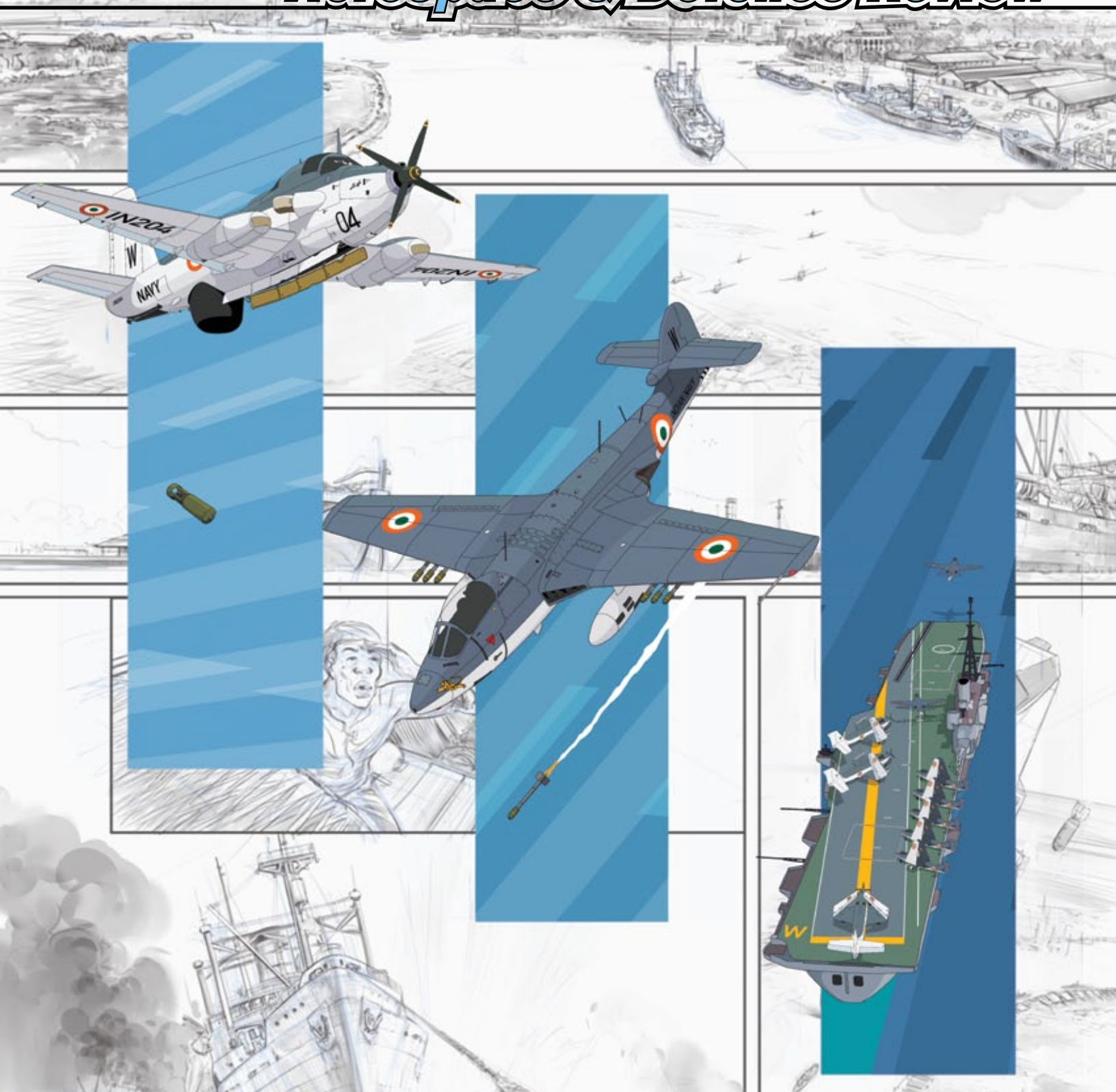
VAYU

Aerospace & Defence Review

VI/2021



THE INDIAN NAVY ISSUE

Happy Indian Navy Day!

On this day of national glory,
IAI salutes the courageous warriors of the Indian Navy.
IAI stands committed to the Indian Navy's vision
of a Combat Ready, Credible, and Cohesive Force.

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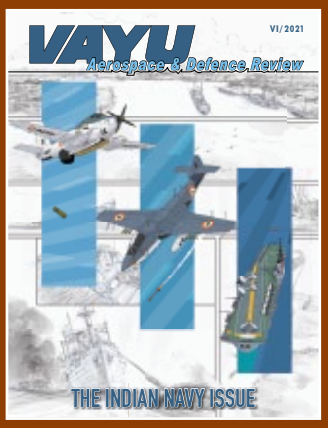

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Commentary, Opinion, Viewpoint, Aviation & Defence in India, World Aviation & Defence News, Ancient Aviator Anecdotes, Vayu 25 Years Back, Tale Spin.

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COMMENTARY

Privatisation of Air India deserves praise…. …. but GoI needs to learn from it, and do more

Photo: Michael D Barker/AIRE Spain

Air India got sold. All 100% of it. This sale was in the works for the last 20 years, with several failed attempts. Imagine looking for a bride or groom for some-one, and a *rishta* is found after 20 years. One has to say, *bahut bahut badhai ho*.

It's been sold by GoI to the Tatas, who ironically were the original founder-owners. In the nerdy world of people who follow privatisation and divestment efforts, this is a minor miracle. A part of me still finds it hard to believe. Perhaps the most expensive set of toys held by GoI, Air India's fleet, despite best attempts, managed to make the government lose thousands of crores every year.

At the time of sale, the company's debt was over Rs 60,000 crore. The winning bidder assumes only around Rs 15,000 crore of this existing debt, while the government will absorb the rest and pay it off by itself. This loss will be in addition to the tens of thousands of crores the government pumped into Air India for the past few decades.

And yet, despite the so-called losses on the deal, the government deserves major praise for getting it done. Air India wasn't just an airline, it was a perennial loss-maker that could never really make money for the government now, especially given the massive interest burden on the huge debt. The government having sold Air India means the losses stop immediately, which some estimates suggest were over Rs 20 crore a day - money that can be spent on development and welfare.

Of course, the government could have absorbed the debt and given the airline a fresh start - under the same management. But it didn't, for it realised that the issue wasn't the debt, but what led to the debt-poor management. Keep cleaning up the debts, keep paying the bills and keep running the airline the same way-nothing would change, and the losses would continue.

For some strange reason, Air India had become a symbol of 'national pride', making the sale a harder one, especially for a government that has nationalism as one of its key political planks. But Air India isn't the Indian Air Force. A loss-making, cash-burning airline ranked low in global ratings is not a symbol of national pride, no matter what its ownership, history or name. National pride comes from excellence, not something Air India was known for.

To sell a loss-making government-employee-staffed airline at any normal time is hard enough, to do it when most international travel is compromised deserves extra praise. To the entire GoI team that worked on the deal – congratulations.

Air India is no ordinary privatisation. It's a high-profile and highly-visible company. A 100% sale of AI shows that privatisation can be done, and citizens are OK with it. There was little backlash on the sale announcement. It is the season to privatise – and the government should do more of the same.

The AI sale also has good lessons for future divestments. Here are the top three cardinal truths to keep in mind, so it doesn't take 20 years to sell a PSU next time.

- Accept privatisation as a part of life, no point debating it. Enough data now exists to show that the government should not run most businesses. Yes, it is true that one shouldn't blindly support all privatisation. However, one shouldn't call every privatisation a `fire sale' or 'selling family silver' either. Frankly, if holding silver is going to be a dumb investment going forward, one should get rid of it any-way. Privatisation vs nationalisation debates have validity, but they are not silly binaries. A certain set of PSUs needs to be privatised, accept it.
- Price the deal right. Air India sale attempts failed in 2001, 2018 and even in 2020. Mostly, it was on account of price. The government was always going to absorb some debt, the issue was how

much. Today, the Tatas will just take about 30% of the airline's existing liabilities. Earlier attempts to get private players to assume 50% or 40% liabilities failed. PSUs are not family silver being sold for peanuts but financial assets that need to be priced right. Else nobody will come forward to buy. The deal had to make sense for the Tatas too. They are taking huge execution risks, hoping to turn the airline around and manage the massive staff used to government-style perks and accountability. For this, the Tatas should make some money. Hence, they must enter the deal at a reasonable price.

- Give up control. Past AI sale attempts to sell 40% and then 76% of the airline failed. This time, a clean 100% sale worked. The government choosing to stick around, even in a minor capacity, would have meant a turnaround could be compromised. A government is used to doing welfare, a company needs to be run based on commercial returns. The government has to leave. Leave the newly married couple alone. Exit, and don't stick around to peep through the window.

The Air India sale hopefully signals a healthy change of mindset towards privatisation that improves Indian productivity. The deal is also a masterclass on how to get a privatisation deal done – with firm resolve, fair pricing, giving up control and yes, after celebrating the marriage leaving the couple alone. There's plenty more PSU kids who still need suitors, after all.

By Chetan Bhagat,
Times of India 23 October 2021

THE TATA GROUP WINNING THE BID FOR AIR INDIA IS GREAT NEWS! WHILE ADMITTEDLY IT WILL TAKE CONSIDERABLE EFFORT TO REBUILD AIR INDIA, IT WILL HOPEFULLY PROVIDE A VERY STRONG MARKET OPPORTUNITY TO THE TATA GROUP'S PRESENCE IN THE AVIATION INDUSTRY.

