri jet engine projects and the rejected INSAS family of small arms. These are, collectively indicative not just of the organisation's lack of focus but also of the total absence of political direction in the vital area of military-industrial capability. No accountability has ever been demanded by any government from any organisation or individual for this dismal state of affairs. The Defence Production portfolio, usually allotted to a junior Minister of State, is actually overseen by the Ministry of Defence bureaucracy, which wields authority but lacks comprehension as well as interest in military technology. Their sole function seems to be protecting their DPSUs from the private sector competition.

The three Services have been denied a say in the prioritisation of DRDO's projects, and the latter is free to spend its budget on technologies which may lack relevance to the military's operational needs. The three Services regularly provide the DRDO with a Technology Roadmap spanning 10-15 years and draw up Staff Qualitative Requirements in close consultation with this organisation. Scientists, must, therefore, refrain from pursuing 'technology demonstration' and other self-assigned goals, while the military waits, in vain, for 'hardware' that would bolster its combat capabilities.

Most DRDO projects have failed owing to the absence of political vision and guidance, coupled with a deficit of project-management skills. The navy's warship and nuclear-submarine building programmes have clearly demonstrated that user participation and project management by hand-picked military officers are the twin keys to the success of such vital programmes.

Having embarked afresh on the 'Atma Nirbhar Bharat' campaign, the bitter experience of the past should prompt the Prime Minister›s Office to ensure that past mistakes are not repeated. Nothing short of a complete revamp of our DTIB will deliver desired results.

Amongst the measures those merit serious considerations are:

- Evolution of a 50-year Defence Production Strategy that spells out actions required for rejuvenation and planned growth of India's DTIB.
- Creation of an independent Ministry of Defence Production.
- Re-structuring of the DRDO to inject transparency, efficiency and accountability. Participation of user Service(s) must be mandated, in terms of management as well as a financial contribution to the project.
- Mobilisation of the private sector as a full partner in defence R&D as well as production.

Post COVID-19: Re-imagining the new world order

As the world grapples, rather unsuccessfully so far, with its worst pandemic in a century, COVID 19, it would be an understatement that the world, as mankind has known for decades, will ever be the same again! The Coronavirus is not just a medical emergency which has afflicted the entire world, already caused near half-million fatalities and with its rampage continuing alarmingly, the socio-economic-political consequences for the world, in the near future, are likely to be as horrendous as the employment of a weapon of mass destruction(WMD).

Post COVID 19, whenever that period dawns, what the new world order or disorder would be is agitating the minds of governments and analysts the world over. Though it is rather premature today to crystal-gaze as to when the world can rejoice that COVID 19 is now part of history, it is equally imperative for governments and global institutions, the world over, to frankly analyse the ramifications of the aftermath of such an apocalyptic event. It will be better to be prepared for the after-results now than be found ill-prepared as the world was when this pandemic struck in full surprise and ferocity.

The onslaught of this coronavirus was indeed a Black Swan event and hence it found the world, including the most powerful nation on the earth, USA and most of the technologically advanced nations, like in Europe, grossly under-prepared – a fact that will puzzle future historians. For the uninitiated, a Black Swan event is a metaphor for an unpredictable event that is beyond what is normally expected of a grave situation and is characterised by both extreme rarity and equally severity in occurrence. Events like the Black Death plague which had engulfed the world 600 years back and took a toll of 25 million lives, the Spanish Flu a hundred years back which took millions of lives, the atom bomb attacks on Hiroshima and Nagasaki in Japan by the US Air Force at the near-end of World War II or the 9/11 terrorist attack on the Twin Towers in the US could be categorised as Black Swan events.

Prior to ascertaining through the prism of uncertainty the contours of the "new normal" or the "next normal", it will be in order to study what all went grievously wrong in the globe's response to the pandemic. Firstly and, unquestionably, was the emerging superpower China's total disdain for the fallout of the coronavirus. Reliable reports in the western media point out that as early as 17 Nov 2020, the virus was detected in the Wuhan laboratory in China's Hubei province. It was attributed to the major animal market of Wuhan which sells dead bats, dogs, cats, fish, seafood and many other forms of animal produce for the Chinese palate. Once the virus started spreading uncontrollably, it was only on 31 Dec 2019 that China cared to inform the WHO regards the spread of an "abnormal pneumonia".

From the beginning of January 2020, the pandemic rapidly spread its tentacles to the US and most nations of Europe with devastating effect. Amazingly and regrettably, the US and most nations were rather sluggish in their response mechanisms to combat this dreadful virus. No stringent lockdowns or social/physical distancing or curbs on travel or congregations was enforced---- the tragic results were for all to see with medical systems collapsing and no drugs/vaccines

available, no hospital beds or ambulances, as required, available. It was only that by end Feb/ mid-March some emergency measures were enforced---much too late though. The world expects all fellow nations to share critical information with each other in the event of such emergencies as such viruses do not recognize any international borders.

In India too, there is a view that we may have been a bit late in enforcing lockdowns and other stringent measures. Nevertheless, PM Narendra Modi's much awaited 21 days lockdown announced on 24 March (and its subsequent extension till 31 May 2020), though necessary, could have been better implemented with some advance planning. Though the centre and state bureaucracy did step up subsequently to resolve the teething problems, especially of migrant labour, many helpful interventions from well-meaning NGOs, gurdwaras, temples, the public and others, the humanitarian problems have been overcome to a large extent. Overall, the nation's response, cutting across religious lines, to this medical emergency has been encouraging and embellished with humanitarianism.

The other major fall-out of the COVID 19 pandemic will, in all certainty, be the catastrophic economic costs the world will have to bear. The IMF has stated that the current crisis is the most horrible in a century and will be likely worse than the "Great Depression" (1929-1939). It visualises the global GDP to shrink by a whopping 3 percent though it forecasts that next year could witness an improvement. As observed all over the world, stock markets have tumbled to abysmally low levels, production facilities come to virtual shutdowns, staff laid off, air and rail travel shut, supply chains both international and intra-nation disrupted etc. In addition, oil prices have had a dangerously steep decline throwing the world trade and economy out of gear. The US with its financial muscle ultimately, despite being financially badly mauled, is expected to slowly bounce back. President Donald Trump, now in his crucial re-election year, may take some out-of-the box fiscal initiatives to bring the US economy back on track. The ongoing trade war between China and the US may witness contours of a rivalry not witnessed so far. Anyway, China needs to be globally chastised for its unethical practices.

It will be a natural fall-out for most nations now to take a fresh look at their trade relations with China. Japan has already announced a US $ 2.2 billion package for their industrialists to pull out of China. Others like Taiwan may do so too. Some of the industries moving out of China may prefer to re-locate to India and here is a good chance for India to welcome them here and give a fillip to India's currently near-stagnant "Make in India" programmes. However, the Indian establishment will have to shed its hollow big talk, traditional lethargic attitudes and genuinely encourage foreign investments into India. India's private industry is modern, robust, and skilful enough to work together with foreign collaborators.

The world now must rise and strengthen global institutions like the UN and its various agencies to combat global challenges. No country, however powerful, can exist as an island as witnessed now. Nations like China, notwithstanding its deep pockets, must be cautioned not to disturb the economic equilibrium of the world, most of which is reeking with poverty and under-development. China's intransigent attitude not even allowing a discussion on the pandemic at the United Nations Security Council last fortnight is unacceptable to the world.

In the coming years, it is certain that owing to the gruesome after-effects of COVID 19, nations, both the powerful and the poor, are going to take far more seriously their public health preparedness and emergency standard operating procedures. Medical infrastructures, rightly so, demand far greater thought, planning and investments than hithertofore.

It is well on the cards that even the militarily powerful nations will look into the various nuances of biological warfare. It is now clear to the entire world that a virus can prove to be far more lethal than many megatons of explosives and modern weaponry. According to many western journalists, China may deny its botched-up bio warfare experiment, but it is a matter of time when the bitter truth will unravel. India as a signatory of the Geneva Convention of 1972 (effective since mid-1975) to eschew production and experimentation of WMDs including bio weapons should not only use its moral authority to make nations be sincere adherents of existing UN protocols but, importantly, for its own safety put into place adequate defensive mechanisms to thwart such challenges. The lessons to be drawn from COVID 19 must be taken seriously. In addition, the UN must draw up contingency plans to prevent, contain and manage and ultimately defeat such likely challenges in the future. It will have to be a synthesis of health, economic, political, and even military measures.

The new world order, in all likelihood, will be drastically differing, more sobering, additionally fiscally prudent, and conservative and with nations becoming isolationist and inward looking. China's image and its economy will certainly take a sound beating. Though the pandemic is world-wide and global problems, unquestionably, require global solutions, yet in the coming years we may witness the rise of hyper-nationalism and authoritarianism in most nations including democracies. Nevertheless, as India strives to do its bit to get its economy back on track and takes various prophylactic measures for the future, it must do its bit to strengthen global institutions.

Lt Gen Kamal Davar (retd)

(all images from the internet)

"New procurement plans and strategic projects"

In his review of India's defence industry on 30 April 2020, Prime Minister Narendra Modi emphasised the need for self-reliance and increased exports, which twin objectives will require adoption of a new procurement procedure which is "in the final stages of implementation" and gives an advantage for domestic firms involved in this industry. According to observers, the PM's direction could lead to accelerating of strategic manufacturing projects that are already under process. The strategic partnership (SP) model is presently focused on naval helicopters, submarines and multi-role fighters in collaboration with select foreign companies.

Draft of 'Defence Procurement Procedure' 2020

Defence Minister Rajnath Singh has unveiled a draft of the *Defence Procurement Procedure* (DPP) 2020, wherein "leasing" has been introduced as another category for defence equipment at affordable rates. Indigenous content stipulated in various categories of procurement has been enhanced to support the 'Make in India' initiative. Under the 'Buy (Indian-IDDM)' category of the new DPP, only Indian products (designed in-house, developed and manufactured with a minimum of 50 per cent indigenous content of the total contract value) of an Indian vendor would be classified in this category, which gets the highest priority during defence procurement.

Also, in the new DPP, a new category of 'Buy (Global-Manufacture in India)' has been introduced, bringing in foreign vendors' products that have a minimum of 50 per cent indigenous content under this new category. "With the experience gained by the industry and the Ministry of Defence (MoD), it is now time to take further steps to strengthen 'Make in India' initiative, refine Life Cycle Support of procured equipment & platforms and hasten the defence acquisition process by further simplifying the procedures & reducing the overall procurement timelines."

74% FDI in Defence production

In a major policy announcement made on 16 May 2020, Finance Minister Nirmala Sitharaman has said that the FDI limit in defence manufacturing under the automatic route will be increased from the present 49% to 74% "subject to security clearances". This announcement was in context of several measures announced to 'boost' self-reliance in the defence sector and in context of Prime Minister Natendra Modi's *Atmanirbhar Bharat Abhiyan* or 'Self-reliant India Movement'. The Minister also announced plans for Corporatisation of the Ordnance Factory Board (OFB), indigenisation of imported spares and setting realistic qualitative requirements of weapons to support the local industry. The Government is also notifying a list of weapons and equipment that cannot be imported, the list "to be reviewed" every year and more items added to it after discussions with the department of military affairs.

Import of defence equipment

"Capital procurement of defence equipment is undertaken from various domestic as well as foreign vendors, based on operational requirement of the Armed Forces to keep them in a state of readiness to meet the entire spectrum of security challenges", as stated in Parliament. Rs 45,705.57 crore was spent on the import of defence equipment during previous FY (2018-19), while the percentage spent on salaries was 46.10% and that on Defence Research & Development Organisation (excluding salaries) was 4.42%. Weapons procured under the Capital Acquisition Budget amounted to 24.73% of the Defence Budget during FY 2018-19.

450 new fighters for the IAF

In the Indian Air Force's long term re-equipment plan which encompasses the next two decades, the requirement is for some 450 new fighters, bulk of them to be indigenously designed and manufactured. In a series of interviews (*see article in this issue)*, Air Chief Marshal RKS Bhadauria spelt out this requirement which includes the immediate procurement of 83

LCA Mk.1As to follow the first 40 Mk.1s even as development of the LCA Mk.II (or Medium Weight Fighter, MWF) and Advanced Medium Combat Aircraft (AMCA) continues at Bangalore. However, contrary to some views, the induction of 114 Multi-role Fighter Aircraft (MRFA) would also proceed in parallel.

First IAF Rafales now by end July

According to sources in France, the first batch of four Rafales for the Indian Air Force will now be ferried to India only by end July, some three months later than scheduled because of the pandemic. Confinement measures announced by the French Government in wake of the Covid-19 meant that there was temporary closure of some facilities which impacted on the training and delivery programme. The first batch of Rafales for No.17 Squadron will now arrive in Ambala in late July, the rest expected by early 2021. The second Squadron (No.101) to be formed at Hashimara in north Bengal, will get their Rafales in April-May 2022.

"Realistic" GSQRs

Echoing an earlier statement made by General Bipin Rawat, Finance Minister Nirmala Sitharaman has stressed the need for the "realistic setting" of general staff qualitative requirements (GSQRs) of weapons and platforms. "Sometimes unrealistic quality requirements are set and quite a lot of time is spent in searching for suppliers who will meet all those requirements…", she said. However, professionals have reacted in that it was inconceivable that the forces were to be given equipment which did not meet their operational requirements fully as "phase wise development of a war fighting system is an accepted methodology but GSQRs must meet operational necessity in full" said Air Vice Marshal Manmohan Bahadur of the *Centre for Air Power Studies*.

IAF to procure 70 HTT-40s

Putting to rest several years of uncertainty, the Indian Air Force will be placing orders for 70 HAL HTT-40 turboprop basic trainers, to supplement the Pilatus PC-7 Mk.IIs presently in service. This was confirmed by the CAS during a widely followed interview, both in the print and electronic media in mid-May 2020. In their original requirement, the IAF had projected need for 180 basic turboprop trainers after the premature grounding of the HAL HPT-32 following a series of mishaps. Following a somewhat controversial selection process, the Swiss-origin trainer was selected and ordered, the first tranche of 75 was to be followed by more aircraft but this was not followed up.

HAL achieves turnover of over Rs 21,000 Crore

Hindustan Aeronautics Limited has recorded a turnover of over Rs. 21,100 crores (provisional and unaudited) for the financial year ending 31 March 2020 (Rs 19,705 crores in previous year). The Company posted a revenue growth of around 7% during 2019-20 for the second year consecutively, post listing as compared to 3.8% during 2017-18. "The encouraging performance of the company in 2019-20 has been achieved in-spite of difficulties in cash flows, interruptions in operations due to workmen agitation and the interruption arising from March 2020 because of the Covid-19 lockdown which affected the final tests and certification of certain additional aircraft that were under final stages of production".

In 2019-20, HAL produced 31 new aircraft / helicopters and 117 new engines plus overhaul of 199 aircraft / helicopters and 490 engines. These include Sukhoi Su-30MKIs from Nasik, Dornier 228s from Kanpur and Dhruv ALHs from Bangalore.

BEL turnover of Rs. 12,500 crore

Bharat Electronics Limited (BEL) achieved a turnover in excess of Rs.12,500 crores during FY 2019-20, a growth of 6% over the previous year's turnover of Rs.11,789 crores, with an order book totaling Rs 51,800 crore as on 1 April. The previous year had BEL securing significant orders including for the Akash (7 squadrons), coastal surveillance systems (CSS), upgrade of EW systems, radars, AMCs for radars & weapon systems, software defined radio (SDR), sonars, advanced communication systems and others.

Some of the major projects executed during the year were command & control systems, thermal imagers for tanks, upgrade of communication systems, land based EW systems, weapon repair facility, electronic fuzes, various radars, smart city projects, Delhi CCTV project, Schilka upgrade, avionics package for the LCA, classroom jammers, real time information system for railways and the LRSAM. BEL also achieved export sales of $ 48.59 million including those for cable looms, coastal surveillance system spares, radars, compact multi-purpose advanced stabilisation system (CoMPASS), electro mechanical parts, and others.

Joint air exercise with Myanmar

The first HADR (*Humanitarian Assistance and Disaster Relief*) exercise between the Indian and Myanmar Air Forces recently took place at Air Force Station Bamrauli (Allahabad). The objectives of the exercise included planning of HADR operations in a given scenario, 'learn best' practices, executing missions during HADR disasters, 'understanding' SAR procedures, the exercise being conducted under aegis of Central Air Command. India and Myanmar had signed a Memorandum of Understanding on defence cooperation on 29 July 2019 "for furtherance of India-Myanmar cooperation in the field of Defence".

HAL re-enters NUH programme?

As a direct spin off from the Government's new defence policy pronouncements, it is possible that HAL will re-enter the competition to provide 111 naval utility helicopters in competition with several foreign companies. This long pending requirement of Indian Navy has been subjected to many changes in the procurement procedure, the NUH being part of the SP process with several the Indian private sector companies bidding for the programme alongside selection of the OEM. HAL would offer its navalised advanced light helicopter (ALH) including folding rotor blades.

Contract for MH-60R helicopters

The US Naval Air Systems Command has awarded a $905 million firm-fixed-price, cost-plus fixed-fee contract modification to Lockheed Martin for 21 MH-60R 'Romeo' helicopters for India plus three additional for the US Navy. The helicopters are to be embarked on the Navy's frontline warships including aircraft carriers, destroyers, frigates and corvettes. The MH-60Rs will perform ASuW and ASW missions along with secondary missions including VERTREP, SAR, and communications relay.

"India's selection of the MH-60R 'Romeo' multi-mission helicopter provides the Indian Navy with the most advanced anti-surface/antisubmarine warfare helicopter in operation today," stated Tom Kane, Director Sikorsky Naval Helicopter Programmes. "The MH-60R offers the lowest risk and best value option because the aircraft is already in full production and globally supportable. The MH-60R provides a vital capability in the Indo-Pacific region and equips the Indian Navy with a tremendous capability that is ready for operations immediately upon delivery."

IAC-1 sea trials delayed

Directly impacted by the Coronavirus, which has also prevented major suppliers to take part in planned basin trials, the schedule for INS *Vikrant* (IAC-1) has again slipped by at least six months. According to Naval sources these trials are now unlikely to begin in September-October 2020. In his last Navy Day statement, the CNS was hopeful that INS *Vikrant* would be fully operational by end 2022 but this target has now moved to the right, by perhaps a year.

61st Cavalry to be mechanised

In a move that has upset many military traditionalists, the Indian Army is to convert its sole, and perhaps the world's last, horsed-cavalry regiment, to becoming a standard armoured regiment. The Jaipur-based 61st Cavalry will be equipped with T-72 main battle tanks, with three independent squadrons from other regiments being amalgamated under the banner of 61st Cavalry (or Armoured Regiment). The Regiment's present 300 horses (including 100 in New Delhi) will become part of a new equestrian unit for continuing ceremonial functions, along with the President's Body Guard (PBG).

Essential supplies to the Indian Army

In a reply to the question in Parliament, the Defence Minister stated that "the authorisation and holding of essential items including snow goggles, multi-purpose boots for soldiers deployed in high attitude areas in Ladakh and Siachen is as per operational requirement of the Indian Army". There has been no instance of insufficient supply of the requisite sanctioned food for soldiers in high altitude areas in Siachen and Ladakh. The Government has authorised special scales of rations to all troops deployed above 12,000 feet, the ration scales "based upon nutritional requirement of a soldier as per their energy expenditure under different climatic conditions. Soldiers are supplied with the authorised scale of rations, which caters to their nutritional requirement as well as their taste preference".

Military Engineer Services restructured

Defence Minister Rajnath Singh has approved the proposal by the Army's Engineer in Chief to 'abolish' some 9304 posts in the MES as part of restructuring the civilian work force. "A leaner work force, well equipped to handle complex issues will be more cost effective". The MES is responsible for the construction and maintenance of all Army, Navy, Air Force infrastructure in the country.

Armed Forces retirement age increased

The CDS General Bipin Rawat has stated that the retirement age of jawans in the Army, airmen in the Air Force and sailors in the Navy is set to increase by "some years". He gave the example of specialist Corps such as the EME and AMC in that their personnel could serve till the age of 50 years which would directly impact on retaining trained manpower and also delay pensions.

Vistara confident on future

In midst of the Covid 19 pandemic, Chairman of Tata SIA Airlines (Vistara), Bhaskar Bhat has said that the airline is focusing on conserving cash and tackling business on a day-to-day basis, keeping

all employees "well informed." He said that it would be good to go "full throttle into ending lockdown and getting the economy back on its feet while ensuring all precautions against health risks". The airline has the backing of Tata Sons in case of urgent liquidity requirements and has a five year growth plan in place with the robust support of Singapore Airlines.

Modernisation of airfield infrastructure

The Ministry of Defence has signed contracts for *Modernisation of Air Field Infrastructure* (MAFI) involving 37 airfields for the Indian Air Force, Indian Navy and Indian Coast Guard (ICG) with Tata Power SED (TPSED), at a cost of nearly Rs 1,200 crore. The MAFI Phase-II is a follow-on programme based on MAFI Phase-I that included upgradation of 30 airfields of the IAF, which has been "of immense benefit to both military and civil users". The turnkey project includes installation and commissioning of modern airfield equipment such as Cat-II Instrument Landing System (ILS) and Cat II Air Field Lightning System (AFLS) etc, directly connected to the Air Traffic Control (ATC), providing excellent control of airfield systems to the controllers.

More AGM-84L Harpoon Block II and MK 54 torpedoes

The Indian Government has requested purchase of ten AGM-84L Harpoon Block II air launched missiles, plus containers, spare and repair parts, support and test equipment, publications and technical documentation, personnel training and training equipment, US Government and contractor representatives technical assistance, engineering, and logistics support services and other related elements of logistics and programme support. The Harpoon missile system is integrated with the Indian Navy's fleet of P-8I long range maritime patrol and ASW aircraft.

16 MK 54 All Up Round Lightweight Torpedoes and three MK 54 Exercise Torpedoes, have also been requested by the Indian Navy, the Defense Security Cooperation Agency said in two separate notifications to the US Congress.

ICGS *Varad* joins fleet

On 18 March 2020, Indian Coast Guard Ship *Varad* joined the fleet at Paradip port, being the third Offshore Patrol Vessel (OPV) under operational command of Coast Guard Regional Headquarters (North-East) at Kolkata. *Varad* will be deployed off the Odisha and West Bengal coasts for EEZ surveillance and other duties. ICGS *Varad* is the fifth in the series of seven OPVs indigenously designed and constructed by Larsen & Toubro Ltd at Katupalli, Tamil Nadu, fitted with state-of-the art navigation and communication equipment, sensors and machinery.