ON AN EMOTIONAL NOTE, AIR INDIA, UNDER THE LEADERSHIP OF MR. J. R. D. TATA HAD, AT ONE TIME, GAINED THE REPUTATION OF BEING ONE OF THE MOST PRESTIGIOUS AIRLINES IN THE WORLD. TATAS WILL HAVE THE OPPORTUNITY OF REGAINING THE IMAGE AND REPUTATION IT ENJOYED IN EARLIER YEARS. MR. J. R. D. TATA WOULD HAVE BEEN OVERJOYED IF HE WAS IN OUR MIDST TODAY.

WE ALSO NEED TO RECOGNIZE AND THANK THE GOVERNMENT FOR ITS RECENT POLICY OF OPENING SELECT INDUSTRIES TO THE PRIVATE SECTOR.

WELCOME BACK, AIR INDIA!

Ratan N. Tata

RATAN N. TATA

A screengrab from Twitter

Statement from Ajay Singh, Chairman and Managing Director, SpiceJet: "I congratulate the Tata Group on winning the bid for Air India and wish them all the success. It was my honour and privilege to be shortlisted for bidding for Air India. I am confident that the Tata Group will restore the glory of Air India and make all of India proud. I would also like to congratulate the Government on the successful disinvestment of Air India. They ran a transparent and flexible process and gave new impetus to India's disinvestment programme. I have been an Air India fan all my life and it's time for the Maharaja to reclaim its position as a leading airline of the world."

OPINION

Air Marshal Brijesh Jayal says...

Like the US, we, too, deserve a National Security Act deliberated, discussed and passed by Parliament

Recently there has been considerable public focus and debate involving the senior-most military appointments in the oldest and largest democracies of the world. In the US, this involves the Chairman, Joint Chiefs of Staff, the highest ranking military officer and principal military adviser to the President and National Security Council. This post is mandated by law that also prohibits it to exercise operational command authority over the armed forces.

In India, this involves the Chief of Defence Staff (CDS), a post only recently created and whose authority and charter appear to have evolved solely within the administrative walls of the Ministry of Defence without any legislative scrutiny. The CDS simultaneously wears two hats, one as secretary, department of military affairs within the MOD and the other as the Chairman, Chiefs of Staff Committee. The Service Chiefs, however, continue to be responsible for operations involving their charges.

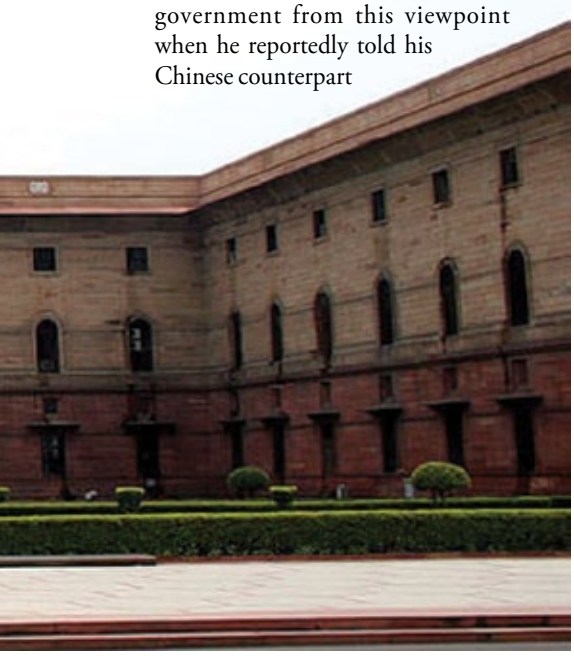
According to a western media report, the debate in the US is centered around accounts in a book titled 'Peril' that indicates that chairman, JCS had carried out acts of insubordination to prevent Donald Trump from starting a war as a diversion from his election defeat last year. Not only had General Milley reportedly called his Chinese counterpart to reassure him that the US would not conduct a surprise attack, and that he would alert Beijing if the President tried to order one; but he also ordered officers assigned to the Pentagon war room to let him know if the President ordered a nuclear launch, despite the fact that he was not in the chain of command.

The General is currently appearing before the senate armed services committee for what reports say will be a tense cross-examination of steps that he reportedly took and it will be instructive to see what lessons emerge. Whatever be the outcome, one can assume that since the US system operates under a law, it will only be after due legal and legislative processes have played their legitimate part.

Closer home, in a strongly worded column titled 'A General cannot set narrative in democracy' in a national daily, a senior journalist of repute is highly critical when in the context of theatre commands, the CDS is quoted to have said: "The chiefs will be responsible for raising, training, and sustaining functions of their services" and "the war will be fought by the theatre commanders on a plan approved by the chief of staff committee (COSC)". Further adding, "In the long run, what we are looking at is the theatre commanders will become operational commanders, reporting to the COSC chairman". The column is critical of this claim since it runs counter to the notified charter of the CDS, and observes that in our parliamentary democracy, it is only the cabinet committee on security that is empowered to decide on sensitive matters such as these.

This follows close on the heels of another recent observation made by the

CDS in a seminar wherein he is reported to have mentioned the "clash of civilisations" theory to describe China's growing ties with the Islamic world vis-a-vis the West. Diplomatically embarrassed, the external affairs minister was quick to distance the government from this viewpoint when he reportedly told his Chinese counterpart



that "India had never subscribed to any clash of civilisations theory".

In fairness to the CDS, in both the above cases, he appears to have been sharing his thoughts and ideas in an academic environment presumably wearing his secretarial hat and not that of the chairman COSC. In the former role, he ought to be able to use an intellectual platform to reflect his views, but not so in the latter as he is also the 'first amongst equals' in military hierarchy and continues to be subject to the Indian Army Act. Quite apart from any other fallout of such ambiguity, the bigger danger of such instances is one of creating confusion in the minds of ranks of the armed forces and weakening the strong foundations of unity of command and control on which the entire national war fighting edifice rests.

Ministry of Defence,
Government of India

It will be recalled that soon after the CDS announcement, the Defence Secretary had publicly stated that the CDS would hit the ground running and show tangible results in hundred days. The subsequent complexities in attempting to introduce theatre commands is but one pointer towards problems that will crop up if major reforms in the national security management structure are rushed without carrying out due diligence and essential background work. Thorough administrative, operational and legal scrutiny is critical to ensuring that changes contemplated not only enhance national security in its complex dimensions, but do so without in any way disturbing the complex relationship amongst various institutions of governance and democracy- more importantly the profession of arms whose personnel are also subject to their respective Service Acts.

Mercifully, these are early signs of the type of complexities that may arise in our hurry to appoint a CDS without clearly defining the appointment's area of authority and responsibility and backing it with the necessary legislative and other safeguards. If there is one lesson that emerges from the cases reflected above, it is that for as vital a subject as national security, like the US, we too deserve a National Security Act deliberated, discussed and passed by the Parliament.

Admiral Arun Prakash says...

The new AUKUS alliance holds some lessons for India

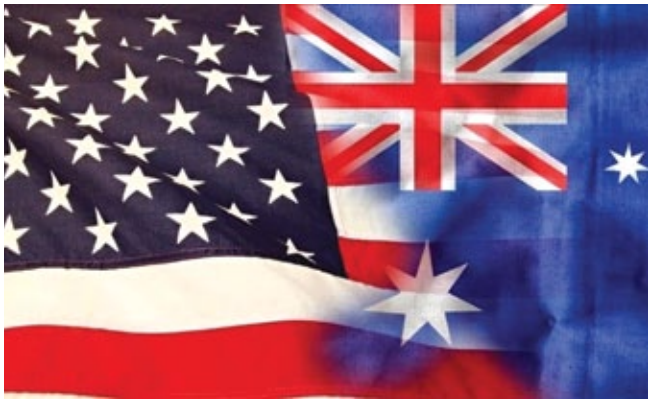


Illustration by Elena Teslova/ aa.com.tr

President Joe Biden, listens as he is joined virtually by Australian Prime Minister Scott Morrison, left, and British Prime Minister Boris Johnson.

In a surprise, virtual statement on 15 September 2021, the heads of government of Australia, the UK and US announced the formation of a trilateral security pact, to be known by the acronym, AUKUS. Without naming China, US President Joe Biden announced, in a press conference, that "in order to deal with rapidly evolving threats," the US and Britain would share, with Australia, intelligence and advanced technologies in areas like artificial intelligence, cyber-warfare handjob quantum computing and nuclear submarine construction.

The surprise at the formation of AUKUS is for a number of reasons. First, the three nations are already allied to each other, in more ways than one — the US and UK are NATO allies, and Australia, New Zealand and the US are linked by the ANZUS pact. All three are also members of the "Five Eyes" intelligence alliance. Secondly, this announcement, coming just days before the first in-person summit meeting of the Quadrilateral Security Dialogue (Quad), places a question mark over the continuing relevance of this forum and its long-overdue actualisation. Finally, the inclusion of a much-diminished, post-Brexit UK in such a long-range alliance is bound to raise a few eyebrows.

China has made no secret of its neurosis about the Quad as well as the naval exercise, "Malabar," both of which, now, have a common membership, comprising the US, India, Australia and Japan. Beijing's apprehensions arise from the suspicion that this concatenation could be a precursor to "containment" – the Cold War strategy which eventually brought the USSR to its knees.

While frequently heaping scorn on their attempts at synergy and coordination, China loses no opportunity to send intimidatory messages to the Quad nations. This has led to palpable trepidation amongst members of this grouping, who have remained over-cautious in their utterances and tended to "tip-toe" around the "dragon" in their midst. The Quad has neither created a charter nor invested itself with any substance; fearing that it would be dubbed an "Asian NATO." China, on its part, has dismissed the Quad as a "headline-grabbing idea which will dissipate like sea-foam".

So far, China has had its way in the geopolitical arena without hindrance from any quarter. In the South China Sea, having staked outrageous territorial claims, and contemptuously dismissed the adverse verdict of the UN Court of Arbitration,

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SAAB

China has proceeded to create artificial islands, and to convert them into fortified air bases. Regular "freedom of navigation operations" by the US and allied navies have neither deterred, nor daunted China.

Even more belligerent has been China's conduct along the Sino-Indian border, where it has used massive military deployments to stake claims to large tracts of Indian territory, leading to a sanguinary conflict in mid-June 2020. India, having counter-mobilised, at economic considerable cost, has stood its ground. Given our limited options, this dangerous confrontation is likely to continue.

Against this backdrop, it is possible that creation of the AUKUS could well be an attempt to send a stronger message to China. However, China's description of this alliance as an "exclusionary bloc," should be food for thought for two members of the Quad/ Malabar forums — India and Japan — who have been excluded from the new grouping.

While uncharitable comments about "Anglo-Saxon solidarity" must be ignored, there may be substance in the belief that the "Anglosphere nations" — which share common cultural and historical ties to the UK —do inspire more confidence in each other. Whether the Quad and AUKUS will reinforce each other, or remain mutually exclusive, will, no doubt, become clear in the upcoming Quad summit.

An issue that should give cause for reflection in New Delhi, arises from Biden's promise to transfer advanced technology, including submarine nuclear-propulsion to Australia. It brings into stark relief India's failure to acquire any significant high technology from the US, in spite of bilateral ties, which have steadily grown in warmth and closeness over the past decade and a half.

Some major milestones in the Indo-US security relationship have been: Signing of the pathbreaking Indo-US Civil Nuclear Agreement, in 2008; launching of the Defense Technology and Trade Initiative in 2012; accord of the status of "Major Defense Partner" by the US Congress in 2016; grant of Tier 1 status to India, enabling export of high-technology items; and institution of "2+2 talks" in 2018. Signing of the fourth and last of the key "foundational agreements" in 2020, was supposed to have eliminated the final impediment to closer defence cooperation.

"Our strategic partnership with India, a fellow democracy…is reaching new heights," says a 2019 US State Department document. While the warming of the Indo-US relationship brings comfort to Indians, we must beware of hyperbole, obscuring reality, in the bilateral discourse. American offers of help "to make India a great power" and overzealous declarations (at the apex level in November 2017) that "two of the world's great democracies should also have the world's two greatest militaries," must be taken with a generous pinch of salt.

China, it is said, owes its pole position to the advanced technology it was given, or it purloined from the US over a 30-year period. All that India has to show for its "strategic partnership," is approximately $22 billion worth of military hardware purchased from US companies — a distinctly retrograde step when we seek atmanirbharta and freedom from external reliance. We need all the technologies being offered to Australia, in addition to "know-how" and "know-why" of much else, including stealth fighters, jet engines, advanced radars and, of course, nuclear propulsion for submarines as well as aircraft carriers.

A US carrier group pictured during an exercise near the Philippines. (Photo: AFP)

Multiple aircraft fly in formation over the USS Ronald Reagan, a US Navy aircraft carrier in the South China Sea. (Photo: Kaila V Peters/US Navy)

For India to attain its full potential, it will need insurance against hegemony, and a breathing space to restore its economy to its earlier buoyant trajectory. This respite will enable it to catch up with technology and boost its military muscle. While preparing to fight its own battles, India will need to seek external balancing. If realpolitik so demands, it must break old shibboleths and strike new partnerships — wherever there is convergence of interests.

HAL delivers 200th gun bay door for Boeing F/A-18

S. Manicka Vasagam, GM (Aircraft), HAL handing over the delivery documents to Ashwani Bhargava, Director-Supplier Development (Boeing India)

HAL has made a milestone delivery of the 200th gun bay door for Boeing F/A-18 Super Hornet. R. Madhavan, CMD, HAL stated, "HAL has a long-standing partnership with Boeing and we look forward to strengthening our association on military and civil programmes. We are prepared to collaborate with Boeing to boost manufacturing under the Atmanirbhar Bharat and Make in India programmes".

Agni-5 successfully launched

A successful launch of the surface-to-surface ballistic missile, Agni-5, was carried out on 27 October 2021 from APJ Abdul Kalam Island, Odisha. The missile, which uses a three-stage solid fuelled engine, is capable of striking targets at ranges up to 5,000 kilometres with a very high degree of accuracy.

File photo via MoD

HAL signs with Alliance Air for 'Made in India' Do-228

India's Regional Connectivity Scheme (RCS) received a major boost with HAL signing a lease agreement with Alliance Air Aviation Limited for the supply of two civil Do-228 aircraft for regional operations in Arunachal Pradesh. Apurba Roy, General Manager, Transport Aircraft Division, Kanpur, HAL and Arun Kumar Bansal, Head of Engineering, Alliance Air Aviation Limited signed the deal papers in Bengaluru on 26 September 2021.

Procurement of two FBFMS for Jaguars from HAL for IAF

The government has signed a contract for procurement of two Fixed Base Full Mission Simulators (FBFMS) for Jaguar aircraft from HAL for IAF with five years Comprehensive Annual Maintenance Contract (CAMC) at a combined total cost of Rs.357 crore. These simulators would be installed at Air Force Stations Jamnagar and Gorakhpur. The commissioning of the first FBFMS with associated equipment shall be completed within 27 months from the contract at Air Force Station Jamnagar and the 2nd FBFMS shall be completed within 36 months from the contract at Air Force Station Gorakhpur.

DRDO's Advanced Electronic Warfare Suite 'Shakti' for Indian Navy

Advanced Electronic Warfare (EW) System 'Shakti' has been designed and developed by Defence Electronics Research Laboratory (DLRL) Hyderabad a laboratory of Defence Research and Development Organisation (DRDO) for capital warships of the Indian Navy for the interception, detection, classification, identification and jamming of conventional and modern Radars. The system has been integrated with the wideband Electronic Support Measures (ESM) and Electronic Counter Measure (ECM) for the defence of Indian Navy Ships against missile attacks. First Shakti system has been installed on-board INS Visakhapatnam and is being installed on-board Indigenous Aircraft Carrier, INS Vikrant. Twelve Shakti Systems are under production at Bharat Electronics Ltd (BEL) supported by more than fifty MSMEs at a total cost of Rs 1805 Crores.

Seven new defence companies carved out of OFB

Defence Minister Rajnath Singh holding a multi grenade launcher as the NSA looks on

Seven new defence companies, carved out of Ordnance Factory Board (OFB), were dedicated to the nation at a function organised by Ministry of Defence on the occasion of 'Vijayadashami' in New Delhi on 15 October 2021. To enhance functional autonomy, efficiency and unleash new growth potential and innovation, the Government had decided to convert OFB from a Government Department into seven 100 per cent Government-owned corporate entities as a measure to improve self-reliance in the defence preparedness of the country. The seven new defence companies are: Munitions India Limited (MIL); Armoured Vehicles Nigam Limited (AVANI); Advanced Weapons and Equipment India Limited (AWE India); Troop Comforts Limited (TCL) (Troop Comfort Items); Yantra India Limited (YIL); India Optel Limited (IOL) and Gliders India Limited (GIL).

Indian Army celebrates 75th Infantry Day

The 75th Infantry Day, to commemorate the contributions of Infantry the largest fighting arm of the Indian Army, was celebrated on 27 October 2021. This day has a unique significance for the nation, as it was on this day in 1947 that infantrymen from the Indian Army, led by 1 Sikh, landed at Srinagar Airfield and saved the state of J&K from Pakistani invasion. As part of the Infantry Day celebrations, a 'Wreath Laying' ceremony was held at National War Memorial to honour the fallen heros of the Infantry, who made the supreme sacrifice on various battlefields in service of the Nation.

IAF revalidates heavy lift for winter stocking

A joint airlift exercise, 'Op Hercules' was undertaken by the Indian Air Force and Indian Army on 15 November 2021. The aim of this high intensity airlift was to strengthen the logistics supply in the Northern sector and to augment winter stocking in the operational areas. The platforms utilised for the airlift were C-17s, Il-76s and An-32s which took off from one of the forward bases of Western Air Command.

BEL pays final dividend to GoI

Bharat Electronics Limited (BEL) paid a total dividend of 400% on its paid up capital to the Government of India for the Financial Year 2020-21. In the photo can be seen Anandi Ramalingam, Chairman & Managing Director (Additional Charge), BEL, presenting the 120% Final Dividend cheque to the Raksha Mantri Rajnath Singh, along with Dinesh Batra, Director (Finance), BEL at New Delhi.