ICGS *Sachet* commissioned

Defence Minister Rajnath Singh commissioned Indian Coast Guard Ship *Sachet* and two interceptor boats C-450 and C-451 in Goa, via video conferencing on 15 May 2020. ICGS *Sachet*, first in the series of five offshore patrol vessels (OPVs) has been designed and built indigenously by Goa Shipyard Limited (GSL) and fitted with state-of-the-art navigation and communication equipment. The *Sachet* displaces 2,350 tons and is propelled by two 9,100 KW diesel engines to attain a maximum speed of 26 knots, with an endurance of 6,000 nautical miles.

INLCU L57 commissioned

INLCU L57, a Landing Craft Utility (LCU) Mark IV warship built by the Garden Reach Shipbuilders and Engineers Limited (GRSE) was commissioned into the Indian Navy at Port Blair on 15 May 2020 by Lt General PS Rajeshwar, C-in-C Andaman &

Nicobar Command. Primary role of this seventh LCU Mk IV is also transportation and deployment of main battle tanks, armoured vehicles, troops and equipment from ship to shore.

Mission *Sagar*

As part of Mission *Sagar*, INS *Kesari* was deployed to Port Louis Mauritius on 23 May 2020 for providing assistance in dealing with the COVID-19 Pandemic. A 14-member Specialist Medical Team comprising Indian Navy doctors and paramedics was embarked onboard to work alongside their Mauritian counterparts to render assistance for Covid-19 related emergencies. The Medical Assistance Team included among others, a Community Medicine specialist, a pulmonologist and an anesthesiologist.

Airbus support for TRISHNA

The French Space Agency (*Centre National d'Etudes Spatiales*, CNES) has signed a contract with Airbus Defence and Space for the development and manufacture of thermal infrared instruments for the TRISHNA (*Thermal infraRed Imaging Satellite for High resolution Natural resource Assessment*) satellite the latest in the joint Franco-Indian satellite programme dedicated for climate monitoring and operational applications. CNES and ISRO (Indian Space Research Organisation) are partnering on the development of an infrared observation system with high thermal resolution and high revisit capability including a satellite and associated ground segment. "TRISHNA observations will enhance our understanding of the water cycle and improve management of the planet's precious water resources, to better define the impacts of climate change, especially at local levels" according to a spokesman. ISRO will provide the platform, the visible and short wave infrared instrument and will be the prime contractor for the satellite, while CNES is co-responsible for the mission and will provide the thermal infrared instrument, to be developed by Airbus, the ground segment to be shared between both countries.

Private Sector role in Space programme

Continuing on her broad sweep of policy announcements, Finance Minister Nirmala Sitharaman has said that India's private sector will be given role in the space programme including that on satellites, launches and space-based services. "The Government will provide predictable policy and regulatory environment to private players", she said.

ISRO to launch 36 missions

Union Minister of State for Atomic Energy and Space, Dr Jitendra Singh has stated that the Indian Space Research Organisation has planned 36 missions during the year 2020-21. ISRO will launch 10 earth observation satellites, 3 communication satellite, two navigation satellites, two space science satellites among others. During the earlier FY 2019-20, 11 targeted missions were completed, with one of the most anticipated upcoming missions of the space agency, *Gaganyaan*, scheduled for launch in 2022. Meanwhile, ISRO plans to send two unmanned missions, one in late 2020 and another in mid-2021, these precursor missions to carry a humanoid robot to study the environment and perform all tasks designated for humans to conduct in orbit.

Air Chief Marshal RKS Bhadauria in his office at Vayu Bhawan (photo PRO Air Force)

Air Chief's interview on 18 May 2020

In midst of the Covid 19 pandemic, Air Chief Marshal RKS Bhadauria, Chief of the Air Staff IAF interviewed with select Indian media, both print and electronic on 18 May 2020. Not surprisingly the first questions were focused on the IAF's status during the pandemic, and as to how the Service was affected operationally.

As reported by Sushant Singh of the *Indian Express*, the CAS stated that the IAF's operational capability has not been degraded at all. "Air defence alert has continued unabated while our transport and helicopter fleets have been working throughout the lockdown period to handle Covid-related tasks, support to state administration and government agencies, as well as air maintenance tasks to support the Army in forward areas. Training and operational methodology was reviewed to ensure segregation of combat crew and preservation of resources.

Our plans were initiated proactively catering to force preservation through travel protocols, mandatory quarantine for vulnerable categories and minimising exposure. We took precautions and preventive measures as early as in February, such as preparing isolation and quarantine centres. By March, we had established quarantine facilities in nine locations across India with a capacity of 1,650 personnel. *Crisis Management Centres* were established at all levels and a corona helpline for IAF personnel has been functional since beginning of March. The IAF remains fully engaged in the collective national effort and has been continuously shouldering tasks as part of *Mission Lifeline Udaan* and *Op Sanjeevani*".

IAF C-130J Super Hercules

A single squadron of the IAF is presently equipped with the LCA Mk.1 (photo by Deb Rana), with a second being formed

Answering the question by Rajat Pandit of The Times of India, on indications that the defence budget was being reduced, the CAS agreed that "the capping of government expenditure will affect us. But we are looking at ways to mitigate the impact by prioritising our critical requirements. We are putting measures in place to curtail our revenue budget by about 20-25%. On capital expenditure, we are looking at reorganising our plans based on actual budget availability".

Specifically then on the critical matter of new fighters for the Indian Air Force, the CAS was clear that with the renewed emphasis on 'Make in India', the highest priority was on the contract for 83 LCA Mk.1As along with indigenous high tech weapons including air-to-air missiles and long range precision guided munitions. These would follow the earlier deal for 40 LCA Mk.1s.

The LCA Mk.II and the ambitious fifth generation AMCA programme were part of the IAF's longer term induction plan, with some six squadrons of the former and a similar number of the latter being considered. Importantly, the CAS emphasised that in parallel, some 114 numbers of a multi-role fighter aircraft (MRFA) would be required, and this was to be considered under a separate

Model of the AMCA

category in terms of performance and technology, with "transfer and absorption of technology as well complete manufacture in India to be ensured …which will energise the indigenous industry, particularly for the AMCA programme".

Induction of the first Rafales for the IAF was addressed, the CAS accepting that initial delivery "has been delayed by about two months due to break in training and supply chain disruptions …. The first four are likely to come to India by end of July and delivery of subsequent fighters will follow with current delays to be mitigated in future deliveries".

As for the matter of Sukhoi Su-30MKI upgrade, Air Chief Marshal RKS Bhadauria stated that "the IAF is in detailed discussions with HAL as well as the OEM for finalising an upgrade plan".

Inevitably, the question of the IAF attaining its target of 42 fighter squadrons was raised to which the CAS replied "the squadron strength is a force structure issue and depends on a host of factors. We cannot lose sight of the developments in the North and West, with both our adversaries continuously increasing and upgrading their inventories. As part of its long-term perspective plan, the IAF

The IAF's first Rafale, in France

China watch ! TV screen shot of the CAS being interviewed by 'India Today' on 18 May 2020

plans to increase its squadron strength in a pragmatic manner leveraging the 'Make in India' initiative".

On force multipliers, the CAS confirmed that "the case for two additional AWACS is being processed … the FRA project has been analysed de novo and various options are being considered".

The good news for HAL and their design & development efforts is that HAL's turboprop trainer will be ordered by the IAF, the CAS confirming that "the trainer plan has been completely shifted to the HTT-40", with orders for 70 of this type to be placed, which will serve alongside a similar number of Pilatus PC-7 Mk.IIs imported from the Swiss some years back even as HAL was then striving to develop its basic turbo prop trainer.

"Make in India" exemplified: HAL's HTT-40 turboprop trainer

‘Flying Bullets’ Resurrected

First LCA Mk.1 (FOC) delivered

On 27 May 2020, the Indian Air Force received the first Tejas LCA Mk.1 (FOC) aircraft at Air Force Station Sulur (near Coimbatore) from HAL and, with it, stood up No.18 Squadron (*Flying Bullets*) which is the second unit (after No.45 Squadron) with the indigenously-developed and built light combat aircraft. Air Chief Marshal RKS Bhadauria received the aircraft documents from Mr R Madhavan, Chairman HAL in a ceremony attended by Air Marshal Amit Tiwari AOC-in-C Southern Air Command, Air Marshal TD Joseph, Commodore Commandant of No.18 Squadron and Dr Girish Deodhare, PGD (CA) and Director Aeronautical Development Agency (ADA).

Earlier, the aircraft was blessed at an all denomination religious ceremony in the squadron hangar.

Series production of the FOC-standard Tejas LCA Mk.1 has been continuing at the Bangalore Complex of HAL, the first

such aircraft flown by HAL Chief Test Pilot (fixed wing) Air Commodore KA Muthana on 17 March 2020, with HAL-assigned tail number LA 5021 (*in photo above*). Another three FOC-standard LCAs have been built and are currently being test flown at HAL Bangalore before joining the first such at Sulur. The unit establishment (UE) of an IAF fighter squadron is 16 aircraft plus 2 twin-seaters but HAL has yet to build the four twin-seaters for the two squadrons equipped with the single-seat LCA Mk.1s. A consequence has been that after the 16th LCA Mk.1 (IOC) tail number LA 5016, the IAF has sequentially given tail number LA 5017 to the first LCA Mk.1 (FOC) with the next three reportedly following in sequence till LA 5020.

The second FOC aircraft with tail number LA 5018 seen at HAL Bangalore

LCA formation take off at Air Force Station, Sulur.

On 27 May 2020, Air Chief Marshal RKS Bhadauria then handed over LCA aircraft documents and a symbolic 'key' to the CO No.18 Squadron Gp Capt Manish Tolani and later flew in an LCA Mk.1 (IOC) of No.45 Squadron, the CAS being a test pilot himself and having extensively flown the LCA while commanding the National Flight Test Centre (NFTC) at Bangalore.

No.18 Squadron was raised at Ambala on 15 April 1965, being the fifth such formation on HAL-built Gnat light fighters, commanded by Wg Cdr AL Michael and adopting a '*Flying Bullet*' as its unit crest. No.18 Squadron is famed with its pilot Flying Officer Nirmal Jit Singh Sekhon receiving a posthumous *Param Vir Chakra* during the 1971 war in air defence of Srinagar, the only PVC of the IAF.

The Gnat and Flg. Offr. Nirmal Jit Singh Sekhon PVC

No.18 Squadron also has the distinction of always operating HAL-built aircraft, the Gnat being followed by the Ajeet and later the MiG-27ML with which it was equipped at Kalaikunda when it was number plated in April 2016.

Heartening sight of increasing numbers of the Tejas LCA in squadron service.

Navantia online event on India's P75(I) programme

Navantia organised a conference with both the Indian industry and S80 suppliers, as well as other companies and associations interested, in an event held online in midst of the COVID19 lockdown on 21 April. The event was attended by over 200 professionals from more than 150 different companies

Navantia is participating in the P75(I) project using the basis of the S80 plus, the only 3000-tonne AIP submarine currently under construction worldwide. "This baseline is very close to the requirements of the Indian Navy, possibly the closest among any possible. For this reason, technical effort at this stage is minimum and Navantia is focusing in other aspects such as the indigenisation of major equipment/ materials and Transfer of Technology (ToT) options", stated company officials.

The industry event started with a welcome message from Fernando Formoso, Navantia Director in India, followed by a presentation by German Romero, Navantia Cartagena Shipyard Engineering Director, which described the main features of the S80 plus and also the construction status, schedule and pictures of the actual construction. Also, a description of the revolutionary AIP system was presented. The system, known as BEST "Bio-Ethanol Stealth Technology", has been developed by the Spanish Company Abengoa and the American Collins Aerospace, working under a subcontract by Navantia. The explanation on the AIP was supplemented by a short video. The technical presentation was followed by a presentation on ToT and indigenisation possibilities delivered by Jorge García Monedero, Navantia Services Director.

Navantia's experience in ToT programmes is ample. At present, ToT is successfully being carried-out in three countries, involving local construction of destroyers in Australia, one LHD in Turkey, and the implementation of an indigenous combat system for corvettes in Saudi Arabia developed by a Joint Venture created between Navantia and SAMI (Saudi Arabia Military Systems). Previously, Navantia was co-designer and builder of *Scorpene*-class submarines for the Chilean and Malaysian navies, and also participated in the design and transfer of technology to India's of six *Scorpene* submarines being built in MDL (Mumbai), deploying a resident team in India between 2006 and 2013

Navantia has signed MoUs with both SPs shortlisted for the P75(I) project in India: L&T and MDL. Also, contacts have been established and NDAs have been signed with more than 100 companies in India covering approximately 50% of the supplies. There is still potential for nearly another 50% area where there is no Indian supplier identified. Soon, Navantia shall release into the market 500 purchase technical specifications at a rate of approximately 100 per month within the 5 months following the Industry event, which also offered the possibility of requesting one-to-one meetings, which will be conducted following the presentation: more than 60 requesting the meeting!

"We consider this first Industry Event a great success and are eager to continue working with India and progress as much as possible with the P75(I) project. Once the COVID-19 situation permits, follow-up face-to-face meeting and visits lo potential suppliers shall take place", according to the company spokesman.

The Spanish shipbuilder Navantia, is a 'world reference' in the design, construction and integration of state-of-the-art war ships, as well as ship repairs and modernisation. It is also engaged in the design and manufacture of Integrated Platform Management Systems, Fire Control Systems, Command and Control systems, Propulsion Plants and through life support for all its products. Even though its main line of activity is in the naval field, Navantia designs and manufactures systems for the army and the air force.

HAL's LCH

A Tiger in the Sky

Designed and developed for operations in support of ground troops at high altitudes and holding the distinction of the first attack helicopter to land on Siachen, maiden flight of Hindustan Aeronautics Limited (HAL) Light Combat Helicopter (LCH) took place on 29 March 2010 marking successful culmination of three years of design and development efforts by Rotary Wing Research & Design Centre (RWRDC) of the Helicopter Complex and appropriately named 'Tiger Bird' perhaps inspired from its exceptional high agility–and a design painted on the prototype.

Projected to meet requirements of the Indian Air Force and the Indian Army (they are likely to order 65 and 114 units respectively) plus significant export potential, the LCH is being developed as a dedicated attack helicopter derived from the Advanced Light Helicopter (ALH) Dhruv and to be fitted with weapons and special mission systems and having a crashworthy wheel landing gear. In addition to the primary anti-armour role, the rotary-wing platform will play critical roles of escort to special heliborne operations (SHBO), support of Combat Search & Rescue (CSAR) operations, and armed aerial scouting duties.

The LCH began production in February 2020 with a LCH Production Hangar established at HAL's Helicopter Division in Bengaluru. The new hanger to "augment capacity to reach the peak production of 30 helicopters per year", stated HAL Chairman and Managing Director R. Madhavan in a recent statement.

The LCH inherits many technical features of the Dhruv including its rotor system transmission, power plant, hydraulics, IADS and avionics. The features that are unique to LCH are its sleek and narrow fuselage, exterior covered by canted flat panels to minimise Radar Cross Section (RCS), an integrated dynamic system, including a hinge less main rotor and bearing less tail rotor, which works in conjunction with an anti-resonance isolation system to dampen vibrations, tri-cycle crashworthy landing gear, tandem cockpit, self-sealing fuel tanks, and aerofoil shaped stub wings for weapons, armour protection, Nuclear, Biological, Chemical (NBC) protection and low visibility features which make the LCH "lethal, agile and survivable."

Notably the flight controls and hydraulics of Dhruv have been redesigned for the LCH. An indigenous Automatic Flight Control System (AFCS) designed by HAL. The helicopter is powered by two HAL/Turbomeca Shakti-1H1 turboshaft engines fitted with Infra-Red (IR) suppressors, each of which can generate up to 871-kW and can operate up to 3,000-hours without maintenance. It features a Full Authority Digital Electronic Control (FADEC) system, which decreases work of the pilot by automatically counting engine cycles. The LCH has a cruise speed of 260 km/h, a maximum speed of 275 km/h and a climb rate of 12 m/s to a service ceiling of 6,500 m. LCH has an operational range of 550 km and a ferry range of 700 km.

Fitted with a chin-mounted, twin-barrel M621 20 mm cannon on a Nexter THL-20 turret integrated to a Helmet Mounted Sight (HMS), LCH armament will include Belgian 70-mm rockets and air-to-air/air-to-ground missiles and Laser Guided Bombs (LGB) on the weapon stations. MBDA's PARS3 and indigenous Helina

with a range up to 7 km are the favoured anti-armour weapon. MBDA Mistral-2 Air-to-Air Missiles (AAM) are carried to ensure self-protection during scouting operations and to neutralise hostile helicopters and Unmanned Aerial Vehicles (UAV).

The helicopter would have day/night targeting systems for the crew including the helmet mounted sight and an Elbit Compact Multi-Purpose Advance Stabilisation System (CoMPASS) electro-optic/infrared turret (being license built in India by Bharat Electronics Limited) consisting of CCD camera/ third generation 3-5 µm Forward-Looking Infra-Red (FLIR)/Laser Range Finder (LRF)/Laser Designator (LD). The LRF and LD facilitate measurement of range to the target and guidance for the laser guided missiles respectively. The Digital Video Recorder would enable recording of the vital mission for debriefing purposes. The turret gun skewing is controlled by the Helmet Mounted Sight (HMS) of the gunner, who along with the pilot receives adequate inputs from Multi-Function Displays (MFD).

The digitally camouflaged LCH is also fitted with a Saab Self-Protection Suite consisting of Radar/Laser warning receivers and Missile Approach Warning Systems (MAWS) and Countermeasures dispensing system. It is planned to integrate IR/Laser missile jammers on the helicopter. Another addition is a Data Link for Network-Centric Warfare (NCW) operations facilitating transfer of the mission data to the other airborne platforms and ground stations operating in the network, thus facilitating force multiplication. The LCH is designed for low detection (visual, aural, radar and infrared) and includes armour protection of critical areas.

A 30 minute dry running capability of the gear box is a built in-feature to survive after any ballistic hit to the transmission system. Crashworthiness features are built into the wheel landing gear and main structure while dual redundant systems also enhance effectiveness of helicopters in the battlefield environment. The performance features of the LCH including rate of climb, cruise speed, service ceiling are comparable with those of contemporary helicopter types such as the Agusta A129 Mangusta and Tiger. Development costs of the LCH have been "relatively low" compared to that of other helicopter types in its class, ensuring lower unit costs. "LCH design is optimised to ensure ease of maintenance with improved reliability of all the onboard systems to keep the life cycle operating costs low as well," stated a HAL designer.

Sayan Majumdar

"Hand-in-Hand"

Armed Forces with civilian authorities against Covid-19

India's Armed Forces have been working around-the-clock to provide medical and logistics support to contain the Covid-19 pandemic, the Armed Forces Medical Services (AFMS) deploying resources in aid of civilian authorities.

The Armed Forces have been running six quarantine facilities at Mumbai, Jaisalmer, Jodhpur, Hindon, Manesar and Chennai, with 15 other facilities kept as standby for use, as required. Dedicated Covid-19 facilities including High Dependency Units, Intensive Care Unit beds were prepared in 51 hospitals across the country, located at Kolkata, Visakhapatnam, Kochi, Dundigal (near Hyderabad), Bengaluru, Kanpur, Jaisalmer, Jorhat and Gorakhpur.

Five viral testing labs at Armed Forces hospitals for Covid-19 tests have been made part of national grid, and include the Army Hospital (Research & Referral) at Delhi Cantt; Air Force Command Hospital at Bangalore, Armed Forces Medical College at Pune; Command Hospital (Central Command) at Lucknow and Command Hospital (Northern Command) at Udhampur plus six more hospitals.

The IAF's transport fleet is being used to assist in transportation of essential supplies, medicines and medical equipment. In the first weeks, 200 tonnes of stores were airlifted to various parts of the country, with 28 fixed-wing and 21 helicopters deployed from various locations across the country.

The Indian Air Force have evacuated people and transported medical supplies, a C-17 Globe-

master III with crew, medical team and support staff carrying 15 tonnes of medical supplies to China and airlifting back 125 persons, on return. A C-17 Globemaster III also flew to Iran to bring back 58 stranded Indians plus samples for investigation.

An IAF C-130J Super Hercules ferried some 6.2 tonnes of medicines to the Maldives while an Army Medical Corps team consisted of five doctors, two nursing officers and seven paramedics were deployed in the Maldives for capacity building measures and assist in setting up testing, treatment and quarantine facilities.

Even as the Indian Navy's force of maritime surveillance aircraft have continued their operational tasks which take them far out to sea on missions by day and night, the Navy has also earmarked various aircraft types including the Ilyushin Il-38SD, Dornier 228 and Dhruv ALH at INS Hansa, Goa for emergency tasks.

Six naval ships were on standby ready for assistance to neighbouring countries, with medical teams on standby for deployment to the Maldives, Sri Lanka, Bangladesh, Nepal, Bhutan and Afghanistan.

Saluting the 'Corona Warriors'

"Will continue supporting the fight"

At the press conference conducted at New Delhi on 1 May 2020, General Bipin Rawat, Chief of Defence Staff (CDS), accompanied by Gen MM Naravane, COAS, Admiral Karambir Singh, CNS and Air Chief Marshal RKS Bhadauria, CAS addressed the nation to acknowledge efforts of India's *Corona Warriors* and vowed "to continue the support of (those) front-line warriors over the passage of the crisis".

Gen Bipin Rawat stated that the period from 24 March till 3 May 2020 was when considerable sacrifice was asked from every Indian. Most Indians heeded the call for lockdown and worked from home. "There however are a handful of Indians, 'the *Corona Warriors*', who risked and are still risking their lives every day to ensure that basic amenities such as electricity and water are delivered to everyone, that the streets are clean, that basic food items are available, that no patient is returned untreated, that law and order is maintained and that Indian citizens stranded abroad are brought back and cared for. These *Corona warriors*, be they doctors, nurses, hygiene and sanitation staff, police personnel or media personnel, have ensured that India keeps on fighting this pandemic. We salute these warriors and their efforts and wish them the best of health. We are grateful for their sacrifice and their efforts in fighting COVID-19, knowing fully well the dangers that they face".

The CDS added that to show solidarity of India's defence forces, its frontline soldiers with the *Corona Warriors,* India's armed forces would on 3 May organise multiple events including flypasts by fighter and transport aircraft of the IAF, covering the country from Srinagar in the north to Thiruvanthapuram in the south, from Dibrugaarh in the east to Kacchh in the west. Helicopters from the IAF and IN would shower flower petals on the hospitals treating Covid patients. Navy and Coast Guard ships would sail in formation at select locations while Army bands would visit Covid hospitals to play appropriate music outside hospitals in an expression of gratitude to the *Corona Warriors*.

Defence Minister Rajnath Singh too lauded the efforts of India's Armed Forces in carrying out multiple activities at various locations across the country on land, sea and in the air to *Salute the Corona Warriors*, "who are steadfastly fighting to stop the spread of the virus."