India & US hold 11th DTTI meeting

The 11th Defence Technology and Trade Initiative (DTTI) Group meeting between India and the United States (US) was held virtually on 9 November 2021. The meeting was co-chaired by Secretary (Defence Production) Raj Kumar from Ministry of Defence, Government of India and PTDO (Performing the Duties of) Under Secretary of Defence for Acquisition and Sustainment from US Department of Defence Mr Gregory Kausner. The co-chairs were also pleased to note that since the last DTTI Group meeting in September 2020, the first Project Agreement for Air-Launched Unmanned Aerial Vehicle under the Joint Working Group Air Systems was signed which is a major accomplishment for DTTI.

DRDO and Israel sign Bilateral Innovation Agreement

As a tangible demonstration of the growing Indo–Israeli technological cooperation, Defence Research and Development Organisation (DRDO) and Directorate of Defence Research and Development (DDR&D), Ministry of Defence, Israel have entered into a Bilateral Innovation Agreement (BIA) to promote innovation and accelerated R&D in startups and MSMEs of both countries for the development of dual use technologies. The agreement was signed between and Secretary, Department of Defence, R&D & Chairman DRDO Dr G Satheesh Reddy and Head of DDR&D, Israel BG (Retd) Dr Daniel Gold in New Delhi on 9 November 2021.

DRDO and IAF jointly flight test Long-Range Bomb

Defence Research and Development Organisation (DRDO) and Indian Air Force (IAF) team jointly flight tested indigenously developed Long-Range Bomb (LRB) successfully from an aerial platform on 29 October 2021. The LR Bomb, after release from the IAF fighter aircraft, guided to a land-based target at a long range with accuracy within specified limits. All the mission objectives were successfully met. The LR Bomb has been designed and developed by Research Centre Imarat (RCI), a DRDO laboratory located at Hyderabad in coordination with other DRDO laboratories.

DRDO and IAF conduct flight tests of SAAW

Two flight tests of indigenously-developed smart anti-airfield weapon were successfully conducted jointly by Defence Research & Development Organisation (DRDO) and Indian Air Force (IAF). The two different configurations based on satellite navigation and electro optical sensors were successfully tested. Electro optical seeker based flight test of this class of bomb was conducted for the first time in the country. The electro optic sensor has been developed indigenously.

Three more IAF Rafales arrived in India on 13 October 2021 taking the total deliveries to 29. The Rafales are divided between 17 Squadron in Ambala and 101 Squadron in Hasimara. Seven are yet to be delivered before the full order of 36 is completed. (Pix: IAF)

IAC Vikrant conducts 2nd sea trials on 23 October 2021

IAF to buy 24 used Mirage 2000s

To help in sustaining its fleet of Mirage-2000 fighters, the Indian Air Force (IAF) has signed a contract to buy phased out Mirages of the French Air Force, as per government sources. This is the second such agreement that the Indian Air Force has signed for buying okayed airframes that will help one of the most potent aircraft fleets to continue for longer in service. As per reports, the Indian Air Force (IAF) is set to acquire Dassault Aviation made 24 second-hand Mirage 2000 fighters. The IAF has initialled a 27 million euros contract to buy the fighters and out of these, eight are in ready-to-fly condition. The report also revealed that these aircraft, which are around 1.125 million euros each, will soon be shipped to India in containers. However, none of these aircraft will be used for flying.

Treat in the Indian skies!

14 LCA's from AFS Sulur made a few flypasts and performed the ever popular Elephant Walk much to everyone's surprise and excitement

Air Force Station, Sulur passed-out the 100th Dornier 228 after major servicing on 24 September 2021. Air Vice Marshal CR Mohan, Air Officer Engineering Services from Hqtrs-Maintenance Command presided the event in presence of Air Cmde PK Sreekumar AOC-5 Base Repair Depot (BRD).

Maiden flight test of Akash Prime missile

A new version of the Akash Missile–'Akash Prime' was successfully flight tested from Integrated Test Range (ITR), Chandipur, Odisha on 27 September 2021. The missile intercepted and destroyed an unmanned aerial target mimicking enemy aircraft, in its maiden flight test after improvements. In comparison to the existing Akash System, Akash Prime is equipped with an indigenous active Radio Frequency (RF) seeker for improved accuracy. Other improvements also ensure more reliable performance under low temperature environments at higher altitudes.

Abhyas successfully flight-tested by DRDO

Abhyas, the High-speed Expendable Aerial Target (HEAT) was successfully flight-tested on 22 October 2021 by DRDO from the Integrated Test Range (ITR), Chandipur off the coast of Bay of Bengal in Odisha. The vehicle can be used as an aerial

target for evaluation of various missile systems. The performance of the target aircraft was monitored through telemetry and various tracking sensors including Radars and Electro Optical Tracking System (EOTS).

GSL delivers 4th OPV to Indian Coast Guard

The fourth vessel of the five Coast Guard Offshore Patrol Vessel (OPV) Project, completely designed and built by Goa Shipyard Limited was delivered to the Indian Coast Guard on 30 September 2021.

Commissioning of offshore patrol vessel ICGS Sarthak

The indigenously built Indian Coast Guard Ship 'Sarthak' was commissioned at Goa on 28 October 2021 by DG K Natarajan, Director General, Indian Coast Guard. ICGS Sarthak is 4th in the series of five OPVs being built by GSL for the ICG. These OPVs are multi-mission platforms capable of undertaking

concurrent operations. The 105 meter long ship displacing 2450 tons is propelled by two 9100 kilowatt diesel engines designed to attain a maximum speed of 26 knots. ICGS Sarthak, will be based at Porbandar (Gujarat) and operate on India's Western Seaboard under the Operational and Administrative Control of the Commander, Coast Guard Region (Northwest). ICGS Sarthak is commanded by Deputy Inspector General MM Syed and has complement of 11 Officers and 110 men.

Godrej Aerospace delivers 200th set of BrahMos airframe assemblies

Godrej & Boyce, the flagship company of the Godrej Group, announced that its business Godrej Aerospace handed over the 200th set of the cruise missile airframe assemblies to BrahMos Aerospace Pvt. Ltd. (BAPL) for use in its missile systems. Each airframe of the BrahMos missile consists of 138 subassemblies that are manufactured from more than 1500 parts.

HAL in ITSOA Certificate for civil platforms

HAL's avionic equipment 'Air Data Computer (ADC) with Outside Air Temperature (OAT) Probe' has received Indian Technical Standard Order Authorisation (ITSOA) certificate from DGCA for civil platform. The certification is for both hardware and software. The ADC/OAT is the first avionic equipment in India that has qualified for ITSOA and will pave the way for the fitment on future civil platforms like ALH, Dornier, LUH, Saras etc. This is an achievement towards mission 'Aatmanirbhar Bharat'. The ADC is used to calculate the air data parameters such as pressure altitude, calibrated airspeed, mach number, total air temperature, vertical speed based on static pressure, total pressure and outside air temperature inputs.

HAL delivers Semi-Cryogenic propellant tank to ISRO

The heaviest Semi-Cryogenic propellant tank (SC120- LOX) ever fabricated by was delivered to Indian Space Research Organisation (ISRO). The semi cryo-liquid oxygen (LOX) tank – the first developmental welded hardware is a part of the SC120 stage intended for payload enhancement by replacing the L110 stage in existing Mk-III launch vehicle. Last year, HAL had delivered the biggest ever cryogenic liquid hydrogen tank (C32-LH2) which is four meters in diameter and eight meters in length, much ahead of contractual schedule.

Goa Maritime Conclave 2021

The 3rd edition of Goa Maritime Conclave, successfully conducted from 7 to 9 November 2021 at Goa, brought together the Chiefs of Navy/ Heads of Maritime Agencies of IOR littorals, namely, Bangladesh, Comoros, Indonesia, Madagascar, Malaysia, Maldives, Mauritius, Myanmar, Seychelles, Singapore, Sri Lanka and Thailand. The theme for GMC-21, "Maritime Security and Emerging Non-Traditional Threats: A Case for Proactive Role for IOR Navies", was derived keeping in mind the necessity of 'winning everyday peace' in the maritime domain.

Coast Guard Commanders Conference 2021

38th Coast Guard Commanders Conference was held from 9-11 October 2021 at Coast Guard Headquarters, New Delhi. Commanders' Conference is an annual meet of senior Coast Guard Commanders to discuss and review ICG operational preparedness, future roadmap and macro issues pertaining to Coastal Security and maritime safety. Defence Minister Rajnath Singh addressed the inaugural session of the conference on 9 October 2021. He was given an overview on the ongoing developments and future expansion plans of Indian Coast Guard by the Director General Indian Coast Guard. Rajnath Singh in his address lauded efforts of ICG for being the vanguard in the field of maritime search and rescue and pollution response and emphasised to continue drive against contraband and drug trafficking.

Naval Commanders Conference 2021

The Naval Commanders' Conference which commenced on 18 October 2021, concluded after four days of fruitful deliberations. The RM highlighted that Indian Navy had spent more than two-thirds of the Modernisation Budget in the last five years towards indigenous procurement and out of 41 ships and submarines ordered by the Navy, 39 are from Indian shipyards, which is a testament to the Navy's commitment to 'Atmanirbhar Bharat'. He urged IN to maintain the momentum achieved thus far and assured that the steps taken by the Government will give it more strength to increase the lethal strike capability.