Referring to the fly pasts and showering of petals by helicopters of the IAF, Navy and Coast Guard on hospitals, he said that they saluted the nation's resolve and unity in overcoming the challenges posed by Covid19, thanking the Armed Forces for their special initiatives to express gratitude towards medical professionals, police and other frontline warriors and added that "the entire nation stood united in these challenging times".

Delhi, Kolkata, Chennai, Bengaluru, Bhopal, Agra, Amritsar, Belgaum, Ranikhet, Pithoragarh were among many metropolis, big and small townships which witnessed the Army, Navy, Air Force and Coast Guard paying tributes, including laying of wreaths at various police memorials.

Fighter formations, comprising Sukhoi Su-30MKIs, MiG-29s and Jaguars carried out flypast over Rajpath while some orbited over Delhi, as also C-130J Hercules over the NCR region. Su-30MKIs flew over Mumbai witnessed by lakhs of citizens from roof tops of the metropolis.

A number of Navy and Coast Guard ships were illuminated at 25 locations along the coastline including at remote sites and island territories of the Andaman & Nicobar Islands, Lakshadweep and Minicoy islands.

Indian Navy salutes the 'Corona Warriors' ... ...on land, air and the sea

The Indian Navy saluted the *Corona Warriors* on 3 May 2020 through a number of activities on the ground, water and in the air. Station Commanders and Senior Naval Officers across the three Commands (Western, Southern and Eastern Naval Commands) and the Andaman & Nicobar Command applauded healthcare professionals, sanitation workers, policemen and others engaged in fighting the pandemic.

1500 Indian Navy personnel at INS *Hansa*, Goa formed a *Human Word Chain* along the Dabolim runway, the SNC band played lilting numbers on a warship berthed opposite the Cochin Shipyard Limited and near the Vikrant-Venduruthy Bridge, epochal landmarks of Kochi. Naval Bands also performed onboard the decommissioned carrier INS *Viraat* in Mumbai harbour.

A Chetak helicopter of the Navy showered flower petals on the District Hospital at Kochi. Subsequently, a seven aircraft flypast consisting of two Dornier 228s, a SeaKing helicopter, two Dhruv helicopters and two Chetaks was conducted over the city's Marine Drive, alongside steampast by seven fast interceptor craft of the Navy in the channel, displaying a banner of appreciation.

In the East, a Chetak helicopter from INS *Dega* showered petals over Vizakhapatnam's Andhra Medical College, and other institutes. In the West, an IN Chetak helicopter showered petals over Kasturba Gandhi hospital and Asvini Naval hospital in Mumbai while Indian Naval aircraft carried out fly pasts along with those from the Air Force and Coast Guard over various parts of the Andaman & Nicobar Islands.

Eastern Naval Command ships, INS *Jalashwa* and INS *Savitri* saluted *Corona Warriors* on their relentless fight against the pandemic as did Western Naval Command personnel in the Arabian Sea. Indian Navy personnel on board INS *Vikramaditya* off Karwar formed a human word chain in thanking the *Corona Warriors*.

The day's events culminated with 25 Indian Naval warships in nine port cities being illuminated along with the firing of flares and sounding of sirens in the evening.

The Indian Coast Guard also actively took part in the 'India Thanks Covid-19 Warriors' initiative, illuminating ships and showering petals at hospitals treating Corona patients. Coast Guard vessels were illuminated at 25 locations along the entire Indian coastline including remote sites and far flung island territories. Coast Guard helicopters showered petals over Covid-19 hospitals at five locations, some 46 ships and 10 helicopters taking part in this initiative.

‘Lifeline Udan’

India’s airlines in the Covid crisis

‘*Lifeline Udan’* flights were directed by the Ministry of Civil Aviation for transportation of essential medical cargo to remote parts of the country in support of India’s war against Covid-19. More than 700 flights had been operated by Air India, Alliance Air and some private carriers as of 15 May 2020, Cargo transported by air was some 1000 tonnes, flown over a total distance of about 600,000 km.

Helicopter services including those by Pawan Hans operated in Jammu & Kashmir, Ladakh, the offshore Islands and India’s North East region, transporting critical medical supplies and also patients, plus several tons of cargo.

Private carriers, including SpiceJet, Blue Dart, Indigo and Vistara operated cargo flights on a commercial basis, Spicejet making 916 cargo flights from 24 March to 8 May 2020, carrying 6,587 tons of cargo, 337 being international cargo flights. Blue Dart operated 311 cargo flights carrying 5,231 tons of cargo over the period 25 March to 8 May 2020. Of these, 16 were international cargo flights. Indigo operated 121 cargo flights carrying around 585 tons of cargo, including on 46 international flights. Tata-SIA (Vistara) operated 23

SpiceXpress, SpiceJet’s dedicated cargo arm, transported vital surgical supplies, sanitizers, face masks, plus others to provide point to point deliveries of essential supplies, medicines and medical equipment across India

In support of the Government's 'Mission Lifeline UDAN' initiative, Vistara too deployed its newly-inducted Boeing 787-9 Dreamliner aircraft to transport relief material, medical supplies and essential commercial goods

cargo flights during 19 April to 8 May 2020, covering some 32,321 km and carrying around 150 tons of cargo.

A virtual cargo air-bridge was established by Indian carriers flying to East Asia for transportation of pharmaceuticals, medical equipment and Covid-19 relief material. While Air India flew 2000 tons, Blue Dart uplifted 131 tons medical supplies from Guangzhou and Shanghai and 24 tons from Hong Kong, 14 April to 18 May 2020, while Spicejet uplifted 205 tons of medical supplies from Shanghai and Guangzhou and 21 tons medical supplies from Hong Kong and Singapore till 8 May 2020.

'Vande Bharat' !

In one of the largest initiatives to repatriate nationals back home, 11,000 Indian nationals desirous of returning were flown back to India on 43 inbound flights operated by Air India and Air India Express under the *Vande Bharat* Mission from 7 May 2020. Under this mission, Ministry of Civil Aviation co-ordinated with the Ministry of External Affairs and state Governments for bringing Indians back to their homeland.

(photo: Twitter @DelhiAirport)

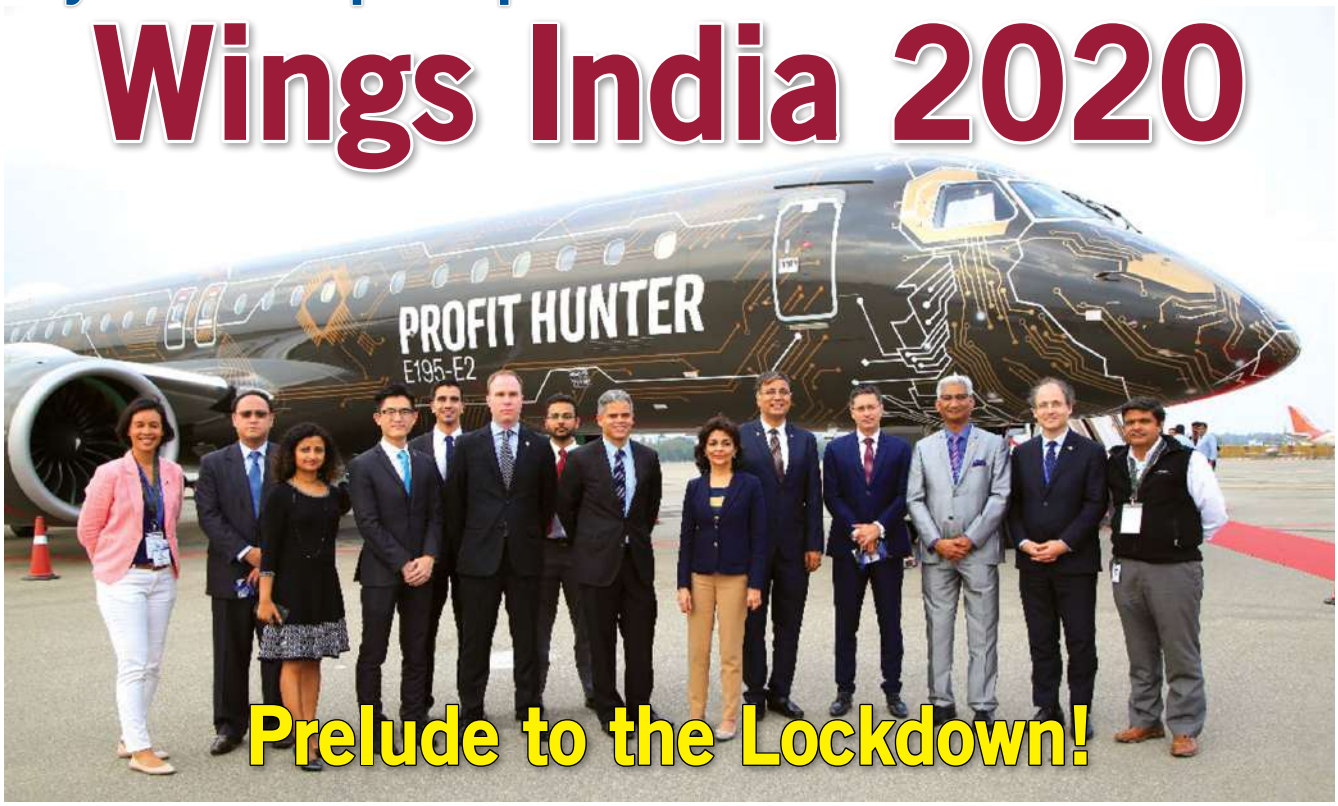
Air India along with its subsidiary Air India Express operated some 64 flights (42 by Air India and 24 by AI Express) to 12 countries including the USA, UK, Bangladesh, Singapore, Saudi Arabia, Kuwait, Philippines, UAE and Malaysia to repatriate 14,800 Indians back home in the first phase.

Meanwhile, the Indian Navy deployed several ships from Kochi to transport Indian nationals in the Maldives back to India. INS *Jalashwa*, deployed for Op *Samudra Setu*, conducted two voyages between Kochi and Male, bringing back some 600 Indian nationals.

After INS *Jalashwa* berthed at Cochin Port, extensive protocols were carried out by the authorities for streamlining the process of Covid screening and immigration procedures, as also transportation for the evacuated Indian nationals to respective districts for further quarantining. INS *Jalashwa* had embarked Indian citizens at Male on 15 May 20 as part of the Indian Government's national efforts to facilitate return of Indian citizens from foreign shores.

Vayu on-the-spot report

Wings India 2020



Ashmita Sethi, at the centre, with Embraer E195-E2, powered by the PW1900G engines

Wings India 2020, the biennial civil aviation and aerospace event from 12-14 March, had 100 plus exhibitors, over 20 states and 500+ delegates participating. Day 1 of the event bore positive response with many companies showing interest in collaboration and business acquisitions. Speaking on the first day at 'Wings India 2020', organised by FICCI, jointly with Ministry of Civil Aviation and Airports Authority of India, Mr. Anand Stanley, Chairman, FICCI, Civil Aviation Committee and Managing Director, Airbus India while addressing a press conference, emphasised India's requirement of nearly 1,900 new passenger and cargo aircraft in the next 20 years. These new additions would "help propel India's domestic traffic growth, which is one of the world's highest at this time".

The aerobatic displays included the Extra 300L Mark Jeffery's team and ALH Dhruv helicopters of the Indian Air Forces' Sarang Team. On static display were the Embraer E195, Honda Jet HA420, Diamond DA42, Cessna 182T, Cessna 206, Bell 505 and Dornier 228.

First day of the event initiated discussions and conversations from airlines, exhibitors and companies' "to recognise and celebrate the excellence, triumphs and innovations of key stakeholders within the aviation industry."

K T Rama Rao, Minister for Industries & Commerce, IT, Electronics & Communications and Municipal Administration & Urban Development, Government of Telangana, Malladi Krishna Rao, Health and Tourism Minister, Government of Puducherry, Arvind Singh, Chairman, Airports Authority of India, Smt. Usha Padhee, Joint Secretary, Ministry of Civil Aviation, Govt of India, Dr Sangita Reddy, President, FICCI and Joint MD of Apollo Hospitals Group and Anand Stanley, Chairman FICCI, Civil Aviation Committee and Managing Director, Airbus India, inaugurated 'Wings India 2020' on the theme of 'Flying For All' with the support from state government, industry partners and companies.

Speaking at the inaugural session, K T Rama Rao, stated, "The Indian aviation and defence ecosystem has witnessed a significant growth trajectory in the past few years. Telangana is the first state in India to take the union government's advice to slash VAT on aviation turbine fuel from 16% to 1%, which has given significant boost to the regional airline industry prompting leading operators to expand their operational base in Hyderabad. In line with the theme of 'Wings India 2020', we are now planning to re-activate old airports and airstrips, create three greenfield and three brownfield airports, and also establish a chain of heliports to connect the remotest parts of our state."

Usha Padhee, Joint Secretary, Ministry of Civil Aviation, Government of India stated, "India is poised to become the epicentre of growth for this sector. Civil aviation is extremely important for any developing economy, it is not only a beneficiary for good economy but also an enabler for growth of the economy. Every entity in the civil aviation ecosystem has to work in tandem, almost in perfect coordination to make sure air traffic is safe and secure. *Wings India 2020* is a platform for us to come together to work towards ensuring the growth of the sector."

"The rapid expansion in India's airport and air navigation structure will definitely fuel the huge business and tourism opportunities in our great country. Indian aviation will be the epicenter of the growth trajectory and will present a whole range of opportunities and challenges and such industry initiatives like "*Wings India 2020* are path breaking," stated Arvind Singh, Chairman, Airports Authority of India.

Pratt & Whitney showcases aviation expertise

Pratt & Whitney re-iterated their 'commitment to innovation and aviation growth in the region'. The company's presence at the show was anchored by a quarter scale model of Pratt & Whitney's GTF engine. The exhibit also featured a full scale model of the GTF engine's key differentiator technology, the fan drive gear system (FDGS), which enables all engine's modules to run at their optimum rotational speed, reducing fuel, noise and stage count.

"India is one of the world's fastest growing aviation markets and *Wings India* is a key event for us to engage with our customers, partners, suppliers and other stakeholders," stated Ashmita Sethi, Managing Director, India for Pratt & Whitney. "Pratt & Whitney's history in India began more than 70 years ago and we look forward to the opportunity to share how the company's products, services and initiatives in the region contribute to the future of aviation in India."

More than 150 GTF-powered A320neo family aircraft have been delivered to Indian operators to date. "GTF engines have carried over 80 million passengers on more than 500,000 flights in India, and have saved Indian operators 90 million gallons of fuel and 880,000 metric tonnes of carbon emissions since entry into service in 2016."

P&W Customer Training Centre

Pratt & Whitney also announced a record 10,000 student days of training at its Customer Training Centre at Hyderabad. Launched in 2015, the centre is one of the three Pratt & Whitney training centres operating globally which offer specialised DGCA and EASA Part 147 approved training. The cente offers advanced training for airline customers, MRO operators, as well as industry and university skill development programmes, to spur the growth of the aviation sector in India. Several leading aerospace organisations have extended their support to the skill development initiatives undertaken by Pratt & Whitney and will consider offering career opportunities to students trained by the company.

"In line with the Government of India›s 'Skill India' and '*Make in India*' programmes, we have strategically invested in a world-class customer training centre in Hyderabad,» stated Ashmita Sethi, Pratt & Whitney Managing Director, India. "Through our centre here, we have been nurturing and developing talent in the aerospace sector since 2015. Our training centre underscores Pratt & Whitney's long-term vision and commitment of developing a robust skill development base in the country to support the growth of the aerospace ecosystem in India."

Mr. K T Rama Rao, Minister for Industries & Commerce, Govt. of Telangana at the Wings India 2020 inaugural

HAL-built Dornier 228 at the event

Airbus' strong presence

Airbus highlighted its products, technologies and services and visitors were able to examine a scale model of its single-aisle A220 aircraft, which is specifically designed and purpose-built for the 100-160 seat market. Displayed alongside was a model of the A350-900 and a scale model of the Airbus H145 twin-engine helicopter. In

Anand Stanley, President & Managing Director, Airbus India & South Asia on the right.

addition, Airbus displayed its capabilities in data analytics and support programmes for its customers. These included the first-of-its-kind open data platform – Skywise, Flight Hour Services – Tailored Support Programme (FHS-TSP), Airbus Interior Services (AIS) and Training Services.

Boeing showcase their commercial capabilities

Boeing highlighted their innovative commercial products and services and the company's exhibit featured its "commitment to innovation, safety and industry partnerships in developing India's aerospace ecosystem in support of *Make in India* and *Skill India*. India is one of the world's fastest growing aviation markets and Boeing is honoured to partner with customers and industry leaders to enhance the country's aerospace sector for the last 75 years," stated Salil Gupte, President, Boeing India. "We look forward to having the opportunity to highlight our ongoing investments in India that span the development of aerospace technology, innovation, production capacity, supply chain, aerospace skilling centres, manufacturing and the modernisation of airport infrastructure and airspace."

In addition to showcasing commercial aviation platforms such as the 787 Dreamliner and 777X, the Boeing exhibit focussed on the company's services capabilities to enhance airline operations. "As India's middle class expands and more consumers are able to fly, we're seeing tremendous potential for the country's growth as a commercial aviation hub," stated Darren Hulst, VP, Commercial Marketing, The Boeing Company.

FSTC Hyderabad Training Facility

FSTC (Flight Simulation Technique Centre), the Aviation Training Establishment offering 'high quality training' duly endorsed by DGCA and EASA, was inaugurated at the event, with a brand-new 8-bay pilot training facility in Hyderabad, formally inaugurated by the Minister of Municipal Administration & Urban Development, Industries and IT & Commerce, K T Rama Rao. Three bays of this facility are already occupied by an A320neo, Bombardier Dash-8 and ATR72-600 simulator and with 5 simulators already positioned at the Gurugram facility, the total number of simulators with FSTC is now eight.

Thales committed to India's vision

We caught up with Mr. Emmanuel de Roquefeuil, VP & Country Director, Thales in India and he had much to say! "The Indian aviation market is set on a high growth trajectory. Currently the ninth largest civil aviation market in the world, India is also now the fastest growing aviation market in terms of domestic tickets sold. It is expected that in the coming years Indian carriers will increase their fleet strengths while freight traffic will rise, and the number of brown field and green field airports will continue to increase. While Indian aviation has seen challenges in the demise of a few well-known carriers, the prospects for the future remain strong. UDAN, the Regional Connectivity Scheme (RCS) is an important initiative of the government with a vision of 'flying for all'. Another recent initiative of the government is 'Digi Yatra', is promising as it seeks to employ the best of technology to provide a hassle free and paperless airport experience. Imagine an airport where entry, check-in, baggage drops and claim, and various other aspects are driven by face recognition technology! Thales' Live face identification system overcomes the need for a physical ticket while providing a fluid and secure traveller experience. These initiatives bring together scale and technology which will power tomorrow's aviation".

Emmanuel de Roquefeuil continued, "Globally two out of three aircraft take off, fly and land using Thales solutions. Overall, Thales solutions make life better and safer for all the stakeholders such as governments, airports, pilots, crews and passengers each day. From air traffic management, training and simulation solutions, nose-to-tail aircraft connectivity and in-flight services, Thales enables and connects all parts of the aerospace ecosystem in the air, on the ground, and in between. Thales is a world leader in ATM and provides integrated gate-to-gate solutions ensuring airport safety and efficient traffic handling operations and seamless handover operations between territories. Thales is actively present in the Indian civilian aerospace market and some of its successful references includes retrofit of avionics and in-flight entertainment (IFE) for Air India, critical avionics to IndiGo and Navigational aids to Airports Authority of India (AAI)".

"By offering its expertise and strengths in aeronautics, defence, transport and digital identity and security markets, Thales has been a perfect match for India's ambitious objectives. The company's engineering competence centre (ECC), launched in Bengaluru last year, is focused on providing high value-added software in the fields of air traffic management, complex avionics systems, cockpit, flight management, connectivity and video systems, radar software and airborne ISR tactical management systems", the Country Director concluded.

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

China's H-20 Stealth Bomber

According to analysts, the Xian H-20 stealth bomber (*see Artist's concept of the Xian H-20 bomber*) has been under development in China for several years and its first flight is anticipated a few years hence, possibly before 2025. Speculated to resemble America's B-2 and the B-21, the H-20 would also be subsonic, wing-shaped and constructed with stealth material. With its projected long range, development of the H-20 is being followed very closely by the US as it would pose major threat to naval forces in the Indo-Pacific region in the times to come.

Orders for Saab 2000 Erieye

Saab has received additional orders for its Saab 2000 Erieye Airborne Early Warning and Control (AEW&C) aircraft, with deliveries to be made between 2020 and 2023. As per the Company, "the industry's nature is such that due to circumstances concerning the product and customer, further information about the customer will not be announced". The Saab 2000 Erieye AEW&C is a complete AEW&C system with multi-role and multi-mission capabilities for both military and civil needs, based on the Saab 2000 aircraft equipped with Saab's airborne radar Erieye and a range of other sensors.

The first operator of the Saab 2000 AEW&C is the Pakistan *Fiza'ya*, which placed orders four such aircraft in June 2006, with entry into service in October 2009. In 2012 after a terrorist attack on the air base at Kamra, three of these aircraft were damaged but two were subsequently repaired at the Pakistan Aeronautical Complex at Kamra itself and re-entered service. In 2017 the PAF reportedly ordered three additional such aircraft, raising the total to six.

Status of the F-35 programme

(Photo courtesy: US Air Force)

During the 11th annual *McAleese Defense Programmes Conference* in Washington, DC Lt. Gen. Eric T. Fick, programme executive officer for the F-35 Lightning II Joint Programme Office, detailed that these aircraft are flown by the US Air Force, Navy and Marine Corps on land and afloat in 24 locations worldwide. Additionally, the United Kingdom, Norway, Israel, Japan, Belgium, Poland and Italy are taking delivery of F-35s, to be followed shortly by Singapore. The programme is "now close to initial operating capability". He accepted that the "organisational structure was difficult to navigate for those on the inside and difficult to understand for those on the outside. To address this complexity, we created a new organisational construct that better aligns authority and accountability to the programme deliverables and outcomes".

Air National Guard F-35A air bases

The US Department of the Air Force has selected Truax Field, Wisconsin and Dannelly Field, Alabama as location for the next two Air National Guard F-35A Lightning II locations. The

F-35As will begin to replace many of the earlier fourth-generation aircraft, but the USAF will continue to fly a mix of fifth and fourth-generation fighters into the 2040s, "to allow the Air Force to maintain enough fighters to meet combatant commander requirements, provide required training, and allow a reasonable and uninterrupted deployment tempo for the force". The USAF expects the F-35As to begin arriving at Truax and Dannelly Fields in 2023.

18 more Boeing P-8A Poseidons ordered

The US Navy has awarded Boeing a $1.5 billion production contract for the next batch of 18 P-8A Poseidon aircraft, the contract including eight aircraft for the US Navy, six aircraft for the Republic of Korea Navy and four aircraft for the Royal New Zealand Air Force. Korea and New Zealand will acquire the aircraft through the Foreign Military Sales process and will receive the same P-8A Poseidon variant designed and produced for the US Navy. The Royal New Zealand Air Force is to receive its first aircraft in 2022 and the Republic of Korea Navy theirs in 2023.

The 100th P-8A Poseidon

Meanwhile, the US Navy has received its 100th P-8A aircraft from Boeing as the global fleet, which also includes those of the Indian Navy and the Australian and UK air forces, will approach 300,000 flight hours around the world. This was the 94th mission-capable P-8A to enter the US Navy fleet, with six additional aircraft used as Engineering Manufacturing Development test aircraft. Boeing has also delivered 12 P-8s to the Royal Australian Air Force, two to Britain's Royal Air Force and eight P-8Is to the Indian Navy (additional aircraft on order).

Qatar's Boeing F-15QA in first flight

First flight of the F-15QA, the most advanced version of this fighter extant, has taken place. Developed for the Qatar Emiri Air Force (QEAF), the flight was to demonstrate next-generation capabilities, taking place at Lambert International Airport in St. Louis. The US Department of Defense had earlier awarded Boeing a $6.2 billion contract to manufacture 36 F-15QA fighters for the QEAF, with first deliveries in 2021. In addition, Boeing was awarded a US Air Force foreign military sale contract in 2019 for F-15QA aircrew and maintenance training for the QEAF. The F-15QA brings next-generation technologies including fly-by-wire flight controls, digital cockpit, modernised sensors, radar, and electronic warfare capabilities plus "the world's fastest mission computer. Increases in reliability, sustainability and maintainability allow defence operators to affordably remain ahead of current and evolving threats."

First export of FTC-2000G

China's AVIC subsidiary Guizhou Aviation Industries Corporation (GAIC) has received an export order for the FTC-2000G advanced jet trainer/light-attack aircraft. According to AVIC, an order was placed in early 2020 by "an undisclosed Southeast Asian country" with delivery of the first batch of aircraft expected in 2021. Speculation on the identity of the customer has been on Cambodia or Myanmar, both of which countries maintain close relations with China and have been actively evaluating Chinese defence equipment. For some time, Cambodian air force pilots have received flight training in China, while Myanmar has received some 16 JF-17 Thunder Block II multirole combat aircraft built by the Pakistan Aeronautical Complex/Chengdu Aircraft Corporation and this country could well be ordering other Chinese-origin aircraft.

South Korea's KF-X programme

According to the *Defense Acquisition Programme Administration* (DAPA), as announced on 16 April 2020, the South Korean government will "increase funding to indigenous defence companies that produce indigenous components for major platforms and weapon systems, so as to stimulate local defence industry and reduce reliance on imported components, as well as boosting job creation". Foreign participation in the KF-X programme presently includes Cobham Mission Systems (missile eject-launchers), Collins Aerospace (engine start system components, environmental control system, speed constant frequency generator, etc), IAI ELTA (AESA radar development), Elbit Systems (terrain following/terrain avoidance TF/TA system), General Electric (F414-GE-400 engines), L3 Harris (BRU-47 and BRU-57 release systems), Meggitt (brake control system, carbon brakes, displays, wheels etc), and Saab (AESA radar development). Meanwhile, MBDA Missile Systems have announced that they would integrate the Meteor beyond visual range air-to-air missile (BVRAAM) onto the KF-X fighter.

Turkey's TF-X Project

Turkey's TF-X National Combat Aircraft (MMU), a joint project of the Turkish Aerospace Industries (TAI) and the Presidency of Defense Industries (SSB), will have increased co-operation between TAI and defence company HAVELSAN. The MMU a fifth-generation jet, with features similar to Lockheed Martin's F-35 Lightning II, is being developed to replace the Turkish Air Force's present inventory of F-16 fighters, anticipating phase out of the latter in the 2030s. The TF-X fighter jet is expected to make its maiden flight using a domestic engine in 2029, with work under way to develop the new engine in cooperation with related institutions.

Future Combat Air System progression

Under framework of the *Future Combat Air System* (FCAS), Airbus and FKIE (the Germany-based Fraunhofer Institute for Communication, Information Processing and Ergonomics) have created an independent panel of experts on specific use of new technologies to define and propose ethical as well as international legal 'guard rails' for Europe's largest defence project. The FCAS programmeme reflects a complex and extensive networked 'System of Systems', of which a next generation manned fighter will represent one key element. Such manned platforms will team with unmanned ones, called 'remote carriers', which will be providing additional capabilities to complete the missions at stake.

Philippines to order either Apaches or Vipers

The Philippines have requested purchase of either the AH-64E Apache or AH-1Z attack helicopters from the USA, under FMS which includes six AH-1Z or six AH-64E Apache attack helicopters plus associated equipment. The package also covers 14 T-700 GE 401C engines, 18 T700-GE-701D engines; and Honeywell Embedded Global Positioning Systems/Inertial Navigation (EGIs) with/Precise Positioning Service (PPS). Other equipment included are six AGM-114 Hellfire II missiles, 26 Advanced Precision

Kill Weapon System (APKWS) all-up rounds, seven M197 20mm machine guns, Target Sight System (TSS), ammunition, communications equipment and electronic warfare systems.

The 500th AH-64E Apache

Production, flight test and deliveries of the AH-64E Apache helicopter have continued apace at the Boeing site in Mesa, Arizona. With 500 AH-64E Apaches in service with the United States Army and defence forces around the world, the 'Echo' model provides "enhanced performance; joint digital interoperability; situational awareness and survivability with reduced operational and support costs". First delivered in 2011, the AH-64E has been used in actual combat and peacekeeping efforts.

IAI Heron UAVs leased to Greece

The Israel Ministry of Defence will lease the IAI Heron system in its maritime configuration to Greece over three years, with an option to purchase the system upon completion of the leasing period. The Heron system, equipped with both day and night activity platforms, maritime patrol radars and satellite communications, is "for extended operational endurance in a wide range of scenarios including maritime patrol, marine and land border protection, search and rescue, disaster management and more."

Two AT-6 Wolverines for USAF

Textron Aviation Defense has secured a contract from the US Air Force for two Beechcraft AT-6 Wolverine aircraft plus pilot training and engineering services. This is with the USAF Life Cycle Management Centre and includes up to four years of contractor support for maintenance and spares for the AT-6 multi-role aircraft. As Textron Aviation Defense Strategy and Sales vice-president Brett Pierson stated: "The AT-6 is a vital element of the National Defense Strategy to build ally and partner capacity, capability and interoperability, and does so at a fraction of the cost of other combat aircraft. We're eager to deliver the aircraft to the air force in support of Air Combat Command's (ACC) development of operational tactics and standards for exportable, tactical networks that improve interoperability with international partners."

First Nigerian Air Force A-29 Super Tucano

The first of 12 A-29 Super Tucano light attack, combat and reconnaissance aircraft for the Nigerian Air Force (NAF) made its maiden flight at in Jacksonville, Florida. The A-29 Super Tucano aircraft for the NAF are currently in production by Embraer Defense & Security and Sierra Nevada Corporation (SNC) at the Jacksonville facility with delivery to the NAF expected on schedule in 2021.

First HC-130J Combat King II

Lockheed Martin has delivered the US Air Force Reserve's first HC-130J Combat King II to the 920th Rescue Wing (RQW) at Patrick Air Force Base, Florida. This HC-130J is to be operated by the 39th Rescue Squadron (RQS), and is part of the 920th RQW. The Reservists are long-time operators of legacy HC-130 P/N Combat King combat search-and-rescue aircraft, flying and maintaining HC-130s since the 1960s, using HC-130. The HC-130J is the dedicated fixed-wing personnel recovery platform operated by the US Air Force, Air Force Reserve and Air National Guard.

CH-47F Chinooks to RNLAF

Boeing has delivered the first CH-47F Chinook with upgraded cockpit to the Royal Netherlands Air Force (RNLAF), "continuing a track record of on-time deliveries to customers". The RNLAF will operate a fleet of 20 CH-47F Chinooks, the newest variant in operation by several air arms around the world. The 20 CH-47F Chinooks will be equipped with the same state-of-the-art technology as the US Army, including digital automatic flight controls, a fully-integrated *Common Avionics Architecture System* (CAAS) glass cockpit, and advanced cargo handling capabilities.

UAE orders more LM Snipers

Lockheed Martin have received a direct order from the United Arab Emirates Air Force and Air Defence (AFAD) for expedited delivery of Sniper Advanced Targeting Pods (ATP), spares and upgrades and marks first integration of Sniper ATP on their Mirage 2000 fleet. "Deliveries of Sniper ATPs and spares will support the UAE AFAD's requirement to provide precision targeting capability for their Mirage 2000 fleet, the UAE AFAD currently employing Sniper ATP on its F-16 Block 60 aircraft.

Boeing's 'Loyal Wingman' Unmanned Aircraft

A Boeing-led Australian industry team has revealed the first unmanned *Loyal Wingman* aircraft for the Royal Australian Air Force, a milestone for the company. "The aircraft, which uses artificial intelligence to extend the capabilities of manned and unmanned platforms, is the first to be designed, engineered and manufactured in Australia in more than 50 years, and is Boeing's largest investment in an unmanned aircraft outside of the United States". As the first of three prototypes for Australia's *Loyal Wingman* Advanced Development Programme, the aircraft also serves as the foundation for the Boeing Airpower Teaming System (ATS) being developed for the global defence market. The *Loyal Wingman* prototype will now move into ground testing, followed by taxi and first flight later this year.

U-2 Dragon Lady evolves

Lockheed Martin Skunk Works continues to evolve the iconic U-2 *Dragon Lady* to meet future battle space needs under a recent contract award from the US Air Force valued at $50 million. This includes an updated avionics suite that modernises the U-2's onboard systems to readily accept and use new technology; a new mission computer designed to the US Air Force's open mission systems (OMS) standard that enables the U-2 to integrate with systems across air, space, sea, land and cyber domains at disparate security levels and a new, modern cockpit displays "to make everyday pilot tasks easier while enhancing presentation of the data the aircraft collects to enable faster, better informed decisions."

Bahrain orders Raytheon Patriot system

The US Army has awarded Raytheon Company a contract for production of the Patriot air and missile defence system for the Kingdom of Bahrain. "Raytheon's Patriot is the most advanced tactical air and missile defence system in the world, providing protection against a full range of advanced threats, including aircraft, tactical ballistic missiles, cruise missiles and unmanned aerial vehicles".

Final KC-46 RVS 2.0 design

The US Air Force and Boeing have reached two agreements to implement a final KC-46A Pegasus Remote Vision System design, known as RVS 2.0. The first MOA concerns the redesign and retrofit of the RVS 2.0 in full compliance with the contract requirements at no additional cost to the government. The second and separate MOA acknowledges possible impacts of the COVID-19 outbreak on the USA and the defence industrial base, "and releases previously withheld contract payments to help ensure successful performance under the programme".

NGC Advanced Anti-Radiation Guided Missile for USN

The US Navy has awarded Northrop Grumman Corporation $165 million for Lot 9 full rate production (FRP) of the AGM-88E *Advanced Anti-Radiation Guided Missile* (AARGM). These include all all-up round missiles and captive air training missiles for the US Navy and foreign military sales. "AARGM is an advanced system for pilots against modern surface-to-air threats. It is capable to rapidly engage land and sea-based air-defence threats, as well as striking, time-sensitive targets" (*see in image, launched from F-18*).

Rafael systems for M-346FA

Rafael Advanced Defense Systems are to supply 5th generation Litening-5 and RecceLite systems to equip Leonardo's M-346FA light combat aircraft. The FA variant has been developed as a multi-role aircraft, for air-to-surface, air-to-air and tactical reconnaissance missions.

Rafael to supply Litening 5/RecceLite

Rafael also announced a contract to supply 5th generation Litening and RecceLite airborne electro-optical systems "an undisclosed air force." Integrated with Rafael's pods, the jet will now have combat-proven, stand-off capabilities using the Litening 5 multi-spectral airborne targeting pod. The Litening pod is in use by 27 air forces and carried by over 25 platforms globally, including the F-16, F-15, AV-8B, F-18, F-4, F-5, A-10, B-52, Jaguar, LCA, AMX, Mirage 2000, Tornado, Typhoon, MiG-21, MiG-27, M346, KC-390, Gripen, Sukhoi 27 and Sukhoi 30, plus others.

BAE Systems advanced seekers for BMDS

BAE Systems has been contracted by Lockheed Martin to design and manufacture next-generation infrared seekers for the Terminal High Altitude Area Defense (THAAD) weapon system, providing critical targeting technology for protection against ballistic missiles. "The sensor design work will improve the missile defensc system's ability to neutralise more threats and improve its manufacturability".

Hypersonic Glide Body experiment

The US Department of Defense has tested a hypersonic glide body in an experiment conducted from the Pacific Missile Range Facility, Kauai, Hawaii on 19 March 2020. This hypersonic glide body (C-HGB), flew at hypersonic speed to a designated impact point, with the Missile Defense Agency (MDA) monitoring the tracking data. "This ongoing development of systems is designed to defend against adversary hypersonic weapons."

Hensoldt's *Kalætron* Attack system

Sensor solution provider Hensoldt has developed a modular airborne electronic combat system: *Kalætron Attack*. "By neutralising enemy fire control radars at different distances, it

preserves freedom of movement for the air forces that deploy it and their allies, even when faced with state-of-the-art air defence systems". *Kalætron Attack* is a new addition to the *Kalætron* electronic warfare product family, which uses fully digitalised hardware and artificial intelligence to detect radar-based threats to air forces in rapid time to neutralise them with targeted electronic countermeasures (ECM).

Raytheon Lower Tier Air & Missile Defence Sensor

Raytheon has tested the first radar antenna array for the US Army's *Lower Tier Air and Missile Defense Sensor*, or LTAMDS. The US Army selected Raytheon to build LTAMDS, a next-generation radar to detect advanced threats such as hypersonic weapons. LTAMDS consists of a primary antenna array on front of the radar, and two secondary arrays on the rear. The radar antennas work together to enable operators to simultaneously detect and engage multiple threats from any direction, ensuring there are no blind spots on the battlefield. LTAMDS' primary array is about the same size as the Patriot radar array but provides more than twice Patriot's performance.

Coyote Block 2 counter-drone weapon system

The US government has cleared Raytheon to sell its Coyote Block 2 counter-drone weapon to "approved allied nations as part of the Howler counter-drone system". In 2019, the US Army had deployed the Howler, a combination of the Ku-band Radio Frequency System and Coyote Block 1, this high-speed, highly maneuverable Block 2 designed to use Raytheon's KuRFS multi-mission radar as its fire control source.

HMAS 'Arunta' tests missile system

Following a 20-month upgrade, the Australian Navy warship HMAS *Arunta* has test fired its *Evolved Sea Sparrow Missile* (ESSM) off the coast of Western Australia. The ESSM is a surface-to-air weapon that uses radar homing guidance to counter fast-moving anti-ship missiles, forming part of *Arunta*'s air defence capability. The *Anzac*-class frigate is the first of its class to undergo the *Anzac Midlife Capability Assurance Programme* (AMCAP) upgrade at Henderson, Western Australia as part of Australia's *Warship Asset Management Agreement Alliance* (WAMA).

Missile Defense Agency's LRDR

The Missile Defense Agency's (MDA) *Long Range Discrimination Radar* (LRDR) programme has delivered the first of ten antenna panels to Alaska, that will constitute first of the system's two radar antenna arrays. Lockheed Martin is to deliver the radar to MDA in 2020, to serve as a critical sensor within MDA's layered defence strategy "to protect the US homeland from ballistic missile

attacks". The two radar antenna arrays comprise a total of 20 panels, each about 27 feet tall, approximately four stories high and wide. Temporary structures have been assembled in front of the radar facility to ensure the panels are installed on schedule, regardless of weather conditions.

US Army contract for M109A7 and M992A3s

The US Army has awarded BAE Systems a $339 million modification contract for production of 48 sets of M109A7 Self-propelled Howitzer (SPH) and its companion, the M992A3 Carrier, Ammunition, Tracked (CAT) vehicle, which includes post-delivery support and spare parts. "The M109A7 SPH and M992A3 CAT vehicle set is a vital programme enhancement for increased combat capability and sustainment of the Army's Armored Brigade Combat Teams (ABCTs), providing enhanced indirect-fire artillery capabilities to the ABCTs with new technologies for power generation and survivability".

Rostec 155mm Msta-S howitzer

Rosoboronexport and UralVagonZavod (UVZ), both part of Rostec State Corporation have demonstrated combat capabilities of their 155mm Msta-S self-propelled howitzer including accurate firing on targets. The Msta-S, developed at the initiative and with the participation of Rosoboronexport, employs a NATO standard 155mm gun and "is designed to destroy artillery and mortar batteries, tank columns, command & control and reconnaissance posts." The 155mm Msta-S self-propelled howitzer is equipped with an automatic laying and fire control system, a thermal imaging sight coupled with a laser rangefinder, observation devices, a muzzle velocity radar, loading mechanisms, mechanised charge stowage, mechanisms for feeding projectiles and charges from the ground, and a 12.7 mm machine gun mount.

Additional 155mm BONUS Munitions for US Army

The US Army is reportedly ordering additional advanced BONUS munitions manufactured by BAE Systems and Nexter of France. BONUS is a 155-millimeter munition designed for destroying armoured targets and will be employed by the Army's inventory of M109 self-propelled howitzers and M777 ultra-lightweight towed howitzers. The BONUS round contains two sensor-fuzed warheads with advanced target-seeking sensors. Once deployed, these "seek, track and strike targets within an area of 32,000 square metres".

Excalibur projectiles for the Netherlands

The US Government has approved the Dutch Government's request for precision projectiles, the Royal Netherlands Army to receive 199 Excalibur Increment IB tactical projectiles with the American designation M982AI. The Excalibur precision-guided artillery ammunition was developed jointly by Raytheon and Bofors and first deployed by the US Army in Afghanistan in 2012. The 155-mm projectile has a base-bleed propulsion system to increase its range (to some 40 km) and folding glide fins at the tip to steer the projectile on final approach. Guiding is based on GPS data and begins at peak of the trajectory and allows precise control till the target impact.

Rheinmetall's VarioRay LLM laser light modules

As part of its 2019 defence procurement programmeme, the Swiss Army has placed an order with Rheinmetall for the VarioRay LLM laser light module. Delivery of 9,640 devices is to

commence from May 2020 and completed by the end of 2022. The order also includes accessories, spare parts and training support. Rheinmetall Air Defence AG is the general contractor for the project and Rheinmetall Soldier Electronics GmbH are the manufacturers.

NG's HAMMR system

Northrop Grumman has demonstrated its *Highly Adaptable Multi-Mission Radar* (HAMMR) system at Eglin Air Force Base, Florida, using the HAMMR system, mounted on a *High Mobility Multipurpose Wheeled Vehicle* (HMMWV) as an Integrated Air and Missile Defence (IAMD) sensor to detect and track an unmanned aerial vehicle target. Northrop Grumman's HAMMR is a short-to medium-range X-Band Three Dimensional (3D) radar that utilises the proven Active Electronically Scanned Array (AESA) AN/APG-83 F-16 fighter radar in a ground-based, sense on-the-move role. HAMMR provides robust multi-mission 3-D performance for air surveillance, weapon cueing and counter-fire target acquisition missions in either a 360-degree or sector-only staring mode.

US Marines order Centaur UGVs

US Marine Corps have ordered more than 140 Centaur Unmanned Ground Vehicles (UGV), plus spares from FLIR Systems, Inc. The Centaur is a medium-sized UGV that provides a standoff capability to detect, confirm, identify, and dispose of hazards, the open-architecture robot features, an advanced EO/IR camera suite, a manipulator arm that reaches over six feet, and the ability to climb stairs.

Bell V-280 team Valor selected

Bell Textron has been selected as 'project agreement holder' for the *Competitive Demonstration and Risk Reduction* (CD&RR) effort as part of the US Army's Future Long Range Assault Aircraft (FLRAA) programme. Bell will deliver a refined V-280 Valor design, with supporting technical documentation that builds on the data collected during the two years and 170 hours of flight testing under the *Joint Multi-Role Technology Demonstration* (JMR TD) programme. This follows the successful US Army led JMR TD programme, as part of Bell-managed collaboration with the twelve leading companies that constitute *Team Valor* to enable rapid production, systems integration and deliberate programme schedule to validate the V-280's flight capabilities and operational relevance. "The V-280 achieved all programme goals, demonstrating its speed by flying above 300 knots and demonstrating low speed agility attitude quickness per ADS-33F-PRF"

Boeing's US Army 'Future Attack Reconnaissance Aircraft'

Boeing, has revealed images of its new light reconnaissance and attack helicopter, developed under the FARA (*Future Attack Reconnaissance Aircraft*) programme for the US armed forces. The US Army requires replacement of its Bell OH-58 Kiowa Warrior, already retired since 2017, for reconnaissance missions and assault tasks. Boeing's design for the FARA competition is a single-engine helicopter with reduced effective radar reflection surface, a two-seater tandem cabin, and a pusher propeller. The helicopter will have a hingeless six-bladed main rotor and a conventional tail section with four rotor blades but also a propeller at the rear.

Sikorsky awarded LRIP contract

Sikorsky is to build 12 additional HH-60W Combat Rescue Helicopters (CRH) following a second *Low Rate Initial Production* (LRIP) contract award by the US Air Force Lot 2 valued at over $500 million. This follows a series of significant programme milestones in 2019, including first flight, a Milestone C decision by the Air Force and award of the first Low Rate Initial Production (LRIP) contract for 10 aircraft. The HH-60W is an all-new helicopter based on the proven UH-60M Black Hawk and customised for the US Air Force's rescue mission.

Rafael $ 2.7 billion turnover in 2019

Rafael Advanced Defense Systems Ltd. has declared its financial results for FY 2019, with record sales of $2.7 billion, an increase of 3.9 % compared with 2018. The company's orders totaled $2.8 billion, with record high export orders, and an order backlog of $7.2 billion. Rafael has made a number of other significant achievements, including sale of two Iron Dome batteries to the US Army, and an on-time delivery of the US Army's first Trophy Active Protection Systems. In 2019, Rafael received urgent orders from India for the supply of Spike missile systems, plus a major order for Spike from Germany, expanding its Spike operator-base to 34 nations. The company signed a number of important JVs, and posted an increase in the number of users of its Litening Pod. Rafael also won a strategic contract for a multi-domain project with the Israeli MOD and was awarded the *Israel Defence Prize* for its Spice 1000 air-to-surface system.

Raven UAS contract

AeroVironment has a contract to provide Raven small unmanned aircraft systems (UAS) and training to "an allied nation". AeroVironment's Raven system is designed for rapid deployment and high mobility for operations requiring low-altitude intelligence, surveillance and reconnaissance, "the hand-launched Raven providing situational awareness, day or night, with an operational range of 6.2 miles (10 kilometers)".