Air Force Commanders Conference 2021

The second bi-annual IAF Commanders' Conference was inaugurated by Raksha Mantri on 10 November 2021 at Air Headquarter (Vayu Bhawan). Chief of the Air Staff, Air Chief Marshal VR Chaudhari welcomed Defence Minister Rajnath Singh, CDS General Bipin Rawat and Secretary Defence Production Raj Kumar.

Akasa Air orders 72 737 MAX's

Boeing and Akasa Air, a brand of SNV Aviation, on 16 November 2021 announced the new Indian carrier had ordered 72 737 MAX airliners. "Valued at nearly $9 billion at list prices, the order is a key endorsement of the 737 family's capability to serve the rapidly growing Indian market", stated Boeing executives. Akasa Air's order includes two variants from the 737 MAX family, the 737-8 and the high-capacity 737-8-200. "Providing the lowest seat-mile costs for a single-aisle airplane as well as high dispatch reliability and an enhanced passenger experience, the 737 MAX will ensure Akasa Air has a competitive edge in its dynamic home market", further stated Boeing officials.

Vinay Dube, CEO Akasa Air and Stan Deal, Boeing Commercial Airplanes President and CEO

Akasa Air selects CFM's LEAP-1B to launch operations in India

Akasa Air has selected the CFM LEAP-1B engines to power its recently announced 72 Boeing 737 MAX airplanes. The agreement, which also includes spare engines and long-term services agreement, is valued at nearly $4.5 billion US at list price. With this purchase and services agreement, Akasa Air will have from day one of its operations an innovative and comprehensive maintenance programme delivered by CFM, the world's premier engine manufacturer.

NAL adopts Dassault Systèmes' solutions

Dassault Systèmes has announced that National Aerospace Laboratories (NAL), a constituent of Council of Scientific and Industrial Research (CSIR) has adopted the "Passenger Experience" industry solution experience based on the 3DEXPERIENCE platform to design civil aircraft in India, specifically the Saras Mk-2 programme. NAL is also using DraftSight, a feature-rich 2D and 3D Computer Aided Design (CAD) solution for 2D design standardisation in the manufacturing of civil aircraft.

Air India to implement GE's 360 Foam Wash

Following technology trials and aircraft maintenance technician training, Air India is the latest airline to adopt GE's 360 Foam Wash to help maintain its GEnx-powered Boeing 787 fleet.

Air India previously received a technical license from GE Aviation to use GE's patented 360 Foam Wash system on its GEnx-1B aircraft engines and has now industrialised the innovative cleaning system into its maintenance process. The system is self-contained, allowing it to be used inside maintenance hangars or outdoors. GE's 360 Foam Wash is approved for use on multiple GE engine programmes, including models of GE90, GEnx, CF34 and CF6.

IndiGo transports 67.9% of Covid vaccines

Continuing with its mission to support the nation, IndiGo transported a total of 67.9cr Covid vaccine doses from 12 January to 20 October 2021. The airline carried 1727 tonnes of the vaccine across 4505 destinations, securing a leading share of 67.9% in vaccine transportation during this period.

SpiceJet celebrates India's 100 crore vaccination milestone

As India celebrated the historic milestone of administering 100 crore Covid-19 vaccination doses on 21 October 2021, SpiceJet unveiled a special livery to honour the contribution of frontline workers and corona warriors who "under the leadership of Prime Minister Narendra Modi, have worked tirelessly to make this dream into a reality". The livery includes an image of the Prime Minister and healthcare workers and adorns three Boeing 737's of SpiceJet.

AirAsia India starts TaxiBot operations

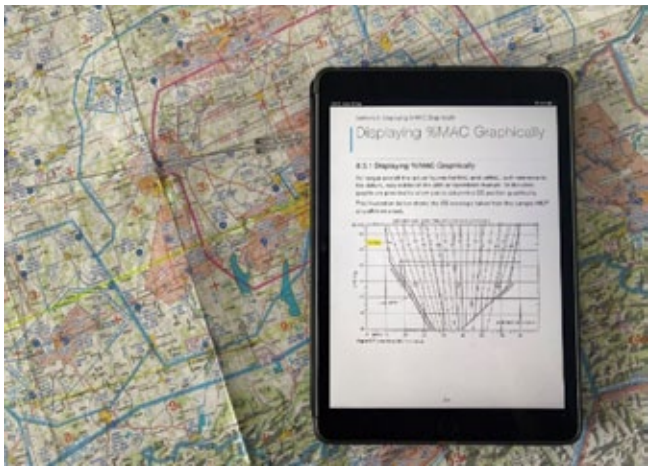
Driving sustainability and optimising efficiency in aviation operations, AirAsia India announced the implementation of an Alternate Taxiing Solution. The Taxibot is a semi-robotic towbarless aircraft movement device developed by Israel Aerospace Industries. The Taxibot can tow an aircraft from the terminal gate to the take-off point (taxi-out phase) and return it to the gate after landing (taxi-in phase) without utilising the aircraft engines.

American Airlines expands footprint in India

In response to the growing travel demand between the United States and India, American Airlines announced the launch of new nonstop New York to New Delhi service on a Boeing 777-300 beginning 12 November 2021. The airline, which received approvals and permissions both from the Indian and the US Governments, will fly an aircraft configured with 8 Flagship first-class lay-flat seats, 52 Flagship business lay-flat seats, 28 premium economy recliner seats, and 216 main cabin seats.

Skyborne launches DGCA Distance Learning progamme

Skyborne Airline Academy Vero Beach has launched its Directorate General of Civil Aviation (DGCA) distance learning programme, enabling trainees in India to remotely start their journey to becoming an airline pilot. The theoretical knowledge package is offered through SKYWORX, Skyborne's educational division. Trainees will complement 18 weeks of self-study with live tutor-led sessions from Skyborne's experienced instructors using Padpilot technology, preparing them for their DGCA CPL theory exams.



APPOINTMENTS

Air Chief Marshal VR Chaudhari is new Chief of the Air Staff

Air Chief Marshal VR Chaudhari took over as the Chief of the Air Staff (CAS) at a ceremony at Air Headquarters (Vayu Bhawan) on 30 September 2021. An alumnus of NDA, the CAS was commissioned in December 82 in the fighter stream of the IAF. He has flown more than 3800 hours on multiple fighter and trainer aircraft.

The outgoing (L) and incoming (R) CAS

During his career spanning almost four decades, the CAS has tenanted many significant command and staff appointments. He has commanded a MiG-29 Squadron, two Air Force Stations and Western Air Command. His staff appointments include Deputy Chief of Air Staff, Senior Air Staff Officer at HQ Eastern Air Command, Assistant Chief of Air Staff Operations (Air Defence), Assistant Chief of Air Staff (Personnel Officers), Deputy Commandant of Air Force Academy and Air Assistant to Chief of the Air Staff.

Air Marshal Sandeep Singh is new Vice Chief of the Air Staff

Air Marshal Sandeep Singh took over as Vice Chief of the Air Staff (VCAS) on 1 October 2021. An alumnus of National Defence Academy, the Air Marshal was commissioned in the flying branch of IAF in Dec 1983 as a Fighter pilot. The Air Officer is an Experimental Test Pilot and a Qualified Flying Instructor. He has diverse experience in operational and experimental test flying on various types of fighter aircraft and has flown about 4400 hours.

During his nearly thirty eight years of service in the IAF, the Air Marshal has held numerous important command and staff appointments. He has commanded Aircraft and Systems Testing Establishment, a frontline air base and an operational fighter squadron. He has held the appointments of Assistant Chief of the Air Staff (Plans), Senior Air Staff Officer at HQ Eastern Air Command and Deputy Chief of the Air Staff at Air Headquarters. Prior to assuming the current appointment, he held the appointment of AOC-in-C South Western Air Command.

Air Marshal Vikram Singh is Air Officer Commanding-In-Chief, SWAC

Air Marshal Vikram Singh took over as Air Officer Commanding-in-Chief (AOC-in-C), South Western Air Command (SWAC) at Gandhinagar on 3 October 2021. The Air Marshal graduated from Christ College Bangalore in May 1983 and was commissioned in the fighter stream on 21 December 1984. The Air Officer has diverse experience in operational and experimental test flying on various aircraft prominent among them being MiG-21 and Mirage-2000. The Air Marshal has undergone the Flying Instructor's Course, Experimental Flight Test Course and is a graduate of the Staff Course from Pretoria, South Africa. He has performed Flight Test duties at various test centres including that at the National Flight Test Centre. He has also commanded an Air Force Station in the western front. The Air Marshal has served in various staff appointments at Air Headquarters and has been the Air Attaché at Moscow, Russia. He has also served at the Integrated Defence Staff Headquarters and was Assistant Chief of the Air Staff (Plans) at Air Headquarters. The Air Marshal was Senior Air Staff Officer, Western Air Command before taking over the present appointment.

Air Marshal Amit Dev assumes charge of Western Air Command

Air Marshal Amit Dev assumed the appointment of Air Officer Commanding in Chief (AOC-in-C) of Western Air Command on 1 October 2021. An alumnus of National Defence Academy, the Air Marshal was commissioned in the flying branch of IAF in Dec 1982 as a Fighter pilot. A Fighter Strike Leader, the Air Officer has about 2500 hours of operational flying experience

on a wide variety of fighter aircraft in the inventory of IAF. During nearly thirty nine years of service in the IAF, the Air Officer has held numerous important command and staff appointments. He has commanded a MiG-21 Squadron, a frontline Air Base, an Air Defence Direction Centre and an Operational Fighter Base. He has tenanted the appointments of Assistant Chief of the Air Staff (Inspection), Director General Air Operations and Air Officer in Charge Personnel at Air Headquarters. Prior to assuming the current appointment, he held the appointment of AOC-in-C Eastern Air Command.

Vice Admiral R Hari Kumar to be the next Chief of the Naval Staff

The Government has appointed Vice Admiral R Hari Kumar, presently Flag Officer Commanding-in-Chief Western Naval Command as the next Chief of the Naval Staff with effect from the afternoon of 30 November 2021. The present Chief of the Naval Staff, Admiral Karambir Singh retires from service on 30 November 2021.

During his long and distinguished service spanning nearly 39 years, he has served in a variety of Command, Staff and Instructional appointments. Vice Admiral R. Hari Kumar's Sea Command includes INS Nishank, missile corvette INS Kora and guided missile destroyer INS Ranvir. He also commanded Indian Navy's aircraft carrier INS Viraat. He served as Fleet Operations Officer of the Western Fleet. Before taking over as FOC-in-C Western Naval Command, he was Chief of Integrated Defence Staff to the Chairman, Chiefs of Staff Committee.

Vice Admiral Krishna Swaminathan is Chief of Staff, Western Naval Command

Vice Admiral Krishna Swaminathan assumed charge as Chief of Staff of the Western Naval Command on 4 November 2021. Commissioned into the Indian Navy on 1 July 1987, Admiral Swaminathan is a specialist in communication and electronic warfare and an alumnus of the National Defence Academy, Khadakvasla; the Joint Services Command and Staff College, venham, United Kingdom; the College of Naval Warfare, Karanja; and the United States Naval War College, New Port, Rhode Island, USA.

Air Marshal BR Krishna assumes charge of CISC

Air Marshal BR Krishna assumed charge of Chief of Integrated Defence Staff to the Chairman, Chiefs of Staff Committee (CISC) on 1 October 2021. The CISC paid homage to the bravehearts at the National War Memorial, in New Delhi followed by Tri-Service Guard of Honour. Commissioned as a fighter pilot in 1983, Air Marshal Krishna has had a distinguished career spanning over 38 years. Qualified Flying Instructor and experimental test pilot, he has flown a wide variety of fighters, transport aircraft and helicopters in the inventory of Indian Air Force. He has over 5,000 hours of flying experience including operational, instructional and test flying. He is an alumnus of National Defence Academy, Defence Services Staff College and National Defence College.

ER Sheikh is first Director General of the Ordnance Directorate

E.R. Sheikh has assumed charge as first Director General of the Ordnance Directorate (Co-ordination and Services). It is the successor organisation of Ordnance Factory Board (OFB). An Indian Ordnance Factory Service (IOFS) officer of the 1984 batch, he has been a spearhead of modernisation. In particular, he has contributed to the establishment of the modern production line system for the manufacture of small arms ammunition at the Ordnance Factory Varangaon. As Deputy Director General (DDG)-Propellants and Explosives, he oversaw several plant modernisation projects in explosive factories that led to enhancement in productivity, quality and safety. He also led the successful indigenous development of Bi-Modular Charge System (BMCS) for artillery ammunition.

Rajiv Bansal is new Secretary, Ministry of Civil Aviation

Rajiv Bansal has assumed the charge of Secretary, Ministry of Civil Aviation, Government of India. Bansal is an Indian Administrative Services Officer of 1988 batch, from Nagaland cadre. He has held many important positions in the Union Government including Chairman and Managing Director, Air India Ltd., Ministry of Civil Aviation; Additional Secretary, M/o Petroleum & Natural Gas; Joint Secretary, M/o Electronics & Information Technology; Secretary, Central Electricity Regulatory Commission (CERC); and Joint Secretary, D/o Heavy Industry, M/o Heavy Industries & Public Enterprises. He has also held several key positions in the Government of Nagaland including Commissioner & Secretary, D/o Health & Family Welfare, Nagaland; Commissioner & Secretary, School Education Department, Nagaland; Commissioner & Secretary, Finance Department, Nagaland amongst others.

MoD orders 118 MBT Arjun Mk-1A's for Indian Army

India's Ministry of Defence (MoD) placed an order with Heavy Vehicles Factory (HVF), Avadi, Chennai for supply of 118 Main Battle Tanks (MBTs) Arjun Mk-1A for the Indian Army on 23 September 2021. The order, worth Rs 7,523 crore, will provide further boost to the 'Make in India' initiative in defence sector and is a big step towards achieving 'Aatmanirbhar Bharat', envisioned by Prime Minister Mr. Narendra Modi. It may be recalled that the Prime Minister had handed over the MBT Arjun Mk-1A to Chief of Army Staff General M M Naravane in Chennai on 14 February 2021.

The state–of-the-art MBT Mk-1A is a new variant of Arjun Tank designed to enhance fire power, mobility and survivability. Infused with 72 new features and more indigenous content from the Mk-1 variant, the tank will ensure effortless mobility in all terrains, besides precise target engagement during day and night. It has been designed and developed by Defence Research & Development Organisation (DRDO) by incorporating numerous upgrades on Arjun MBT, the in-service main battle tank with the Indian Army.

The MK-1A is equipped with accurate and superior firepower, all-terrain mobility and an invincible multi-layered protection provided by an array of advanced technology systems. It can take on the enemy during day and night conditions and in both static and dynamic modes. By virtue of these capabilities, "this indigenous MBT proves to be at par with any contemporary in its class across the globe". This tank is particularly configured and designed for Indian conditions and hence it is suitable for deployment to protect the frontiers in an effective manner.

This production order to HVF, Avadi opens up a large avenue in defence manufacturing for over 200 Indian vendors including MSMEs, with employment opportunities to around 8,000 people. This will be a flagship project showcasing the indigenous capability in cutting edge defence technologies.

The MBT Arjun Mk-1A has been designed and developed by Combat Vehicles Research and Development Establishment (CVRDE), along with other laboratories of DRDO within two years (2010-12). The development activities commenced from June 2010 and the tank was fielded for user trials in June 2012. It took only two years to develop and field the MBT Arjun Mk-1A for user trials from the user requirement. Extensive trial evaluation was conducted in various phases covering 7000+ kms (both in DRDO and user trials) of automotive and substantial firing of various types of ammunition during 2012-2015.

DAC approves proposals of value Rs.13,165 cr and 7,965 cr

The Defence Acquisition Council (DAC) in its meeting of 29 September 2021 and further on 2 November 2021 held under the Chairmanship of Raksha Mantri Mr. Rajnath Singh accorded Acceptance of Necessity (AoN) for Capital Acquisitions proposals for modernisation and operational needs of the Indian Armed Forces amounting to approx. Rs.13,165cr. Of the total amount approved, procurement worth Rs. 11,486cr. (87%) is from the domestic sources. Later, the Defence Acquisition Council (DAC), in its meeting of 2 November 2021 held under the chairmanship of the Defence Minister, accorded Acceptance of Necessity (AoN) for capital acquisition proposals for modernisation and operational needs of the Armed Forces amounting to Rs 7,965 crore. All of these proposals (100%) are under 'Make in India' with focus on design, development and manufacturing in India.

Key approvals include helicopters, guided munition and rocket ammunition. Looking into the need of the Indian Army for an Advanced Light Helicopters (ALH) Squadron, to improve its integral lift capability ensuring its operational preparedness, the DAC accorded approval of procurement of 25 ALH Mark III helicopters from HAL under Buy Indian-IDDM at an approx. cost of Rs.3,850 cr in keeping with the continued thrust towards 'Aatmanirbhar Bharat' and 'Make in India'. Giving boost to Indigenous Design and Development of ammunitions, DAC accorded approval for procurement of Terminally Guided Munition (TGM) and HEPF/RHE Rocket Ammunition under Buy (Indian-IDDM) category at an approx cost of Rs.4,962 cr. from domestic sources. Other proposals worth Rs. 4,353 cr. were also accorded AoN by the DAC.

In addition, the DAC also approved a few amendments to the DAP 2020 as a part of Business Process Re-engineering to ensure further ease of doing business for the industry as well as measures to enhance procurement efficiency and reducing timelines.

More key approvals in November were the procurement from domestic sources include twelve Light Utility Helicopters from Hindustan Aeronautics Limited (HAL); Lynx U2 Fire Control System from Bharat Electronics Limited (BEL) which will enhance the detection tracking and engagement capabilities of naval war ships and Mid Life Upgradation of the Dornier 228 aircraft from HAL to increase the naval capabilities in maritime reconnaissance and coastal surveillance.

As a further impetus to 'Aatmanirbhar Bharat', a global procurement case of naval guns has been foreclosed with these guns' quantity added to the upgraded Super Rapid Gun Mount (SRGM) being manufactured by Bharat Heavy Electricals Limited (BHEL). These SRGMs provide niche capabilities of engaging fast manoeuvring targets using guided munitions and range extensions and are to be fitted on the warships of the Indian Navy.