Upgrade of Hermes 900 UAS

Elbit Systems has been awarded two contracts valued at $20 million from "Latin American customers" to upgrade the capabilities of their Hermes 900 Unmanned Aircraft Systems (UAS), both contracts to be performed within a 12-month period. Under the contracts, the company will integrate satellite communication systems and automatic takeoff and landing systems into the Hermes 900 UAS. This upgrade will advance these Medium Altitude Long Endurance (MALE) UAS to the latest configuration, enabling extension of the operational range to more than 1000km and performing the takeoff and landing autonomously and independent of GPS reception.

Airbus fully automatic A3R Operation

Airbus has achieved the first ever fully automatic air-to-air refuelling (A3R) operation with a boom system. The flight test campaign, conducted earlier in the year over the Atlantic Ocean, involved an Airbus tanker test aircraft equipped with the Airbus

A3R solution, with an F-16 fighter aircraft of the Portuguese Air Force acting as receiver. This test is part of industrialisation phase of A3R systems ahead of its implementation in the A330 MRTT tanker development.

CH-53K in air refueling tests

The CH-53K King Stallion has successfully demonstrated air-to-air refueling, giving long-range logistics support capabilities for the US Marine Corps. The 4.5 hour test was accomplished over the Chesapeake Bay with a KC-130J aerial refueling tanker, the CH-53K flying behind in strong turbulence. These tests were performed at increasing closure rates to ensure the CH-53K can handle the forces on the refueling probe when contacting the drogue during aerial refueling.

Elbit command and control systems

Elbit Systems has been awarded a contract from the Swiss Federal Office for Defense Procurement (*Armasuisse*) to provide Command and Control ("C2") systems for the Tactical Reconnaissance System (TASYS) of the Swiss Armed Forces.

BAE Systems APKWS laser-guided rockets

BAE Systems are continuing to focus on "the most effective and cost-efficient precision munitions" including the APKWS laser-guided rockets for the US Department of Defense (DoD) and its allies. APKWS rockets are assembled by adding innovative guidance kits to Hydra rockets, which have remained as unguided munitions for decades. The APKWS guidance kit works with new and stockpiled fuses, warheads, and rocket motors, and does not require modifications to rocket components, launchers, or firing platforms.

MoUs between PCO and Rafael

PCO S.A. of Poland and Rafael Advanced Defense Systems of Israel have signed MoUs for co-production of the Toplite electro-optical systems (EOS) in Poland, intended for use by Polish Mi-24 helicopters, the two companies cooperating since 2007 for supply of optoelectronic heads for Poland's Głuszec helicopters. Under this agreement, PCO S.A. will become part of the supplier chain under other Rafael programmes.

US Army's Sentinel A4 Radar programme

The US Army's Sentinel A4 radar programme has achieved several key milestones, the US Army approving the programme's *Systems Requirement Review* (SRR), *Systems Functional Review* (SFR), and the *Preliminary Design Review* (PDR) for one of the subsystems. Lockheed Martin's open scalable radar architecture is the cornerstone of the radar system's design and will allow for future upgrades that not only extend the life of the radar, but address threats to warfighters that will evolve over the next 40 years.

US Army orders Patroit Advance Capability-3

Lockheed Martin has received a $6.07 billion contract from the US Army for production of Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhancement (MSE) interceptors and associated equipment, to be delivered during 2021-2023. "The contract involves production and delivery of PAC-3 MSE interceptors, launcher modification kits, associated equipment and non-recurring efforts to support the United States and global customers".

LM's PrSM proves reliability

Lockheed Martin has tested its next-generation long-range missile designed for the US Army's Precision Strike Missile (PrSM) programme at White Sands Missile Range, New Mexico. "All objectives were achieved in the third and final flight demonstration as part of the Technology Maturation and Risk Reduction phase of the programme". PrSM was fired from Lockheed Martin's High Mobility Artillery Rocket System (HIMARS) launcher and flew approximately 85 kilometers to the target area, resulting in highly accurate and lethal warhead impact.

Rafael's Spike FireFly

Israel's MOD has ordered Rafael's Spike FireFly (known in the IDF as *Maoz*) loitering munition. Jointly developed by Rafael and the IMOD, FireFly weighs only 3 kg and provides Behind-Cover

Precision Attack Capabilities for the dismounted soldier. Ordered for the Israel Defense Forces FireFly was designed for fighting within the urban arena where situational awareness is limited, the enemy is behind cover and precision is critical. FireFly is rapidly deployed within seconds, as a portable, durable and includes a rugged airframe to withstand the harsh environment of urban combat.

NGC and Raytheon partner on Next Gen Interceptor

Northrop Grumman and Raytheon Missiles & Defense, are partnering on a US Missile Defense Agency (MDA) contract for the Next Generation Interceptor (NGI). "This strategic partnership will offer the MDA an interceptor solution that will support the warfighter and MDA's efforts to rapidly deploy a system that complements and strengthens the existing Ballistic Missile Defense architecture".

Javelin JV on F-Model missile

The Javelin Joint Venture team, a partnership of Raytheon Missiles & Defense and Lockheed Martin have completed the first production Javelin F-Model (FGM-148F) missile, which

"versatile, man-portable, fire-and-forget weapon system, with an advanced, multipurpose warhead can defeat current and future armour, including explosive reactive armour". Javelin has been used extensively in combat operations in Afghanistan and Iraq with US and coalition forces employing the Javelin in more than 5,000 engagements since its deployment in 1996.

MQ-8C Fire Scout radar testing

The US Navy, with support from Northrop Grumman, has commenced flight testing of the MQ-8C Fire Scout equipped with the Leonardo AN/ZPY-8 radar. "The AN/ZPY-8 radar significantly increases Fire Scout's detection and tracking of targets. The ability to simultaneously employ multiple modes supports US Navy intelligence, surveillance and reconnaissance requirements," stated Melissa Packwood, programme manager, tactical autonomous systems, Northrop Grumman. "This increased capability enables Fire Scout to extend ranges to meet emerging requirements."

Leonardo's M-345 certified

The DAAA (*Directorate for Air Armaments and Airworthiness*) which is the Italian Ministry of Defence's Certification Authority, has issued the 'Initial Certification' for Leonardo's new

M-345 jet trainers. This important milestone comes after intense activities with two hundred dedicated flights logged alongside the critical support of the Italian Air Force's Flight Test Centre, 61st Wing and the 10th Aircraft Maintenance Unit.

BAE gets Systems Integration Contract

The US Navy's Naval Air Warfare Center Aircraft Division's (NAWCAD) Aircraft Prototyping Systems Division has awarded BAE Systems prime position for a $26.7 million task order to "install, integrate, and test" the Navy's Large Aircraft Infrared Countermeasures (LAIRCM) system on KC-130J aerial transport and refueling aircraft. The DoN LAIRCM advanced missile warning system improves aircraft capability and survivability by countering advanced infrared missile system threats.

Second Boeing 777X

Maiden flight of the second Boeing 777X has taken place with Capt. Ted Grady, 777X project pilot and Capt. Van Chaney, 777/777X chief pilot, at the controls. Registered as WH002, this is the second of four such aircraft dedicated for flight tests to determine test handling characteristics and other aspects of the airliners performance. An array of equipment, sensors and monitoring devices throughout the cabin allowed the onboard team to document and evaluate the aircraft response to test conditions in real time.

Boeing ends agreement with Embraer

Boeing has terminated its *Master Transaction Agreement* (MTA) with Embraer, under which the two companies had sought to establish a new level of strategic partnership, the joint venture comprising Embraer's commercial aviation business with a second joint venture to develop new markets for the C-390 Millennium medium airlift and air mobility aircraft. "Boeing has worked diligently over more than two years to finalise its transaction with Embraer. Over the past several months, we had productive but ultimately unsuccessful negotiations about unsatisfied MTA conditions. We all aimed to resolve those by the initial termination date, but it didn't happen," said Marc Allen, president of Embraer Partnership & Group Operations. "It is deeply disappointing. But we have reached a point where continued negotiation within the framework of the MTA is not going to resolve the outstanding issues."

2nd Chinese-built frigate for PN

(Image from PakDefence)

Keel laying ceremony of the second ship of the frigate *Type 054 A/P* was held at Hudong Zhonghua Shipyard on 23 March, 2020, another milestone in induction of four such new generation frigates for the Pakistan Navy. Keel laying protocols were signed by both Pakistani and Chinese officials, with Commodore Azfar Humayun, Chief Naval Overseas (China), as the Chief Guest.

SSN 'Suffren' in sea trials

Sea trials of the *Suffren*, first *Barracuda*-class nuclear attack submarine, have begun which will enable the French Defence Procurement Agency (DGA) and the French Navy to test

performance of the submarine at sea before its delivery later this year. These series of sea trials follow the divergence of the nuclear reactor which took place in December 2019 and the dock tests carried out since the launch of the submarine on 12 July 2019. A total of six *Barracuda*-class submarines will be added to the French Navy's fleet by 2030.

USS 'Zumwalt' delivered

The US Navy accepted delivery of USS *Zumwalt* (DDG 1000) on 24 April 2020, lead ship of the next-generation of multi-mission surface combatants which will now transit from Combat Systems Activation to the next phase of developmental and integrated at-sea testing. This marks a major milestone of the dual delivery approach for USS *Zumwalt*, which achieved *Hull Mechanical & Electrical* delivery from shipbuilder General Dynamics' Bath Iron Works in May 2016. Raytheon Integrated Defense Systems was prime contractor for the *Zumwalt Combat System*, leading activation and integration for *Zumwalt*-class ships both in Bath, Maine and San Diego.

BAE contracted for US Navy's AEGIS Combat System

BAE Systems Inc. has been awarded a five-year contract to provide the US Navy's AEGIS Technical Representative (AEGIS TECHREP) organisation with critical large-scale system engineering, integration, and testing expertise for the AEGIS Weapons and Combat Systems aboard US Navy surface combatant ships. This was awarded under the National Institutes of Health (NIH) Information Technology Acquisition and Assessment Centre's Chief Information Officer–Solutions and Partners 3 (CIO-SP3) Government-Wide Acquisition Contract. CIO-SP3 is an Indefinite Delivery/Indefinite Quantity contract, intended to provide information technology solutions and services.

LM's HELIOS Laser Weapon System

Lockheed Martin and the US Navy are integrating a laser weapon system onto an *Arleigh Burke*-class destroyer after successfully conducting a Critical Design Review (CDR) for the High Energy Laser with Integrated Optical-dazzler and Surveillance (HELIOS) system. "HELIOS will provide an additional layer of protection for the fleet with the low cost per kill, speed of light delivery, and precision response. Additional HELIOS systems will accelerate the warfighter learning curve, provide risk reduction for future laser weapon system increments and provide a stronger demand signal to the supply base," stated Brendan Scanlon, HELIOS Programme Director, Lockheed Martin Rotary and Mission Systems.

AGM-84L Harpoon Block II missiles for Morocco

The Government of Morocco has ordered ten AGM-84L Harpoon Block II Air Launched missiles and related equipment for an estimated cost of $62 million, under FMS. The Government of Morocco had requested 10 AGM-84L Harpoon Block II Air Launched missiles, plus containers, spare and repair parts, support and test equipment, publications and technical documentation, personnel training and training equipment, etc. at the cost of $62 million.

Kongsberg contract for Naval Strike Missiles

Kongsberg Defence & Aerospace AS has contracted with Raytheon Missile Systems for Naval Strike Missiles (NSM) as part of the US Navy Over-The-Horizon Weapon System (OTH WS) programme "NSM is a long-range, precision strike missile that can detect and destroy heavily defended land and sea targets at long distances". In 2018, the US Navy awarded Raytheon a contract to manufacture and deliver NSM as the Over-The-Horizon Weapon System for littoral combat ships and future frigates. In 2019, the USS *Gabrielle Giffords* (LCS 10) became the first US Navy littoral combat ship to launch the NSM in an integrated setup, launched during *Pacific Griffin*, a biennial exercise conducted near Guam.

Contract for 'San Antonio'–class LPDs

Huntington's Ingalls Shipbuilding Division has received a $1.5 billion fixed-price-incentive modification to a previously awarded contract for procurement of the detail design and construction of LPD 31 amphibious transport dock. The ship will be the 15th in the *San Antonio*-class and the second Flight II LPD. Ingalls' LPD Flight II programme vendor base consists of more than 600 manufacturers and suppliers in 39 states, including 387 small businesses. Ingalls has delivered 11 *San Antonio*-class ships to the Navy, with three more under construction.

USS *Delaware* joins USN

On 4 April 2020, the US Navy commissioned USS *Delaware* (SSN 791), the 18th *Virginia*-class attack submarine. The submarine has a speed in excess of 25 knots submerged, and will operate for over 30 years without refueling. *Delaware*'s keel was laid 30 April, 2016, being the final Block III *Virginia*-class submarine, pending the next wave of Block IV deliveries.

10 Guided Missile Frigates for USN

Contract for detail design and construction (DD&C) of up to 10 Guided Missile Frigates (consisting of one base ship and nine option ships) has been awarded to Marinette Marine Corporation (MMC) of Marinette, Wisconsin by the US Navy. The FFG(X) will have multi-mission capability for air warfare, anti-submarine warfare, surface warfare, electronic warfare, and information operations. Specifically FFG(X) will include an Enterprise Air Surveillance Radar (EASR) radar, Baseline Ten (BL10) AEGIS Combat System, a Mk 41 Vertical Launch System (VLS), communications systems, MK 57 Gun Weapon System (GWS) countermeasures and added capability in the EW/IO area with design flexibility for future growth.

Launching into the Future

General Atomics EMALS and AAG Systems

General Atomics Electromagnetic Systems (GA-EMS) announced in April 2020 that successful trials on USS *Gerald R. Ford* (CVN 78) concerning Flight Deck Certification (FDC) had been completed using the Electromagnetic Aircraft Launch System (EMALS) and Advanced Arresting Gear (AAG) system. The number of aircraft to have landed and taken off from the US Navy's CVN 78 now totals more than 2,000, fleet squadrons from Carrier Air Wing Eight (CVW-8), as well as pilots from Strike Fighter Squadron (VFA) 106 and Carrier Airborne Early Warning Squadron (VAW) 120 operating hundreds of sorties over a two week period with all arrested landings and catapult launches completed safely.

"We continue to see EMALS and AAG perform according to specifications to execute cats and traps with the objective of reaching the robust evolution rates necessary for combat," stated Scott Forney, President of GA-EMS. "We are working closely with the Navy and CVN 78 crew to ensure operational performance is achieved. We remain extremely proud of our team, the squadrons' pilots and the ship's crew for all their hard work and dedication, and look forward to continuing success as CVN 78 undergoes these continued at sea periods."

FDC is a qualification of the ship's various aviation systems and includes the crews' qualification to operate the numerous systems. FDC was completed on 20 March following day and night launch and recovery exercises with F/A-18E/F Super Hornets. FDC is intended to qualify and prove ship and crew capabilities under operational conditions that can occur while on deployment.

On 31 January, CVN 78 completed Aircraft Compatibility Testing (ACT), a significant milestone that exhibited EMALS and AAG's ability to launch and recover five types of aircraft in varying configurations – four of which were for the first time. CVN 78 to accommodate the current naval air wing, including F/A-18E/F Super Hornet, E-2D Advanced Hawkeye, C-2A Greyhound, EA-18G Growler, and T-45C Goshawk aircraft.

GA-EMS is delivering EMALS and AAG for the future USS *John F. Kennedy* (CVN 79) and USS *Enterprise* (CVN 80). Significant cost savings are being realised through multiple ship production contracts, which minimise gaps in production while maximising planning, scheduling and delivery to support all three *Ford*-class carriers.

Radomes from SABCA for GA-ASI MQ-9Bs

General Atomics Aeronautical Systems, Inc. (GA-ASI) will work with Belgium-based Sociétés Anonyme Belge de Constructions Aéronautiques, SABCA to supply Satellite Communications (SATCOM) radomes for the MQ-9B SkyGuardian and SeaGuardian Remotely Piloted Aircraft (RPA). SABCA is one of

GA-ASI's team of Belgian suppliers – known as *Team SkyGuardian Belgium* – that will be providing content for all MQ-9B aircraft. The Government of Belgium has approved Belgian Defence to negotiate the acquisition of MQ-9B to meet the nation's RPA requirements.

The British Royal Air Force is acquiring the MQ-9B as part of its Protector RG Mk1 programme and is scheduled for first delivery in 2020. In December 2020, the Australian Government announced the selection of GA-ASI's MQ-9B SkyGuardian for the Australian Defence Force (ADF) under *Project Air 7003*.

First production-representative MQ-9B SkyGuardian

GA has completed the first production-representative MQ-9B SkyGuardian Remotely Piloted Aircraft (RPA), first flight of this aircraft taking place on 30 March at GA-ASI's Flight Operations Facility in El Mirage, California. The new SkyGuardian, known within GA-ASI as BC03, is a company aircraft being utilised for ground and flight testing to collect airworthiness certification data starting with flight loads and aircraft performance testing. The results from the tests will form the Type Certification Exposition needed to achieve the Military Type Certificate for the Protector platform.

The multi-mission MQ-9B is built for all-weather performance with lightning protection, damage tolerance, and a de-icing system. SkyGuardian, as well as the maritime SeaGuardian, features a GA-ASI-developed Detect and Avoid System (DAAS).

Air National Guard to install GA-ASI DAAS

General Atomics Aeronautical Systems and the US Air National Guard (ANG) have signed a contract for GA-ASI to supply its Detect and Avoid System (DAAS) for one MQ-9 Block 1 and one MQ-9 Block 5 Remotely Piloted Aircraft (RPA).

The DAAS consists of GA-ASI's Due Regard Radar (DRR) and processor, and a Traffic Alert and Collision Avoidance System (TCAS). For the ANG, GA-ASI will upgrade software in the DRR to add a tactical weather mode, in addition to the air traffic surveillance capability. GA-ASI's DAA system also enables safe access to uncontrolled airspace and will comply with Due Regard procedure when operating in international airspace.

USMC operational flight with GA-ASI MQ-9A

US Marine Corps (USMC) pilots and sensor operators from Marine Unmanned Aerial Vehicle Squadron 1 (VMU-1) have conducted their first operational flight of an MQ-9A Reaper Unmanned

Aircraft System (UAS) "in the Middle East." The multi-sensor reconnaissance-equipped MQ-9A UAS produced by General Atomics Aeronautical Systems, Inc. (GA-ASI) has provided crucial support to USMC's forward operations on the battlefield.

With oversight of the GA-ASI team, the VMU-1 *Watchdog* crews took control of a Company Owned/Company Operated (COCO) MQ-9A supporting forward deployed Marines, this USMC achievement coming shortly after surpassing 7,000 hours of COCO flight operations since September 2018.

GA and the Hypersonic Glide Body

General Atomics Electromagnetic Systems (GA-EMS) recently participated in successful testing of the Common Hypersonic Glide Body (CHGB) during joint flight test Flight Experiment 2 (FE-2) in support of the Army Long Range Hypersonic Weapon (LRHW) and the Navy's Conventional Prompt Strike (CPS) programmes. This event was one in a series of tests slated to be conducted by the joint services. GA-EMS provided flight hardware and cables, flight software inputs and testing, test event training, data network infrastructure and data management.

Since 2006, GA-EMS has been working with the industry, government and the Departments of Defence and Energy to develop and test hypersonic weapons. Currently, GA-EMS is providing manufacturing, production, engineering and technical support to integrate, test, and evaluate CHGB and flight test vehicles through system and subsystem-level ground and flight test activities.

The MPF programme: US Army's Future Armoured Fleet

General Dynamics Land Systems has unveiled its platform for the *Mobile Protected Firepower* (MPF) programme; this platform of GDLS will compete with BAE Systems for the contract with US Army. The programme requires a light tank for the US Armed Forces "to provide adequate protection and firepower along with excellent mobility bridging the gap between the heavy Main Battle Tanks and the future Optionally Manned Fighting Vehicle (OMFV)."

This will provide the Infantry Brigade Combat Team (IBCT) with 'a protected platform capable of delivering overwhelming precision firepower combined with the ability to move rapidly in a variety of terrain conditions.' Currently IBCT lacks such a platform which can provide the necessary firepower along with adequate protection to engage hardened enemy bunkers, light armoured vehicles, dismounted personnel and sniper positions.

The light tank should be of 30 tones and is one of the five next generation combat vehicles being developed by *Army Futures Command*, the new four star command which will focus on "managing the force against rapidly developing and evolving high end threats and thus focusing on a vehicle which can provide mobility, lethality and survivability against high intensity threats in multi domain operations."

There were originally three major competitors: BAE Systems, General Dynamics Land Systems and SAIC, the latter remarked. According to reports, $375.9 million was awarded to BAE Systems and $335 million to GDLS; to build 12 prototypes each with delivery starting in 14 months and testing in 16 months. Initially 55 vehicles will be procured every year aiming at a total procurement of 550 units. The targeted fielding for the First Unit Equipped is Fiscal Year 2025.

The offer from BAE Systems is the result of more than 30 years of research and development for an optimised, rapidly deployable, the combat vehicle designed specifically to support light infantry. The technology demonstrator of the Mobile Protected Firepower (MPF) vehicle or 'light tank', equipped with the Iron Fist active protection systems (developed by IMI of Israel) was presented at the *Association of the United States Army* (AUSA) Global Force Symposium in Huntsville during 2019. In 2018 it was provided with a contract worth up to $376 million for the Engineering, Manufacturing, and Development (EMD) phase of the

The GDLS offer

programme and rapid prototyping effort with low rate initial production options.

Its contender is based on the M8 light tank originally offered in late 90s to replace the M551. The system is equipped with XM35A electro-thermal chemical gun (105 mm) based on the M35 can fire advanced multi-purpose (AMP) which when fired from ETC gun can achieve a velocity higher than from the current 120 mm main gun. It is equipped with an auto loader which allows it to achieve an excellent rate of 12 rounds per minute!

The innovative roll out power pack design allows for easy access to the engine and transmission without the aid of heavy equipment. BAE Systems stated, "It also integrates scalable armour and innovative survivability subsystems to protect the vehicle and crew from threats on the future battlefield. The vehicle employs situational awareness systems adding to the highest levels of survivability and crew protection. The compact design allows for multiple vehicle deployment on a C-17 and exceeds the Army's transport requirement–and it is sustainable within the IBCT."