VAYU Interview with

Air Chief Marshal VR Chaudhari, Chief of the Air Staff, IAF

VAYU : At a recent IAF Commanders' Conference, IAF's 'Vision 2030' was articulated upon. Could you give us an overview on the timelines for these critical objectives to be met?

The IAF is undergoing a major transformation through induction of state of the art equipment along with up gradation of key legacy platforms and systems. Induction of indigenous Light Combat Helicopter (LCH) and S-400 Air Defence system is expected to start in the immediate future. The induction of Rafale aircraft would be completed as per the contractual timelines and LCA Mk1A shall be available from 2024. Concurrently we expect the Multi Role Fighter Aircraft (MFRA) plans to be firmed up to build our op capability. Other major inductions of AMCA and combat enablers like FRA, AWACS, AEW&C, armed drones etc would be near induction/operational by 2030. Simultaneously, we will transform our capabilities in multi-domain warfare, notably cyber and space, and carry out a thorough overhaul of our training processes to make them future ready.

VAYU : As of end-July 2021, a total of 26 out of 36 Rafales had been accepted and ferried to India along with the recent induction into 101 Squadron. Meanwhile, there are some disparate reports on

progress of the IAF's requirement for 114 multirole fighter aircraft, the process having begun some years back. Could you please update us on the status in context of the IAF's 'Vision 2030'?

IAF plans to induct six squadrons of MRFA in a phased manner. The finalisation of ASQRs is under progress after which the proposal will be moved for Acceptance of Necessity (AON) by MoD.

VAYU: The IAF has placed an order for 83 LCA Mk1As. Could you kindly give us the probable time lines for induction of the first LCA Mk1A into IAF service? And also the kind of support the IAF is giving towards the LCA Mk-II/MWF as also the AMCA?

Induction of LCA Mk 1A is likely to commence in 2024. IAF has been involved in the LCA programme since its inception and has contributed consistently to its development, flight testing, operational clearances and successful induction. IAF is fully committed to the AMCA programme and is providing requisite expertise, support and operational inputs for successful rollout of the project.

VAYU: The IAF's transport and helicopter fleet have been carrying out Herculean efforts flying reinforcements, equipment and supplies to the Ladakh region/ Covid support and natural disaster relief over the past 2 years. To increase the logistical gaps and a future acquisition plan, what is the status of India's Avro replacement programme with the C-295W being the top choice?

IAF is looking at augmenting its medium tactical airlift capability thorough replacement of the Avro fleet. Towards this the procurement of 56 C-295 MW aircraft is already finalised. While 16 aircraft will be delivered in a flyaway condition, 40 are to be manufactured in India by the Tata consortium. This will enhance the tactical load lifting capability and modernise IAF's transport fleet and also allows para-drop of troops and cargo. Procurement of C-295 would give IAF the ability to operate from semi-prepared strips supporting air transport operations in far-flung areas.

VAYU: As for helicopters, could you give us the IAF's plans to induct the HAL LCH. What about the IAF interest in the HAL's IMRH programme? Lastly, on helicopters, any plans to acquire any more Chinooks?

The Contract for LCH is being finalised with HAL by the Contract Negotiation Committee (CNC) of MoD and is likely to be signed in this financial year. IAF operational requirement of LCH would be catered after the IOC of the LCH production helicopter. HAL has carried out Preliminary Design Studies of IMRH based on which operational requirements are presently under finalisation. Chinooks have been operationalised in envisaged roles, and case for procurement of additional Chinooks to meet our operational requirements is under active consideration.

IAF at 89: Touching the sky with glory – Quite Literally!

Every year on 8 October, the Indian Air Force Day is celebrated and this year IAF marked its 89th anniversary since it was officially founded in 1932.

The special day was celebrated at Hindon Airbase (Ghaziabad city of Uttar Pradesh) and held in the presence of senior officials of the three Armed Forces; Chief of Defence Staff (CDS) General Bipin Rawat, Navy Chief Admiral Karambir Singh and Chief of Army Staff General MM Naravane while the new IAF Chief of Air Staff Air Chief Marshal VR Chaudhari inspected the parade.

Vintage aircraft were flown and put up a magnificent show to celebrate the occasion.

The show started at 8am with ten paratroopers of the Akash Ganga Team jumping from an An-32 immediately followed by three paratroopers carrying the Indian tricolour together with the IAF flag. This was a depiction of the Tangail airdrop operation, mounted during the 1971 war. In the re-enactment of the famous operation, three paratroopers, including one from the Army, jumped from a vintage Dakota transport aircraft. It was a sight to behold!

Following the paradrop, we witnessed 3 Mi-17V5s carrying Indian flag in VIC formation. Few minutes later, five ALH Mark IV helicopters flew in the same VIC formation. This was followed by the arrival of guests, the parade, medal ceremony and the IAF chief's speech. The whole presentation lasted for about 45 minutes.

Now, it was time for the excitement. The flying display began with two LCA Tejas, call sign Sekhon 1 and 2 take off and perform some very amazing manoeuvres. Then came in the Mi-17s followed by Chinooks, carrying howitzer guns. After that, Mi-17s along with AH-64 Apaches marked their presence. Then came in one of the mammoth workhorses of the Indian Air Force the C-130J Hercules.

The 'big daddy': After that, another giant of the IAFC-17 flew in with Su-30MKIs. I cannot explain the excitement in the crowd when the jets rolled in. It was difficult even for me! The Bisons came rushing. There's a reason they are called 'Fast Interceptors'. They were so fast that my camera couldn't focus on them before they disappeared in the sky. Following the MiG-21s, were the Jaguars, MiG 29s, another batch of Su-30s. All of them flew in VIC formation, deploying flares.

We also saw a flypast from the DC-3 Dakota along with Dorniers. After this, the viewers witnessed the most awaited flypast as the newly inducted Rafale flew in nose up, low height, slow speed formation along with Su-30MKIs. If my memory serves me right, due to their airframe design with canards, these are the only two jets that can pull this off.










We also saw some superb acrobatic manoeuvres from the very skilled Surya Kiran Team who flew the Hawk jets, along with nicely timed display from the Sarang Helicopter (ALH) aerobatics team. The final show was a combination of synchronised flying between LCA, Rafales and Su-30s, performing Vertical Charlies while deploying flares. What an amazing view it was. I told my friends who accompanied me, that only the IAF knew how to end a show!

Text and pictures by Mayyank Kaul

HAL's LCH handed over to IAF

Prime Minister Mr Narendra Modi handed over HAL produced indigenous Light Combat Helicopter (LCH) to the Indian Air Force (IAF) during the 'Rashtriya Raksha Samarpan Parv' celebrations on 19 November 2021 to mark the 75th year of India's independence, held at Jhansi. The IAF Chief Air Chief Marshal Vivek Ram Chaudhari symbolically received LCH in presence of several dignitaries.

LCH is the dedicated combat helicopter designed and developed indigenously for the first time in India. LCH is the only attack helicopter in the world which can land and take-off at an altitude of 5000m (16,400 ft) with considerable load of weapons and fuel meeting the specific requirements of Indian Armed Forces.

HAL has proactively initiated advance action towards launching the production activities of 15 LCH LSPs with internal funding. Material procurement for all the 15 helicopters have been completed. Three helicopters are ready for delivery to users and the balance helicopters are in advanced stages of production.

HAL has initiated various planning activities and has drawn a detailed master plan for achieving the peak rate production capacity of 30 helicopters per annum in order to cater to production of balance 145 LCHs.

As in other aircraft development, LCH is also being continuously upgraded with advancement of technologies. Improved Electronics Warfare (EW) Suite, Directional Infra-Red Counter Measure (DIRCM), Air to Ground Missile (ATGM), Data link, Anti-Radiation Missile (ARM), Bombs, Nuclear, Biological and Chemical (NBC) protection and Wire cutter are being incorporated.

Being a unique helicopter in this weight category and with this kind of capabilities, LCH is also expected to have a good export potential.

The LCH is a twin-engine, 5.8-ton class helicopter featuring narrow fuselage and tandem configuration for Pilot and Co-pilot/Weapon System Operator (WSO). It incorporates number of stealth features such as reduced radar and infra-red signatures and crashworthy landing gear for better survivability. LCH incorporates advanced technologies and is designed to carry out roles such as destruction of enemy air defence, counter insurgency, search and rescue, anti-tank, counter surface force operations etc.

LCH is a truly 'Make in India' product built with private industry participation. Production of LCH is envisaged through participation of public sector and private sector partners. More than 250 vendors are involved in manufacturing of components, assemblies, tools and test equipment and preparation of technical documentations apart from 70 vendors involved in indigenisation of various items.

Post 1999 Kargil war, the need to have an effective helicopter weapons platform to deliver precision strikes at high altitude was felt by IAF. The design and development of LCH was sanctioned by the Government during October 2006. Subsequently, Indian Army joined the programme during December 2013 leading to a total projected requirement of 160 LCHs.

IAF issued Air Staff Qualitative Requirements during July 2016 for Limited Series Production (LSP) of LCH. Initial Operational Clearance (IOC) for LCH LSP for IAF was accorded by CEMILAC during August 2017 based on the compliance to ASQR. Subsequently, IOC for Indian Army was received from CEMILAC during February 2019.