The second contender was Science Applications International Corp, jointly with ST Kinetics of Singapore and CMI Defence from Belgium. CMI Defence's Cockerill Series 3105 turret is placed on Next Generation Armored Fighting Vehicle (NGAFV) chassis, powered by a 710 hp MTU 8V-199 TE20 diesel coupled to a Kinetics Drive Solution (KDS) HMX3000,

Offer from SAIC

which provides a power-to-weight ratio of 24.5 hp/tone. The vehicle is reported achieve a maximum speed of 70 kmph and an operating range of 500 km. The turret can be equipped with a wide range of armament including high pressure gun, using a common high performance, digital, fully stabilised, day/night weapon control system. The turret weight is kept low through the use of a bustle mounted autoloader. However, it is now out of the competition.

In 2018, the US Army awarded a $335 million Section 804 Middle Tier Acquisition (MTA) Rapid Prototyping contract to General Dynamics Land Systems to deliver 12 prototype vehicles for the Mobile Protected Firepower programme. GDLS aims for a medium weight, large calibre, high mobile platform. The contract has Low Rate Initial Production (LRIP) options for a total of up to $968 million, with GDLS to provide 12 pre-production vehicles and two ballistic hulls and turrets scheduled for March-September 2020.

GDLS unveiled their platform to show a modified Abrams turret with 105 mm gun based on an AJAX chasis. According to reports, 'the turret architecture showcased uses a M1A2 Sep V3 fire control system and Commander's Independent Thermal Viewer (CITV) married to a 105 mm cannon and a 12.7 mm heavy machine gun.'

Many in the US Army believe that a trained crew can load faster than even auto loader and the fast is the loading the higher is the rate of fire. A higher rate of fire can give huge advantages in battlefield over advisories, but auto loading helps battling fatigue which is inevitable after prolonged operations.

There are many countries developing a light tank to bridge the gap between their IFVs and MBTs. Turkey (FNSS) and Indonesia's (PT Pindad) joint production Modern Medium Weight Tank (MMWT) or China's Type-15 and VT-5 are some of the latest in the game. Russia has the Sprut-SD light tank which is as light as 18 tonnes yet can deliver punch of a MBT.

In such a scenario the US does not want to lag behind !

Article by: Sankalan Chattopadhyay (twitter@vinoddx9)

The Contender from BAE Systems

Continuing Developments at Saab

New AESA Radar in trials

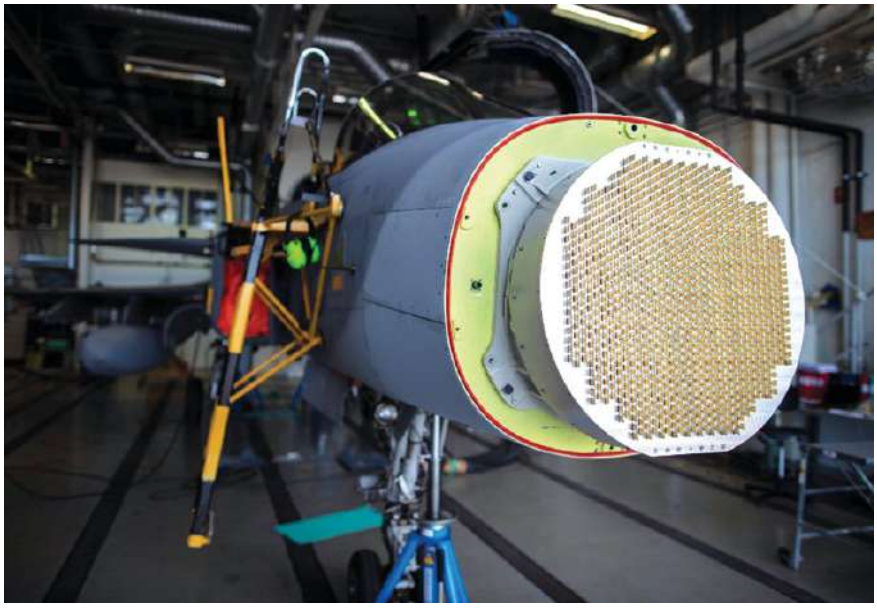
Saab has successfully completed the first air trials with its new fighter X-band Active Electronically Scanned Array (AESA) radar, which will be offered as a new addition to Saab's PS-05/A radar family. Saab continues to develop core AESA technology and has now successfully completed the first air trials with the new X-band AESA radar. The trials were successful, collecting data while detecting and tracking objects.

The radar is designed for fighter aircraft and can be adapted to a variety of platforms. As Saab previously announced, a version of the new AESA antenna has been sold to a US Government customer. "This is an important step in the development of our new fighter AESA radar. We see great possibilities for the radar, and its modular, adaptable and scalable design means it can also be used for a range of other applications", stated Anders Carp, SVP and head of Saab's business area *Surveillance*.

The trials aircraft was a Gripen D, which is currently offered with Saab's latest Mk4 radar. The new version of the radar can be offered to Gripen C/D operators, as an upgrade. The new AESA radar features GaN, a material that gives lower power consumption and improved heat resistance, which enables wider bandwidth and 'greater reliability, availability and efficiency'. The new fighter X-band AESA radar will, for example, have better performance against small targets, enhanced Electronic Counter-Countermeasures (ECCM) capability as well as improved ability to support more advanced weaponry.

Support Contract With British Army

Saab has signed a three-year contract with the UK Ministry of Defence for the provision of support and services to the Direct Fire Weapon Effects Simulator (DFWES) capability. DFWES is a laser



based Tactical Engagement Simulation (TES) system, that allows dismounted and mounted soldiers to simulate the effects of direct and indirect fire. This order includes support and maintenance for the British Army's DFWES capability. In addition to the existing sites in the UK, Canada and Germany, this contract includes continuation of support to the Commando Training Centre Royal Marines, the Infantry Battle School in Brecon and the Infantry Training Centre at Catterick.

Gripen F moves ahead

Saab has performed the first metal cut for the two-seater fighter aircraft Gripen F, marking an important milestone in the programme. Gripen F is under development for the Brazilian Air Force (FAB) and shares the same design and features as Gripen E, but with seat, displays and controls for a second crew member. Gripen F has both a training mode for tuition of one crew member and a mode whereby the two crew members can share the workload with different display settings. The first part was manufactured recently at Saab's facilities in Linköping and is for the air duct section, just behind the cockpit of the aircraft.

"This milestone is important for the Gripen project because it demonstrates that the development phase is proceeding properly. This signals the beginning of the production of the two-seater aircraft, Gripen F, which is much anticipated by the Brazilian Air Force," stated Colonel Renato Leite, head of the Monitoring and Control Group (GAC-Saab) at the Brazilian Air Force.

The joint industrial programme on Gripen F is between Saab and the Brazilian partner companies Embraer, AEL Sistemas, Akaer and Atech. Currently, approximately 400 engineers are working with the development of Gripen F, mainly at Gripen Design and Development Network (GDDN) at the Embraer plant in Gavião Peixoto, São Paulo State, Brazil. Manufacturing will take place both in Sweden and in Brazil.

"Very effective teamwork among many dedicated people, both in Sweden and in Brazil, paved the way for this milestone on this new version of Gripen. These milestones are special moments due to their rarity and that feels great," stated Jonas Hjelm, head of Saab business area Aeronautics.

Brazil has ordered 28 Gripen E fighters that will be delivered to Brazil starting from 2021 and eight Gripen F fighters, starting from 2023. Gripen F is also being offered by Saab to Finland for their fighter replacement programme.

Saab Firefighting Capabilities

Saab has received an order from MSB, the Swedish Civil Contingencies Agency, regarding Sweden's aerial firefighting capabilities, the contract valid during the years 2020-2023. This is for capability to fight fires with two firefighting aircraft, from 1 April to 30 September, through to 2023. Under the contract there is also an option for two more aircraft, beginning with the 2021 fire season. This resource will be available for Sweden and for EU. Saab has during a period of one year, established aerial firefighting capabilities, using the Air Tractor AT-802 F firefighting aircraft, with the associated pilot and technician skills, as well as the specific permits for their operation.

First GlobalEye delivered

Saab has delivered the first GlobalEye Swing Role Surveillance System aircraft to the United Arab Emirates on 29 April 2020. The United Arab Emirates has ordered three GlobalEye aircraft, with the initial contract signed in late 2015. In November 2019 the country also announced its intention to complete a contract amendment for the purchase of an additional two systems.

"The delivery of the first GlobalEye is a major milestone for Saab, but also an important step in the history of airborne early warning and control. We have set a new standard for the market and I am proud to say that we have delivered the most advanced airborne surveillance solution in the world to the United Arab Emirates", stated Micael Johansson, President and CEO of Saab.

GlobalEye is Saab's new airborne early warning and control solution, and provides air, maritime and ground surveillance in a single solution. GlobalEye combines Saab's new Erieye Extended Range Radar and a range of additional advanced sensors with the ultra-long range Global 6000 aircraft from Bombardier.

Iran's Weapons of Deterrence

The US and Iran last clashed with each other in a major incident in 1988 when the US Navy initiated an one day strike operation against the Iranian Navy. The situation has further worsened ever since Major General Qasem Soleimani, Commander of Quds Force, IRGC was recently killed by a US drone strike just outside Baghdad International Airport. In April 2020, the US President Donald Trump tweeted that he had instructed the US Navy to "shoot down and destroy any and all Iranian gunboats" that harass US ships.

Earlier in 2019 during a speech, the President of Iran commented, "War with Iran is the mother of all wars". If Iran does get into a conflict, here are some of the weapons an adversary must watch out for:

Ghadr-110 ballistic missile: The Ghadr-110 is an improved version of the Shahab-3A missile. It is believed to have a liquid fuel first stage and a solid fuel second stage, which allows it to have a range of 1500 km and according to some sources it can reach up to 2000 km. When in 2015, the missile was tested, it was seen by West as a violation of UN resolution.

Sejjil 3: If Ghadr-110 is seen as a threat against American interests in the region, Sejjil 3 is rumoured to be even more potent. It is reported to have three stages, a maximum range of 4000 km.

Fateh-110: A 300 km-range guided missile Fateh-110 is road mobile single stage solid fueled surface to surface missile. It is developed from Zelzal-2 unguided artillery. The weapon has been exported to Syria and Iranian allies. They are used extensively in the Syrian Civil War both by the Syrian Government and Iran›s regional proxies.

A modified version of it, Zolfaghar, which can have a range of 700 km itself has been used by Iran against Daesh in 2017.

Khalij-e-Fars: Khalij-e-Fars is an anti-ship quasi ballistic missile with a range of 300 km. It has been developed from the road mobile Fateh 110 missile which itself a guided modified version of Zelzal long range rocket artillery. This system can be a"game-changer" if used

Ghadir Class submarine

against US aircraft carriers and such a comment came from but none other than Uzi Rubin, the father of *Arrow* missile defence system programme of Israel.

Ra'ad: is Iranian reverse engineered and upgraded anti-ship missile based on China's Silkworm. Silkworm itself based on Soviet origin P-15 Termit. Iran used Silkworm extensively during the last phases of Iraq-Iran War. After China stoped supplying Iran with Silkworm, indigenous development on that missile started and ultimately resulted the Ra'ad. It is reported to have a range of more than 300 km.

Ghadir-Class Submarines: A littoral water submarine, displacement of just 120 tonnes but can still possess danger against enemy naval movement. Ghadir's which are designed to rest at shallow bottom of sea, strike only when the enemy is close and then sail away are definitely a big danger. They are equipped with Valfajr torpedos but their biggest power is the capability to launch *Jask 2*, a new Submarine-Launched Cruise Missile through its 533 mm torpedo tube! Iran Navy supposedly has 23 of such.

Mines: are big threat for shipping in the area. In 1988, when US Navy guided missile frigate USS *Samuel B. Roberts* was stuck by an Iranian mine in the Persian Gulf, US launched operation *Praying Mantis*. Use of mines to harass shipping in the area is reported even in recent times. If Iran starts mining the Persian Gulf, it can trigger retaliation from not only just US but other Arab allies of US too. And no doubt, it will effectively stop commercial shipping in the region.

Ra'ad 85: It is a suicide drone designed to be operated in an electronic warfare environment. It is capable of carrying a variety of warheads to fit the mission profile.

Kamikaze Boats: It is feared that during conflict, Iran may use suicide attacks on US warships with swarming tactics. Iran does have a huge numbers of high speed boats, some of which can travel at speeds "more than 100 kmph". Such boats are equipped with various weapons, while these can be enough to block commercial shipping in the area, Iran can mount suicide attacks against enemy military vehicles and for that they need not to match levels of enemy technology.

IRGCN speed boats

Ghadir Class submarines

Fateh-110

These are some of the major weapons in Iranian inventory; all of these may not necessarily be technologically advanced but can wreak chaos, destruction and economic disturbance to the region which will have a long term effect around the globe.

Sankalan Chattopadhyay
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(Images from the internet)

Artémis all the way!

Developed as a fibre-optic wire-guided acoustic homing heavy-weight torpedo designed to neutralise enemy ships and submarines for *Marine Nationale* (French Navy), the Naval Group (former DCNS) F21 Artémis Torpedo programme is projected to replace the existing F17 torpedo with a new generation more agile, faster, smarter and more operational-performance torpedo. As the only new heavy torpedo development in the world, the characteristics of F21 are significantly superior to all other heavy torpedoes currently in service. With an exceptional range and speed, the F21 torpedo is planned to evolve especially in the very noisy and very dense coastal/littoral areas in maritime traffic. Equipped with a complete 'sonar suite' and an advanced mission system both with extremely high computing power allowing real-time combined complex signal and data processing, the F21 torpedo maintains a clear tactical picture even in the most confined coastal areas and against the most sophisticated of torpedo defence systems. Whatever the operational sequence (search/pursuit/attack), the F21 benefits from a high level of discrimination, identification, Acoustic Counter-Counter-Measures (ACCM) and homing.

The contract includes the development and delivery of about one hundred F21 torpedoes and their integration into French submarines (all six *Barracuda*-Class nuclear powered attack submarines/SSN, some of the *Rubis*-Class SSN, all four *Le Triomphant*-Class nuclear powered ballistic missile submarines/SSBN and the future 3rd generation SSBNs or SNLE3G). It has also been selected for the Brazilian Navy, and proposed for Indian Navy *Scorpène/Kalvari*-Class diesel-electric hunter-killer submarines (SSK).

Initially the F21 was proposed to be a development version of the Italian Black Shark torpedo to be built by a joint venture between DCNS, Thales and WASS. However Naval Group developed the F21 Artemis with Thales and Atlas Elektronik. Still, similarities with the Black Shark include an electric motor driven by an aluminium silver-oxide (AgO-Al) battery. The new generation of silver oxide-aluminium (AgO-Al) sea-water primary battery use dissolved sodium dioxide powder as electrolyte and incorporate a new electronic closed loop electrolyte circulation system. The battery delivers power and energy independently of the depth. In comparison with silver-zinc and other technologies, AgO-Al energy density is unrivalled. It ensures both maximum speed beyond 50 knots (93km/h) and endurance of around 1 hour without compromising safety. The AgO-Al primary battery electrolyte only starts once sea water enters the battery section, which is impossible as long as the torpedo is in the submarine's tube, preventing any unexpected electrolyte triggering on board. In addition, the F21 features a B2211D insensitive explosive warhead and a fully electronic fuse which fulfills not only Insensitive Munition (IM) STANAG 4439 and 4187 standards but also the numerous additional French Navy requirements for SSN and SSBN weapon integration. This results in IM signature being validated at torpedo level by the French assignment authority. Launched in swim-out mode, the F21 sports a range of 57 km and can attain a maximum depth of 600 m.

The advanced sonar and mission system associated with unmatched vehicle capability such as endurance, engagement distance, minimum and maximum speed, silent electric propulsion, wake homing and fibre-optic wire guidance significantly widen the F21 operational employment in times of both war and crisis. The 250 kg warhead, which is detonated either on impact or on acoustic triggering, makes the F21 capable of destroying any submarine or any surface vessel including those with unconventional hulls.

MIGAL fire control system serves as the interface between the torpedo and the submarine's combat information centre. The MIGAL's prime function is to control the torpedo firing sequence for combat and training launchings. The MIGAL presets, checks, launches and wire-guides the F21 and other available torpedoes, one at a time or in salvoes (up to 4 HWT on four targets).

The user friendly Man-Machine Interface is available either in stand-alone mode or through the combat management system. The MIGAL is compatible with any heavyweight torpedo and can be installed on board any submarine or surface vessel. A navy can thus deploy different types of torpedoes from the same platform which in turn helps it to switch seamlessly from one torpedo type to another. Today more than 40 MIGAL systems equip six navies.

Sayan Majumdar

Final Block II Super Hornet, USN awaits Block III

Since 2005, Boeing F/A-18 Super Hornet Block II aircraft have been rolling off Boeing's production line and serving as the US Navy's multi-mission capable workhorse. The service took delivery of the final Block II Super Hornet, completing a production run of 322 one-seater F/A-18Es and 286 two-seat F/A-18Fs, on 17 April 2020.

"Aircraft E322 will leave Boeing's production line and head straight to Strike Fighter Squadron (VFA) 34 based in [Naval Air Station] Oceana," explained Cmdr. Tyler Tennille, of Defense Contract Management Agency (DCMA), who oversees Acceptance Testing.

"When the Super Hornets first came online, they were a game changer," he explained, pointing to the Block II's Active Electronically Scanned Array (AESA) radar as well as larger displays, upgraded sensors and avionics, and increased range and capability to employ an arsenal of precision weapons that delivered advanced lethality and mission flexibility for the service.

The robust airframe is built with an open mission systems architecture, which has enabled easy integration of new weapons and technologies. The Block II Super Hornet serves as the Navy's front line combat aircraft, fully capable across the full mission spectrum which includes air superiority, fighter escort, reconnaissance, aerial refueling, close air support, air defense suppression, and day/night precision strike.

"This aircraft has stood strong as the backbone of the Navy's carrier air wing, and has proven itself repeatedly during numerous operations where it has been the preeminent platform performing multiple missions, sometimes rapidly reconfiguring on the fly."

Even though it is substantially larger – some 7,000 pounds heavier with a 50 percent higher range, the Super Hornet has fewer parts and lower maintenance demands than its predecessor, the Hornet.

"Delivery of this last production Block II Super Hornet is hardly the end of an era, but rather a stepping stone along the path to continuously evolving our platforms to meet the Navy's ever-evolving needs," stated Capt. Jason Denney, Programme Manager of the F/A-18 and EA-18 Programme Office (PMA-265). "Block III delivery is just steps behind and the production lines won't miss a beat, with the first two US Navy Block III test jets delivering soon, followed by delivery of 24 E/F aircraft over the next year for our international customer, Kuwait," Denney said. Following delivery of these aircraft, Tennille said he expects the transition from Block IIs to Block IIIs "to be seamless."

The proven capabilities and successes of the Block II programme were leveraged by the Navy in awarding a multi-year procurement contract for Block III Super Hornets to Boeing in March 2019, totaling approximately $4 billion. The Navy will procure 72 Block III Super Hornet aircraft between fiscal years 2019 and 2021, while realising more efficient production rates and providing the supporting industrial base with stability and advantages in production and spares planning.

Boeing is expected to deliver the Block III jets to the Navy by late spring, when subsequent testing will commence at both NAS Patuxent River and Naval Air Weapons System (NAWS) China Lake. This latest version of the Super Hornet includes an advanced cockpit system; advanced network infrastructure; reduced radar cross-section and a 10,000-flight hour lifespan.

"Though we've done tremendous work to meet readiness requirements, we know continual forward momentum is needed to sustain that readiness while maintaining our tactical advantage to be more lethal and survivable than our potential adversaries," stated Denney. "The solid partnership with Boeing for the Block III production and modification programmes ensures the Super Hornet will remain not only relevant, but ready to fight in today's dynamic global environment and well into the future."

COVID-19 Impact on Airport Operations


(photo: Business Insider)

Post COVID-19, the "COVID-19 Impact on Airport Operations Market by Technology (Passenger Screening, Baggage Scanners, Smart Tag & RFID, E-gate & E-Kiosk, 5G infrastructure, Cybersecurity Solutions and Ground Support Equipment) and Region - Global Forecast to 2025" is estimated to grow from $ 8.5 billion in 2020 and projected to reach $ 14.5 billion by 2025, at a CAGR of 11.0%. The projection for 2025 is estimated to be lower than pre-COVID-19 estimates.

The rise in demand for air cargo activity is resulting in many airline operators converting their passenger aircraft into cargo aircraft with an aim to get new revenue sources and ensure company sustainability. This is expected to help airport operators generate revenue from aeronautical charges, leading to an increase in cash liquidity. A major factor that is driving growth of the airport operation market is the increasing demand for smart passenger screening and management systems across the globe.

The passenger screening segment is expected to hold a significant share in the airport operation market in 2020, expected to grow at a slow pace from Q2 2020 to Q1 2021. It is likely to increase from Q2 2020, post-COVID-19, due to a rise in the adoption of thermal scanners at airports.

Thermal imaging equipment manufacturers are witnessing a spike in demand for scanners from airports, railway stations, and public areas looking for fever screening systems. This demand can be attributed to the effectiveness of thermal scanner devices during the SARS and H1N1 crises. Not only airports but also airlines are procuring thermal imaging scanners to screen their passenger, pilots, and staff.

in the number of passengers and the cancellation of flights have led to reduced revenues from airport charges such as landing & parking charges paid by airlines and passenger service & security charges paid by passengers. While aeronautical revenues are drying up, the cost base for airport operations remains unchanged as airports can neither close nor relocate their terminals during the outbreak.

FLIR Systems (US), Honeywell (US), SITA (Switzerland), Collins Aerospace (US), Siemens AG (Germany), Fluke Corporation


(photo: BBC)

The Asia Pacific region holds largest market share in the aircraft operation technologies industry. The ACI World Airport Traffic Forecasts 2019–2040 predicts $12.4 billion in revenue for the first quarter of 2020 in the Asia Pacific region under normal conditions. The impact of COVID-19 is projected to lead to a revenue loss of $3 billion. The shortfall

(US), Thales Group (France) Daifuku Co., Ltd. (Japan), Amadeus IT Group (Spain), are some of the leading players operating in the airport operations market. These players have adopted growth strategies such as new product developments, contracts, partnerships, agreements, collaborations, and acquisitions to expand their presence in the market further.


(photo: Multibriefs)

Grim Covid-19 Impact on Asia-Pacific Aviation

The latest estimates from the International Air Transport Association (IATA) indicate worsening of the country-wise impact from the COVID-19 crisis in the Asia-Pacific region.

Early on 14 April 2020, IATA released updated analysis showing that the COVID-19 crisis will see global airline passenger revenues drop by $314 billion in 2020, a 55% decline compared to 2019. Airlines in Asia Pacific will see the largest revenue drop of $113 billion in 2020 compared to 2019 ($88 billion in an early estimate), and a 50% fall in passenger demand in 2020 compared to

2019 (-37% in 24 March estimate). These estimates are based on a scenario of severe travel restrictions lasting for three months, with a gradual lifting of restrictions in domestic markets, followed by regional and intercontinental.

"The situation is deteriorating. Airlines are in survival mode. They face a liquidity crisis with a $61 billion cash burn in the second quarter. We have seen the first airline casualty in the region. There will be more casualties if governments do not step in urgently to ensure airlines have sufficient cash flow to tide them over this period," stated Conrad Clifford, IATA's Regional Vice President, Asia-Pacific. He identified India, Indonesia, Japan, Malaysia, the Philippines, Republic of Korea, Sri Lanka and Thailand as priority countries that need to take action.

"Providing support for airlines has a broader economic implication. Jobs across many sectors will be impacted if airlines do not survive the COVID-19 crisis. Every airline job supports another 24 in the travel and tourism value chain. In Asia-Pacific, 11.2 million jobs are at risk, including those that are dependent on the aviation industry, such as travel and tourism," he further stated. "Airlines continue to perform an important role currently with the transport of essential goods, including medical supplies, and the repatriation of thousands of people stranded around the world by travel restrictions. And after the COVID-19 pandemic is contained, governments will need airlines to support the economic recovery, connect manufacturing hubs and support tourism. That's why they need to act now – and urgently - before it is too late."

(source: IATA, photos: GMR)

The Covid-19 effect

25 million jobs at risk with airline shutdowns

The International Air Transport Association has released new analysis showing that some 25 million jobs are at risk of disappearing with plummeting demand for air travel amid the COVID-19 crisis.

Globally, the livelihoods of some 65.5 million people are dependent on the aviation industry, including sectors such as travel and tourism. Among these are 2.7 million airlines jobs. In a scenario of severe travel restrictions lasting for three months, IATA research calculates that 25 million jobs in aviation and related sectors are endangered across the world:

- 11.2 million jobs in Asia-Pacific
- 5.6 million jobs in Europe
- 2.9 million jobs in Latin America
- 2.0 million jobs in North America
- 2.0 million jobs in Africa
- 0.9 million jobs in the Middle East

In the same scenario, airlines are expected to see full year passenger revenues fall by $252 billion (-44%) in 2020 compared to 2019. The second quarter is the most critical with demand falling 70% at its worst point, and airlines burning through $61 billion in cash.

Airlines are calling on governments to provide immediate financial aid to help airlines to remain viable businesses able to lead the recovery when the pandemic is contained. Specifically, IATA calls for direct financial support; oans, loan guarantees and support for the corporate bond market and Tax relief. "There are no words to adequately describe the devastating impact of COVID-19 on the airline industry. And the economic pain will be shared by 25 million people who work in jobs dependent upon airlines. Airlines must be viable businesses so that they can lead the recovery when the pandemic is contained. A lifeline to the airlines now is critical," said Alexandre de Juniac, IATA's Director General and CEO.

Looking Ahead: Re-booting the Industry

Alongside vital financial relief, the industry will also need careful planning and coordination to ensure that airlines are ready when the pandemic is contained. "We have never shuttered the industry on this scale before. Consequently, we have no experience in starting it up. It will be complicated. At the practical level, we will need contingencies for licenses and certifications that have expired. We will have to adapt operations and processes to avoid reinfections via imported cases. And we must find a predictable and efficient approach to managing travel restrictions which need to be lifted before we can get back to work. These are just some of the major tasks that are ahead of us. And to be successful, industry and government must be aligned and working together," stated Alexandre de Juniac.

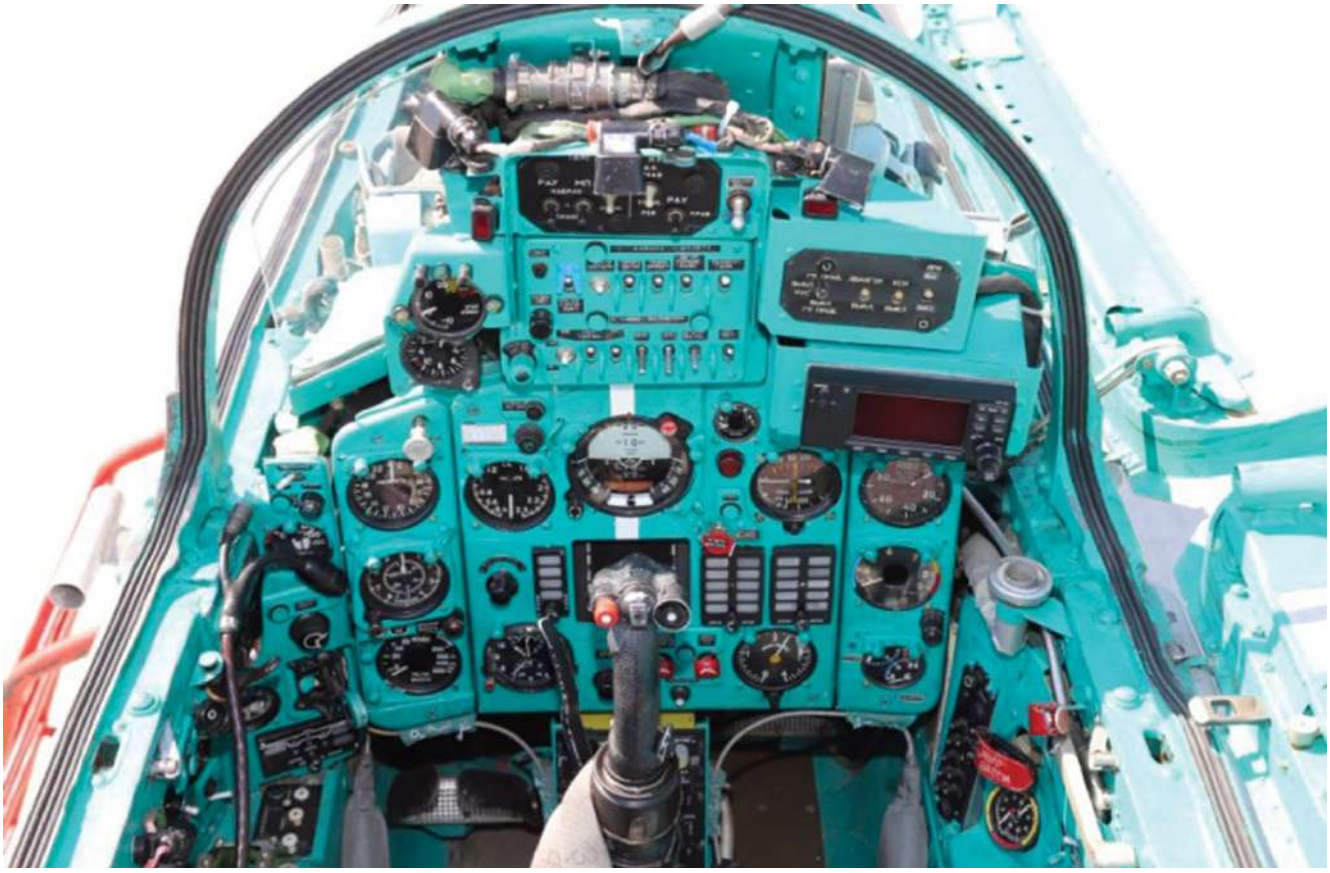
IATA is scoping a comprehensive approach to re-booting the industry when governments and public health authorities allow. A multi-stakeholder approach will be essential. One initial step is a series of virtual meetings—or summits—on a regional basis, bringing together governments and industry stakeholders. The main objectives will be the understanding of what is needed to re-open closed borders and agreeing solutions that can be operationalised and scaled efficiently

"We are not expecting to re-start the same industry that we closed a few weeks ago. Airlines will still connect the world. And we will do that through a variety of business models. But the industry processes will need to adapt. We must get on with this work quickly. We don't want to repeat the mistakes made after 9.11 when many new processes were imposed in an uncoordinated way. We ended up with a mess of measures that we are still sorting out today. The 25 million people whose jobs are at risk by this crisis will depend on an efficient re-start of the industry," he further stated.

The MiG-21 in Croatian service

Within the NATO community, there is one air arm still operating the MiG-21, the Hrvatsko Ratno Zrakoplovstvo or Croatian Air Force which fly daily missions with the venerable, Russian-origin fighter, protecting the south-eastern flank of NATO territory. This classic fighter is still going strong, as Patrick Dirksen and Frank Mink witnessed during a recent visit to Zagreb-Pleso airbase.

In 2012, the two Croatian MiG-21 units, 21 Squadron from Pleso and 22 Squadron from Pula, merged to form the '*Eskadrila Borbenih Aviona*' (EBA) or simply, the Fighter Squadron. To preserve their history, squadron badge of the new unit is a combination of the helmet and shield from 21 Squadron and the '*Boskarin*' or flying bull of 22 Squadron.



The EBA operates from Baza 91, as Pleso is known by the military, with eight MiG-21bisD single seaters in their inventory plus four MiG-21UMD twin-seaters. The 'D' designation stands for '*Dogradnja*' or 'upgraded', which was added after the aircraft was updated by Aerostar in 2014. Apart from regular overhaul, this included a life span extension programme. The navigation equipment has also been updated with a Garmin GPS 400 set, VOR NAV and ILS system, the radio system replaced and a second radio installed.

The MiG-21 is a robust and reliable aircraft that is adored by pilots of the EBA ! They agree that this may be hard to fly in certain flight regimes, but when one respects limits of the aircraft, "it's an impressive aircraft". Croatian Air Force pilots with "satisfactory experience" on other aircraft types within the Air Force can apply for selection to fly the MiG-21. Once they have passed the selection process, the pilot goes through type conversion at Pleso, which is carried out at this base since Pula was closed.

The conversion training is followed by basic fighter manoeuvres (BFM) training, which includes live firing. The MiG-21 has a GSh-23 (23mm) double-barrel cannon with 250 rounds and can also be armed with up to four AA-8 Atol rockets, or R-60M missiles. Some single seat MiG-21s are locally converted to carry an MKM-1 container, which holds a target towed behind the aircraft. When used for air-to-air live firing, an RP-3 target indicator is extended from the container for 1200 metres. The Croatian-built system is also used for AAA practice, in which case, an RP-1 target indicator is towed using a 600m line. The indicator creates a magnetic field and registers all rounds coming close or hitting it, as they disturb this magnetic field. A real time connection with the ground station enables the pilot to 'hear' his score almost immediately, giving him time to adjust his aim if necessary for the next run.

When live firing training is done with the rockets, another MiG-21 drops a parachute flare, which then acts as target. Alternatively two MiG-21s fly in formation, one fires a flare decoy and then moves away, so the other MiG can fire on the decoy. It takes special training to be allowed to fly a target towing aircraft or fire the decoy!

The squadron operates at Pleso from a hangar which has history, having been used by the Royal Air Force in 1945. This hangar was earlier erected in Africa during World War II before being disassembled and rebuilt in Zagreb. Next to this hangar, which is used for daily flying operations and maintenance, a brand new, state-of-the-art QRA facility was established in 2017. This air-conditioned hangar holds three aircraft on 15 minutes alert, following NATO requirements for 'RS' or Readiness State 15. In practice, however, less than 10 minutes is more than enough to have two aircraft up in the air, one of the advantages of these relatively old and therefore less complicated MiG-21s.

In the crew building next to the QRA hangar, two pilots and seven technicians are on 24/7 alert, with their shift lasting 7 days. In practice, flying is normally only done between sunrise and sunset, because the pilots depend on visual identification. At least once a week, a practice scramble is performed. The QRA hangar has large screens in front of the aircraft projecting relevant data for an interception (course, location, speed, altitude, type of aircraft if known), so the pilots can imbibe this while starting up. A traffic light is installed in the hangar to indicate 'go' or 'abort' in case radio communication is lost.

Most interceptions involve unidentified airliners and private aircraft because of a loss of contact or because they are 'lost in space and time'. During our visit, a training interception mission was flown. A PC-9 from Zadar-Zemunik acted as the slow flying aircraft, operating at flight level 250. This type of aircraft is difficult to

Back in 2005, a MiG-21UMD with serial 165 was chosen to be painted in an attractive colour scheme, for the 10th anniversary of 'Operacija Oluja' or 'Operation Storm', which marked end of the *Homeland War* for the Croats on 5 August 1995. This fighter was also presented to the public on this date during a military fly past to commemorate Operation Storm. The now world-famous red-and-white chequered aircraft is nicknamed 'Kockika' or 'Little Cube', and represents the Croatian spirit and uniqueness.

intercept by jet fighters because of the very low speed (less than 400 km/h indicated airspeed), so the Croatian Air Force have developed special procedures for this type of interception which include different patterns for aircraft flying above and below 6000 m. In this case, Major Perio and Major Turk, flying as Knight 04, successfully intercepted the PC-9 a couple of times, proving that the MiG-21 might be old but is still very much capable of doing its job of protecting the Croatian airspace!

All text and photos: Patrick Dirksen & Frank Mink of Tristar Aviation

The authors would like to thank Colonel Ćorić for the unlimited hospitality, leading to this article.

The Dutch 'Lifeliners'

As reported by Dutch hospital trauma centres over the last few years, their four Helicopter Emergency Medical Service (HEMS) helicopters have made some 9700 emergency calls annually, providing urgent assistance. Considering the continuous annual growth trend, the Service is soon expected to reach the 10K emergency call milestone.

The *Dutch Trauma Helicopters*, also known as 'Lifeliners' have recently renewed their contract with the operator ANWB-Medical Air Assistance (part of the Royal Dutch Touring Club) for another six years with an additional extended option. The first two H-135s have been delivered and another two are expected to join the team this year (2020). The requirement for medical support by air in The Netherlands has been growing multiple fold after the arrival of an air ambulance in 2016 and the country is now running various programmes to include drones into the service.

ANWB-MAA operates four Lifeliner HEMS helicopters from stations in Amsterdam VU hospital (Lifeliner1), Rotterdam Airport (Lifeliner2), Volkel Air Force Base (Lifeliner3) and Groningen Airport (Lifeliner4) and has two helicopters on reserve at ANWB-MAA HQ at Lelystad Airport. The reserve helicopters are used for pilot training and when an operational helicopter has to receive periodical maintenance. As Petra van Saaze, Managing Director of ANWB-MAA explained, the company is responsible for the availability of the helicopter and its pilots for each of the four stations, throughout the year on a 24/7 bases.

The hospital trauma centres are responsible for availability of other crew, a nurse and a trauma physician. The nurse, having received additional training to become HEMS Crew Member (HCM), assists the pilot in the cockpit during flight with navigation and safety procedures. For night time operations, the pilot and HCM are trained to use Night Vision Goggles (NVG). The physician is in the cabin and in contact with the emergency room being informed on the urgency and prepares equipment needed. In critical situations the physician joins the car ambulance, where the medics have more space compared to the helicopter, to give additional treatment when the patient's condition requires as much.

Ms Petra van Saaze explained that the final choice of the HEMS helicopter was an outcome of the customer's required tender specifications, which appeared to be fulfilled at best by the H-135.

The Organisation

To ensure that the *Lifeliners* are in 24/7 operation mode, more than 30 pilots are with the ANWB-MAA. Being based in The Netherlands, the company complies with European Aviation Safety Agency (EASA) demands where rules for single pilot Commercial Air Transport (CAT) HEMS flights apply to the organisation. Petra van Saaze stated that the helicopter pilots also go through a special *Crew Resource Management* (CRM) training programme, developed for medical helicopter crews, with an annual repetition course.

Because of the composite helicopter crew, all with different backgrounds, the ANWB-MAA observes this as a very important and essential training in order to maintain a high safety level during HEMS operations and avoiding misinterpretation in communication.

The ANWB-MAA, which owns the Lifeliner helicopters, are paid for their services by the trauma centres for whom they operate. The main hospital trauma centres (Amsterdam, Rotterdam, Nijmegen and Groningen) are funded for this task by the Dutch Ministry of Health, Welfare and Sports.

Ambulance services

Next to the HEMS flights, the ANWB-MAA also operates an H-145 ambulance helicopter service for the northern Dutch Wadden islands. Without hospital presence, the Ambulance Air Team (AAT) transports non-critical patients from the islands to mainland hospitals for further medical treatment. Operating under call sign *Medic01*, about 700 medical support flights are flown annually.

As Martin ter Haar, Manager of the Ambulance Helicopter unit, explained, the land-based location of the AAT at Royal Netherlands Air Force Base Leeuwarden, is ideal as all the islands can be reached within 15 minutes flight time from there. A second H-145 is kept on reserve to guarantee the ambulance helicopter service. The H-145 crew is trained and certified for NVG operations as their ambulance service is also on a 24/7 base.

Now with the outbreak of COVID-19 virus, the reserve ambulance H-145 is being operated to fly Intensive Care (IC) patients to other hospitals and taking of IC pressure of hospitals in highly affected regions.

Story and photos by Peter ten Berg

IADE 2020 in Tunisia

The first of more to come

The Republic of Tunisia (al-Jumhūrīyah at-Tūnisīyah République Tunisienne) is located in the Maghreb region of North Africa, Cape Angela, being the northernmost point on the African continent, bordered by Algeria to the west and southwest, Libya to the southeast, and the Mediterranean Sea to the north and east. Its Air Force (Al Quwwat al-Jawwiya al-Jamahiriyah At›Tunisia) flies a mixture of aircraft types and was prominent during the International Aerospace & Defence Exhibition (IADE) which took place at Djerba airport in Tunisa, 4-8 March 2020.

This first International Aerospace & Defence Exhibition was organised in Djerba, at the centre of Gulf of Gabès. The climate in March is mild with warm and sunny weather and the tourist attraction of the island assures a large number of luxury beach hotels to accommodate visitors. Also the Djerba airport has all facilities and space needed for hosting an airshow in the African continent.

The show was inaugurated by the President of the Republic and Supreme Commander of Armed Forces Kais Saied, the opening ceremony attended by official delegations of 40 countries. On the first three days, IADE was exclusively for trade visitors while on the last two days, open to the general public.

USAF KC-135 from Mildenhall alongside C-130J from Ramstein on static display at IADE 2020

The US Air Force was by far the largest participant at the show, which explains its presence reflecting the geopolitical situation in this country. According to the official Show Catalogue, the US Air Force was to display an impressive range of aircraft including two F-16C Falcons, the KC-135 Stratotanker, C-130J Hercules, P-8 Poseidon, C-17 Globemaster, FA-18E, AH-1Z Cobra and AH-64 Apache. However, the C-17, FA-18E and both attack helicopters were not present but the static show was dominated by the US presence, in every sense of the word.

Also making a geopolitical statement, the Royal Saudi Air Force had a large presence, with their formation aerobatic team flying eight BAe Hawk trainers. These Hawks had flown some 3000km, making refueling halts at Cyprus, Crete (Greece) and Malta, before landing at Djerba, with logistic support by a C-130 Hercules. The brightly green-white coloured aircraft carried out impressive displays every day, the pilots mounting their aircraft in style in front of the visitors and exclusive business chalets. This was clearly the first time for the Tunisian public attending the show to witness such a vibrant and flamboyant display being performed.

The Saudi Hawk display impressed visitors

Turkey was represented with a static display of their Anka-S unmanned aerial vehicle (UAV) developed by Turkish Aerospace Industries (TAI). In January, Tunisia had signed a contract for six Anka-S during the visit to Tunisia of Turkish President Recep Erdogan, including its control centre, at a cost of $80 million.

Further underlining close relations between the two countries, was the presence of two Turkish Air Force F-16Cs of the *Solo Turk* demonstration team. Two C-130B

The Turkish Anka-S unmanned aerial vehicle ordered by Tunisia

Solo Turk F-16C at low level with palm trees in the background

Hercules aircraft were present at the start but flew back to Turkey after the official opening. The F-16Cs of *Solo Turk* remained on static display and were swarmed by the public, before being towed away for their flight displays.

The Tunisian Air Force participation was subdued and it was explained that being in public view for the first time, there were some organisational issues. On static display was a brand new Tunisian National Guard Bell-429 GlobalRanger helicopter, the type used for monitoring the coastline, road traffic management, providing emergency response and disaster management including evacuation and fight against terrorism.

Every morning at opening of the show, a Tunisian Bell OH-58D Kiowa would fly in from Gabès-Matmata Air Force base and land for display at the static line. This type has been in service with the Tunisian Air Force since 2016 and although 24 were ordered, only some 18 are in current service.

OH-58D of the Tunisian Air Force

Shortly thereafter, a C-130J would arrive from Bizerte Air Force base, making these two Tunisian Air Force aircraft as lone participants at their own Show. However, during the official opening and during the public airshow, there was a parachute drop display from a UH-60M Blackhawk helicopter.

Still, by far the most impressive and rare sight during the flying display was the flyby a lone F-5F Tiger and two L-59T Super Albatros, which constitute backbone of the Air Force (*photo at masthead)*. For this Show, two F-5Fs had been given a special paint job, with the Tunisian bright red and white colours on belly of the aircraft. The F-5Fs had been relocated from Bizerte Air Force base to Sfax Air Force base, which is close by, some 100 km from Djerba island which also houses the Aero L-59T trainers.

Although the F-5 Tiger is operated by many countries, the desert camouflage makes the Tunisian variant more exotic

The Tunisian Air Forces operates two C-130J-30 Hercules with No. 21 Squadron based at Bizerte-Sidi Ahmed, alongside the Let-410 UVP-200 (below)

while the L-59 Super Albatros aircraft is only operated by the Egypt and Tunisian Air Forces making this a rather rare sight.

The Czech Aero L-59T Super Albatross has been developed from the earlier L-39 Albatros, featuring a strengthened fuselage, longer nose, a updated cockpit, advanced avionics (including head-up display), and a more powerful engine. Originally designed as a trainer aircraft, the L-59T can be armed and has been used by Tunisian Air Forces for counter-insurgency operations.

According to Show Director Gaël Pineau, "the sustainability of the show is assured thanks to the official support. This would thus be an important opportunity for Tunisia and North Africa to highlight the potential of this Continent in the world of aeronautics and defence."

The organisers have announced dates for the next Show, which will be from 9 to 14 March 2022.

Text and photos by: Johan Franken, Frank van der Avoort and Eric Schel

Double (Dutch) Anniversary !

In April 2020, the Netherlands Air Force's No.298 Squadron, flying the Boeing CH-47D 'Chinook' helicopter, celebrated twin anniversaries, its motto being '*Nihil Nobis Nimium*' (Nothing is too much for us). This was the 75th anniversary year of No. 298 squadron and the 25th of CH-47 Chinook helicopters in service with the Dutch Air Force.

To commemorate both anniversaries, a Chinook (tail number D-666) was painted on both sides, one with the squadron screst ('Libelle', or 'Dragonfly') and, on the other side, 'Grizzly' the (un)official nickname of the squadron.

Owing to the Corona virus prevalent in Europe, a big event was cancelled and instead replaced by a flyby over the Netherlands, with photographers invited to cover the Chinook landing at various landing sites.

Taking off from their homebase Gilze-Rijen, the first landing was at the GLV5 low flying training ground. Two passses plus two landings and take offs were performed to display both sides of the Chinook to photographers. Later that day, other Dutch training grounds and airbases were visited to show-off this specially painted helicopter.

History of No.298 Squadron

No.298 Squadron was formed on 1 March 1950, as No.6 *Artillerie Verkennings Afdeling* (ARVA) (Artillery Reconnaissance Division) at Ypenburg Air Base, the first unit so established as part of the Light Aircraft Group (GPLV). The number of personnel and available accommodation was very limited to start with. The unit operated a number of Auster light reconnaissance aircraft, then moved to Soesterberg Air Base, then to Deelen Air Base in 1951. The Auster remained in service until 1953, the aircraft replaced by the Piper Cub in 1952, this aircraft also used for artillery reconnaissance and staff transport, the Piper Cubs remaining in active service until 1968.

In addition to the Piper Cub, the squadron was also equipped with the Hiller R23 Raven in 1955, the first helicopter type in service with the Dutch Air Force. Two years later the squadron moved again to Ypenburg Air Base, and received its first Allouette II in 1959, for the SAR task. The SAR flight then moved to Leeuwarden Air Base and was later renumbered as No 303 SAR Squadron, while No.298 Squadron moved back to Deelen Air Base, after Ypenburg was closed following budget cuts. The Allouette II was replaced by the Allouette III in 1964 and No.298 Squadron moved for the last time in 1966 to Soesterberg Air Base, sole with the Allouette III.

After 30 years, the Allouette III was replaced by the much bigger Boeing CH-47D Chinook in 1995 when the Royal Netherlands Air Force began to follow a new course, the helicopters playing a major role with the Royal Netherlands Air Force. The current Helicopter Group (GPH) now

has the new model, its designation changing to *Tactische Helikopter Groep Koninklijke Luchtmacht* (THG-KLu). No.298 Squadron received 13 Chinook helicopters, the first 7 purchased second hand from Canada, and modified to the CH-47D standard. The following 6 helicopters were newly built by Boeing, No.298 Squadron becoming the heavy transport unit of the THG-KLu.

The main task of No.298 Squadron is to provide air transportation for the 11LMB (11 Airmobile Brigade), the Marine Corps (MARNS) and the Special Operations Forces (KCT).

In addition to the CH-47D, No.298 Squadron now also has a number of CH-47F helicopters which have a distinctive gray colour scheme.

All photos and all text: Joris van Boven and Alex van Noije

Rahul Singh remembers

'The Forgotten War'

The Indian Army in World War II

On 8 May 1945, Nazi Germany surrendered to the Allies, marking the end of World War II in the western theatre. In the East, the War lingered on a little longer but virtually ended with dropping of the devastating Atomic bombs on Hiroshima and Nagasaki. Japan's Emperor Hirohito personally signed the unconditional surrender on 15 August 1945. The 75th anniversary of the end of the War was marked recently by celebrations and aerial flypasts in all countries which were part of the victorious Allied forces, including Russia.

But from India and Pakistan there was a deafening silence. Why? Because New Delhi – and presumably Islamabad as well – feels that this was a "colonial" conflict and therefore not worthy of any kind of official celebration. What utter nonsense and how disrespectful of the armed forces of the Indian sub-continent who fought so gallantly! At the peak of the War, 2.5 million troops from what is now India, Pakistan, Bangladesh and Nepal were part of the British Indian Army, the largest force of volunteers ever assembled in history. They served in major battlefields, from North Africa, to Italy and the Far East. The 5th Indian Division, for instance, fought the Italians in Sudan, then the Germans in Libya, before moving to Iraq to protect the oil fields, was then moved to the Burma and Malaya front, finally going to Indonesia to disarm the Japanese there.

Personnel from the Indian subcontinent received 4,000 gallantry decoration and 31 Victory Crosses, the highest decoration given by the British for valour in action. This is an unsurpassed record of bravery that we should be proud of and not something to be hidden in embarrassment.

In 1962, when I had just graduated from Cambridge University and was 22, an English college friend of mine, Charles Noon, and I decided to go overland by car to Egypt's Port Said, from where I would take a ship to Bombay, and he carry on to Rhodesia, as it was then called, to take up a teaching assignment. Charles had purchased a tiny car, the iconic Morris Mini, for the two-month long journey, which took us through France, Monaco, mainland Italy, Sicily, Tunisia, Libya and then finally Egypt. We did everything on the cheap, staying at youth hostels and with friends, sometimes sleeping in the car, or on the beach.

We traversed many of the War's battlegrounds. In south Italy, in a town called Monte Cassino, an aged lady came up to me, pointing to my turban, jabbering excitedly in Italian. I got hold of a passerby who understood English and asked him what she was saying. He replied that during the War she had seen many soldiers with turbans like mine, which is why she was so excited to see another turbaned man. She wondered if I was also a soldier!

Later, after some research I learnt that a pivotal battle of the War had taken place there, in which 240,000 Allied troops saw action, including the 4th Indian Division (which must have had a lot of Sikhs). It took four major assaults, with bitter fighting, to dislodge the well-entrenched Germans, on top of a hill, where there was a famous monastary (it was left in ruins). The eventual victory paved the way to Rome.

In North Africa, we passed through El Alamein, where two famed adversaries, Erwin Rommel (nicknamed 'The Desert Fox') and Bernard Law ('Monty') Montgomery squared off in an epic encounter. Monty won a decisive victory. In fact, El Alamein and the battle of Stalingrad in Europe broke the back of the Germans. At El Alamein I visited the War Cemetery where 11,886 fallen soldiers from the Commonwealth are commemorated. There were hundreds of Indian names there, emphasising the vital part Indian troops played in that battle. The memory still brings tears to my eyes, almost six decades later.

A maternal uncle of mine, Premindra Singh ('Prem') Bhagat, then a Second Lieutenant in the Corps of Indian Engineers,

Image above: Troops of the 14/13 Frontier Force Rifles, part of the 20th Indian Division during the advance in Burma. (Photograph from collections of the Imperial War Museum*).*

Sherman tanks leading troops of the 17th Indian Division on the advance to Meiktila. (Photograph from collections of the Imperial War Museum*)*

was on a mine-clearing operation, an extremely hazardous task those days with no fancy gadgets, only the delicate poking of the sand with a bayonet to detect where a mine had been planted. His jeep was blown up, killing the other occupants and injuring him. But he carried on continuously for 96 hours. He was one of only two Indian officers ever to win the highly coveted Victoria Cross "for his cold courage", as the citation said. He went on to become a Lieutenant General and should have been made army chief but, so was said, Indira Gandhi feared his immense popularity with the armed forces.

Vital though the role of the Indian army was in the North African theatres it was in the East against the Japanese that it was decisive. After the fall of Singapore, the Japanese troops swept through Malaya and Burma and were knocking on India's doors, with the intention of taking over the whole country (the only part of India they occupied were the Andamans). They were stopped at Kohima. There, on a tennis court and in the surrounding areas, some of the closest and bloodiest fighting of World War II took place. Over 7,000 men on both sides fought and died in just 64 hours. After that the retreating Japanese forces suffered one defeat after another. The worst was at the Second Battle of Sittang River, where the 28th Japanese Army was annihilated. Of an initial force of 20,000 men, only 7,000 survived. The casualties on the British and Indian side? Just 95 men, making it one of the most lopsided victories of the War.

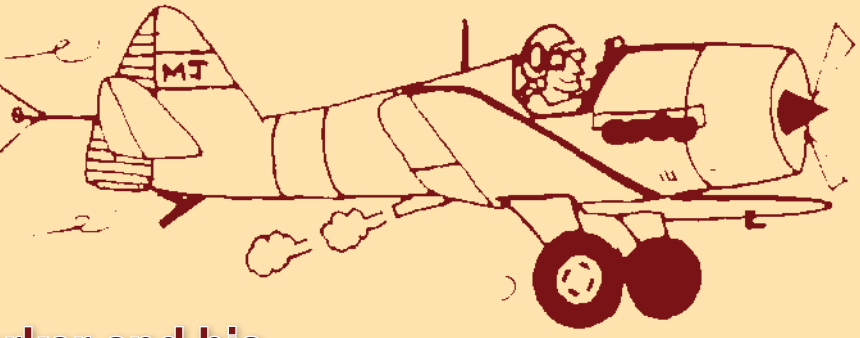
Louis Mountbatten, Supreme Commander of the Allied forces in Burma, had earlier been taunted that though Indians made good soldiers, they weren't capable of leading. He decided to show that they could be outstanding officers as well. He chose three of them: Shankarrao Pandurang Patil Thorat, Lionel Protip ('Bogey') Sen, and Kodendara Subbaya Thimayya (they would go on to become among the most distinguished and respected Generals of Independent India, with Thimayya becoming India's third Army Chief. Mountbatten put them in command of large army formations and they won key battles against the Japanese. Indians made not only top order soldiers but first class commanding officers as well. It is another matter that the Indian Army was largely reduced after the War, it was neglected and allowed to get run down, particularly under the Defence Ministership of Krishna Menon, leading to the 1962 humiliation against the Chinese.

However, the role of the Indian armed forces in World War II had been an outstanding one. It should have been celebrated, not seen as part of an embarrassing "colonial" conflict. Names like Bhagat, Thimayya, Sen, Thorat, along with those that contributed to key victories like El Alamein, Monte Cassino and Kohima, should be etched in words of gold, not covered with a shroud of anonymity, as the Indian government has done.

(Also in *The Tribune*)

Sqn Ldr Arjan Singh with other officers of No.1 Squadron IAF flying Hurricane fighter bombers during the siege of Imphal, 1944 (Image from collection of The Society for Aerospace Studies)

Ancient Aviator Anecdotes



Air Vice Marshal Cecil Parker and his

MEMORIES ENCAPSULATED

Like many of us in our late 80s, I occasionally experience a temporary loss in short-term memory. On the other hand, long-term memory is fairly clear and appears to be preserved in capsules of time-place-event in specified periods. My air force service spanned 35 years (1951-86) during which period I had 19 postings of which four were for less than six months each and one was for a year while on course abroad. Geographically my postings were in J&K (Udhampur), Punjab (Pathankot/Adampur), Haryana (Ambala), Delhi (Palam), Uttar Pradesh (Hindon), Rajasthan (Jodhpur), Gujarat (Jamnagar), Andhra/Telengana (Begumpet/ Hakimpet/ Dundigal), Karnataka (Bengaluru) and Tamil Nadu (Tambaram/Wellington). In the operational role I served at air bases all in the western sector and in the training role at establishments in the southern sector.

Looking back I realise that 80% of my postings were on airfields,15% in class rooms and 5% on staff assignments. The aircraft I flew as captain were the Tiger Moth, Harvard IIB/T6G, Spitfire Mk IX, Tempest IIA, Vampire, Toofani (Ouragan), HT-2, Prentice, Devon, Dakota, Hunter, T-39A (Saberliner), Gnat, Marut, Kiran, Chetak, Iskra, MiG-21 and Krishak. As a co-pilot I flew the F-100F Super Sabre, Hawk, Harrier, Akbar, MiG-23 and the Jaguar. My log book tells me that over 40% of my total flying hours were on one single aircraft type (Hunter) on which I was employed for 10 consecutive years (1962-72) as a flight commander, then as the founding CO&CI of the IAF's first OTU and thereafter as CO of No. 20 Squadron. Thanks to my varied postings though, I was one of the few fighter pilots who had the opportunity to qualify on both twin engined and rotary–wing platforms.

My generation was part of the air force's transition from piston engines to jets, subsonic to supersonic regimes, single engine to twin/multi engined aircraft and fixed wing to swing/rotary wing airborne platforms. Changes in technology, availability of aviation resources and threats shaped our training and tactics. Certainly Indian military air power came of age after the 1965 and 1971 Indo-Pak wars. It is likely that every military aviator has a personal cache of unforgettable moments in the air. My own would undoubtedly include the bale-out from a blazing Tempest in 1952; the landing of a Hunter Mk 56A with three external tanks one of which was a live hang-up napalm bomb in 1970; the recovery to Pathankot after the Hunter gun strike on Peshawar at sunrise on 4 December 1971.

Sixty nine years ago, as a teenager barely out of college, I joined the IAF for one simple reason – I wanted to fly. The air force trained me to become a fighter pilot and, thanks to all those postings and aircraft types, one gradually learned the skills, knowledge and gained the experience needed by the service. It was the acquisition of these professional attributes that contribute to the capsule of happy memories in the cockpit.

Hawker Hunter Mk. 56 of the IAF

GONE – BUT NOT FORGOTTEN

In any profession, one source of information is invariably a more experienced or senior individual. In the air force we interact daily with colleagues, seniors and juniors both in the air and on the ground. This interaction can and should enhance one's own professional or personal skills, knowledge and experience. Topping the list of the many seniors I have learned from, are six air force officers who helped me grow up in the IAF.

In 1951-52, I was a flight cadet and extremely fortunate to have had Navroze Lalkaka as my flying instructor. He loved flying and inculcated this attribute in his pupils while imparting skills and knowledge in the cockpit, classroom or club. It was a great pleasure learning from this patient, talented and dedicated teacher. My guru–shishya relationship with Gp Capt N Lalkaka continued into retirement.

During the same period, Sunil Mukherjee was our CGI (Chief Ground Instructor). A gifted tennis player, my own love for the game brought us together on the tennis court. Off court he was a teacher par excellence of OLQs (Officer Like Qualities) and stressed a great deal on values and ethics. I never worked under him again but we remained in touch and he responded warmly to any advice I sought from him over the years. His late night congratulatory call, from Jalahalli to Pathankot, was the very first I received when my MVC was announced in December 1971. In 2004, I was able to visit an ailing Gp Capt Mukherjee in Kolkata; three weeks later he passed away.

In 1955-57 I was a young (and admittedly somewhat immature) QFI on my first instructional tour at Jodhpur. On one sortie I disregarded a rule and damaged an aircraft. The damage was repaired but I was marched before Pratap Lal the then AOC Training Command. After pronouncing my punishment, he called me in, sat me down with a cup of tea and gave me a talk I have never forgotten. He reminded me of the great cost and trust the air force had invested in me. As the CAS he attended my investiture in Rashtrapati Bhavan in January 1972 and personally walked over to congratulate me. In 1980, I was selected to attend the RCDS course in London but travel sanction for family was not given. I went to see ACM PC Lal, the then Chairman of Air India and he arranged the same for me within my budget. In his memoirs, 'My Years in the IAF', he was kind enough to include my leadership in the counter air strikes during the 1971 Indo-Pak war.

Sham Powar was an instructor when I was a flight cadet and my flight commander in my first squadron (No.7) on Vampires. We came together in Jamnagar in 1966 where he was the Station Commander and I was posted as a wing commander to raise and command the IAF's first OTU on Hunter aircraft. He was not only a great support and help but I learned a great deal on effective leadership from this fine officer and gentleman. Our professional relationship grew into a personal friendship and we spent happy holidays with Gp Capt and Mrs Powar at their farm in Bengaluru and remained in touch till he passed on.

I have had the privilege of flying with some truly gifted pilots. Pete Wilson was certainly one of them. He too was a QFI when I was a pilot trainee, and a pioneer Canberra pilot. In 1968 he took over command of Jamnagar and continued the professional help I received from his predecessor. A man of few words, he led from the front and I learned a great deal of leadership in the air from him. I had the embarrassment of converting him on to Hunter; in a few sorties he was handling the aircraft better than me! He too became a personal friend and our relationship continued in the UK where he had settled and was employed with Scotland Yard and I was attending a course. Air Cmde PM Wilson, Vr C could never hide his nostalgia for the IAF.

As a very effective CAS, successful ambassador and state governor, ACM Idris Latif requires no introduction. Though I had known him from his Wg Cdr days, my first interaction with him was in 1975 when, as a Gp Capt I was posted to command the air base at Hakimpet and had to induct 50 new Polish Iskra trainers. He was then the AOC–in-C Maintenance Command and flew down to spend a day with me to see how he could help as all maintenance and logistics of the aircraft was co-located on my base. As CAS he visited Adampur where I was the AOC in 1978-79. We both retired in Hyderabad where our personal relationship grew to a point where ACM IH Latif made himself 'Idris Bhai' to me. I was honoured and privileged to pay my tribute in the commemorative book on Idris and Bilkees Latif published in 2019.

Photograph by Peter Steinemann


Air Chief Marshal Idris Latif

All six have preceded this writer to the aviator's Valhalla but are remembered with great respect and gratitude.

25 Years Back

From Vayu Aerospace Review Issue III/1995

May of 1995

The merry month of May was, in fact, far from that: blazing hot in the northern Indian sub-continent, temperatures apart. The decade-long stand-off simmering in the Siachin Glacier area exploded again, with some sharp and searing fire flights between the Indian and Pakistani troops deployed along the "world's third pole". Heavy casualties suffered by the assaulting Pak soldiers even as, in the more scenic Kashmir valley, a holy shrine gutted by insurgents even as they faced-off Indian soldiers. There are no real victors in that beautiful but unhappy vale and, international concern notwithstanding, a peaceful solution seems as far away as ever.

C-17 Globemaster III over the 'Hump'

As part of worldwide activities commemorating the end of World War II, the US Department of Defence paid attention to the *China-Burma-India* (CBI) theatre and, in particular, to the sacrifices made by Allied forces, particularly Indian and American, that served together during that campaign. In this context, a US Air Force C-17 Globemaster III with veterans onboard flew over the now famous 'hump', the high mountains at the trijunction of *India-Burma-China* on 28 May, 1995. Earlier, Air Chief Marshal Arjan Singh, former CAS together with a '*Flying Tigers*' veteran laid wreaths at India Gate. Later, the C-17 departed eastwards, first landing at the IAF's Kalaikunda air base, 150 miles from Calcutta, built for the USAAF in 1942-43, and used by B-29s of the XX Bomber Command as also P-51s of the 1stAir Commando. And then, over the 'Hump.'

Prospects for the LTA

The 20-seater Saras-Duet light transport aircraft (LTA) being jointly developed by the Russians and India's National Aerospace Laboratories comes under the Integrated Long Term Programme (ILTP) which involves 78 joint projects in fields that include medicine and space technology. NAL now has a new Centre for Civil Aircraft Design and Development (C-CADD). The new centre is seen as a logical "upgrade" of the Civil Aviation Unit and is intended to give a big thrust to all civil aviation related activities, especially those related to the development of the Saras aircraft.

IAF at Exercise 'Northern Edge'

Five IAF officers, led by Air Marshal Pratap Rao, VCAS and AVM Manjit Singh Sekhon, ACAS (Operations) were at the third and final stage of Exercise *Northern Edge '95* at Alaska in mid-May 1995. This is the very first time the IAF has been invited for such purpose by the USAF and clearly demonstrates the growing links between these two professional air arms. The IAF officers visited both the Elmendrof and Eielson AFBs from where five sorties were flown by the IAF pilots in F-15s and F-16s. USAF officers have been invited to a land-air exercise in the Rajasthan desert, scheduled for early 1996.

Naval Air Arm strengthened

It was announced during the Defence Budget debate in Parliament in mid-May 1995, that Indian Navy would receive greater financial allocations to make up for reduced effectiveness owing to obsolescence and serviceability problems. The Indian Navy's force of Sea Harrier V/STOL fighters will be retrofitted with newer generation airborne radar, avionics and a "more potent missile". Similarly, the navy's maritime reconnaissance aircraft (Tupolev Tu-142Ms and Il-38s) would get upgraded sensors and a new generation anti-ship missile. The Navy's air arm will also be augmented by another 10 Dornier 228-201 Maritime Patrol Aircraft. Regarding the now long-in-the-teeth aircraft carriers (INS *Vikrant* and INS *Viraat),* "replacements are being planned", alongside the acquisition of six new guided-missile frigates and a fleet tanker from Russia.

Sukhoi Su-27s for Vietnam...

After the People's Republic of China, it is Vietnam that has now acquired the Russian 'super fighter', the Sukhoi Su-27 in a reported deal for 20 of these fighters. The induction of Su-27s to Vietnam has caused great consternation to Thailand, with the Royal Thai Air Force urgently seeking a counter fighter, pressurising the United States to release the MDC F-15 Eagle with ASRAAM (*in the event, the RTAF ordered Saab Gripens with a Saab 340 Erieye AEW&C aircraft.*)

... and China seeks licence - production

The PLAAF, which had procured 26 Sukhoi Su-27s in 1992 following resumption of defence ties with Moscow a year earlier, wants to re-equip several air defence regiments with this air-superiority fighter. There are reports that as an immediate requirement, China would like to order an additional 24 Su-27s, but the Russians have stated that any agreement for licence-production of the type in China can only follow if at least 100 Su-27s are bought from Sukhoi's Komsomolsk plant in the Soviet Far East, where production of the Su-27 and its variants currently is "a mere trickle".

First Malaysian MiG-29s

Given the local suffix of MiG-29N, the Royal Malaysian Air Force has now received a total of eighteen (16 single-seat fighters and two dual-seat operational conversion trainers) having been ordered. After first batches of RMAF pilots and technicians completed their conversion training on the MiG-29 and systems with the Indian Air Force, the IAF will follow up by sending two instructors to Kuantan for operational training. In addition, seven IAF technicians will be stationed in Malaysia for advanced on-the-job training, even as a second batch of RMAF technicians has been sent to India.

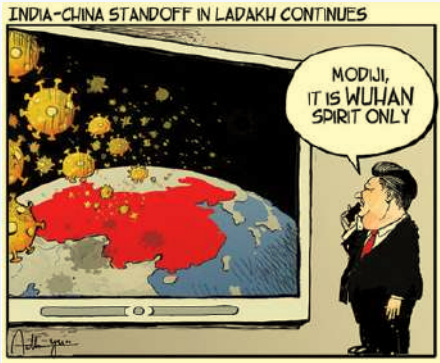
Tale Spin

No laughing matter .... but in the times of Covid-19, something to smile about !

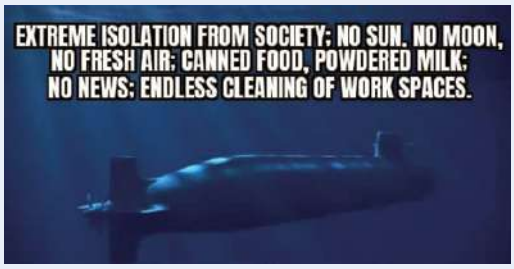
Above, United Airlines take no chances and (below), full mask for the little' copter.

Still wanna fly ?

Even better, make believe your departure from the bedroom to the bathroom, to the kitchen ...!



The Wuhan Spirit explained! (from The Times of India)



The Navy are self isolated, particularly the submariners who have been 'Prepping for this for decades!'

Whats that? Sharp eyed readers should send their answers to the Editor (hint: these are no sheep!).

Afterburner

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