India formalises acquisition of 56 Airbus C295 aircraft

"Programme to kick-start first-ever private aircraft manufacturing in India; will contribute significantly to developing the country's military industrial ecosystem"

India, on 24 September 2021, formalised the acquisition of 56 Airbus C295 aircraft to replace the Indian Air Force (IAF) legacy Avro fleet. It is the first 'Make in India' aerospace programme in the private sector, involving the full development of a complete industrial ecosystem: from the manufacture to assembly, test and qualification, to delivery and maintenance of the complete lifecycle of the aircraft.

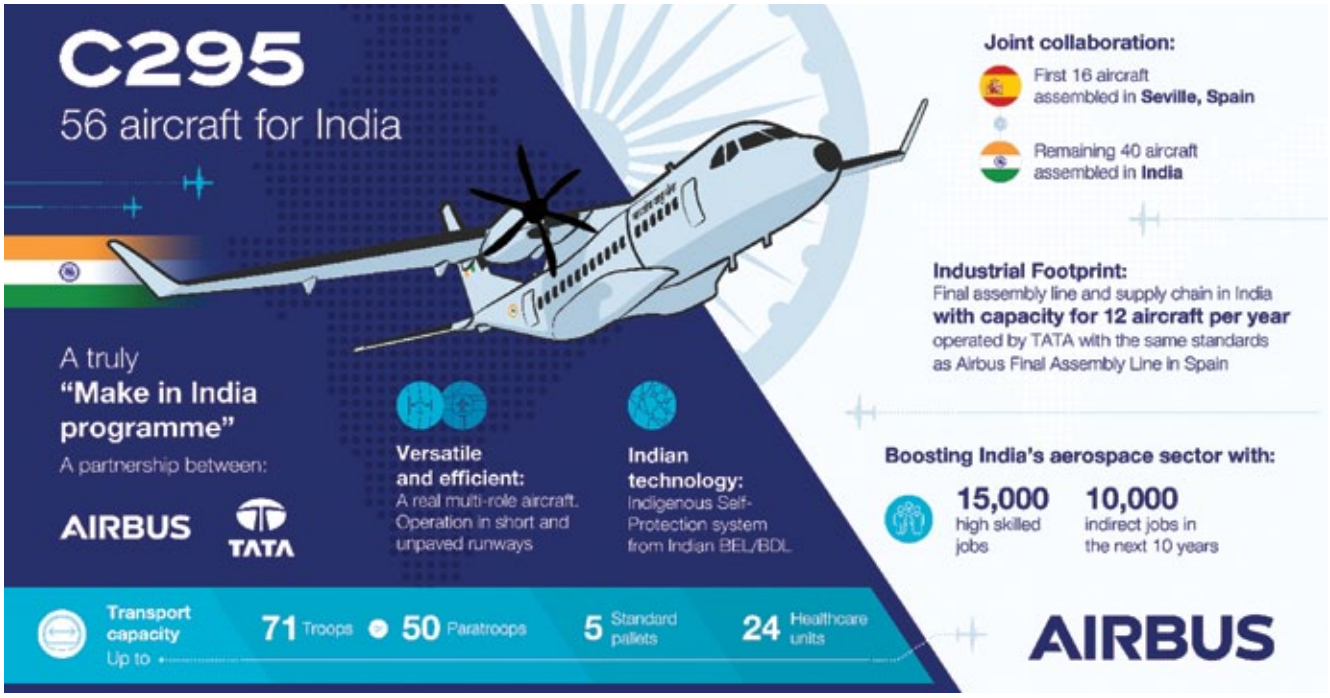
Under the contractual agreement, Airbus will deliver the first 16 aircraft in 'fly-away' condition from its final assembly line in Seville, Spain. The subsequent 40 aircraft will be manufactured and assembled by the Tata Advanced Systems (TASL) in India as part of an industrial partnership between the two companies.

The first 16 aircraft will be delivered over four years after the contract implementation. All the IAF C295s will be handed over in transport configuration and equipped with an indigenous Electronic Warfare Suite.

"This contract will support the further development of India's aerospace ecosystem, bringing investment and 15,000 skilled direct jobs and 10,000 indirect positions over the coming 10 years," stated Michael Schoellhorn, CEO of Airbus Defence and Space. "The C295 has proven again as the segment leader, and with the addition of India as a new operator, the type will enlarge its footprint even more, not only on the operational aspects but on its own industrial and technological development".

Sukaran Singh, Managing Director and Chief Executive Officer, Tata Advanced Systems Limited, stated, "This is a moment of pride for Tatas and a milestone for the Indian military manufacturing ecosystem. For the first time, an Indian private company will be wholly manufacturing an aircraft in India. This endeavour demonstrates Tata Advanced Systems' capabilities as a defence manufacturer to build globally competitive complex platforms in India."

Signing of the contract between all parties involved



'Make in India' is at the heart of Airbus strategy in India, with the company constantly increasing the country's contribution to its global product portfolio. The C295 programme will see Airbus bring its complete bouquet of world-class aircraft manufacturing and servicing to India in collaboration with our industrial partners, including the Tatas and leading defence public sector units such as Bharat Electronics Ltd. and Bharat Dynamics Ltd, as well as private Micro, Small and Medium Enterprises.

With a proven capability of operating from short or unprepared airstrips, the C295 is used for tactical transport of up to 71 troops or 50 paratroopers, and for logistic operations to locations that are not accessible to current heavier aircraft. It can airdrop paratroops and loads, and also be used for casualty or medical evacuation (medevac), as demonstrated during the COVID-19 crisis, using either basic litters or mobile intensive care units (ICU) with life support equipment. The aircraft can perform special missions as well as disaster response and maritime patrol duties.

The IAF becomes the 35th C295 operator worldwide, with the programme reaching 278 aircraft, 200 of which are already in operation and have booked more than half a million flight-hours.

Michael Schoellhorn, CEO of Airbus Defence and Space: "Great news from India where we just signed a contract for 56 C295 aircraft. With this, India will soon become the world's biggest C295 operator. This plane is a true European industrial success story and we're proud to work with our partner Tata in India".

Jean-Brice Dumont, Executive Vice President Military Aircraft, Airbus Defence & Space: "The C295 programme will provide the Indian Air Force with a proven platform, an aircraft that is operating globally and has booked more than 500,000 flight hours in service in all kind of environments. With this highly expected and key contract the C295 family grows up to 35 operators around the globe and continues building upon its strengths as the global reference in its segment."

Venkat Katkuri, Head of Defence and Space, Airbus India & South Asia: "This programme has been in the works for some time now and I want to extend my sincere gratitude to the IAF, MoD and all other Government of India stakeholders for placing their trust in Airbus. We are looking forward to operationalising the project in partnership with the Tata's and engaging more deeply with the Indian industrial ecosystem. Airbus will strive through this and future programmes to develop the local industry and integrate them into our global supply chain under the vision of 'Atmanirbhar Bharat'. As an Indian and as Airbus I am eager to see the Indian industry claim its place on the global stage through this unique 'Make in India' programme."

Remi Maillard, President and MD, Airbus India & South Asia: "The signing of the C295 contract marks a new dawn in India's defence industry. The programme will put India on the global map of prominent aircraft manufacturing countries, serving not only the Indian Air Force well but also the Government of India's vision of an Atmanirbhar Bharat. Airbus will bring its complete bouquet of world-class aircraft manufacturing and servicing to India in collaboration with our industrial partners, including Tata, leading defence public sector units such as BEL and BDL, as well as private MSMEs."

Sights and sounds over Sukhna Lake, Chandigarh
IAF CH-47F Chinook and Rafale enthrall spectators








All photos taken by Sujan Singh Chopra on 22 September 2022

Commissioning of INS Vela

A group photo of the commissioning crew of INS Vela with Admiral Karambir Singh, Chief of the Naval Staff and other senior military and civil dignitaries

The Scorpene is a 2000 tonne conventional-propulsion submarine designed and developed by Naval Group for all types of missions, such as surface vessel warfare, anti-submarine warfare, long-range strikes, special operations or intelligence gathering. Extremely stealthy and fast, it has a level of operating automation that allows a limited number of crew, which reduces its operating costs significantly. Its combat edge is highlighted by the fact that it has 6 weapon launching tubes, 18 weapons (torpedoes, missiles, mines). These submarines have a state of the art sonar and sensor suite permitting 'outstanding operational capabilities'. They also have an advanced Permanent Magnetic Synchronous motor (PERMASYN) as its propulsion motor.

Admiral Karambir Singh, Chief of the Naval Staff interacts with the media

The naval ensign hoisted onboard INS Vela along with ceremonial dressing overall upon commissioning

On 25 November 2021, INS Vela, the fourth P75 Kalvari-class submarines, was commissioned within the Indian Navy in presence of Mazagon Dock Shipbuilders Limited (MDL) Chairman & Managing Director, Vice Admiral Narayan Prasad (Retd.) and several other dignitaries. The event was also attended by Naval Group's Executive Vice President for International Development, Mr Alain Guillou and the local teams. INS Vela is built by Indian shipyard MDL based on the Naval Group Scorpene design and is the second Kalvari-class submarine to be commissioned in 2021.

Launched on 6 May 2019, INS Vela successfully completed all major sea trials including weapon and sensor trials, despite Covid restrictions, and was delivered to the Indian Navy on 9 November 2021. She joins INS Kalvari, Khanderi and Karanj which were commissioned respectively in December 2017, September 2019 and March 2021. The commissioning of INS Vela highlights the success of indigenous submarines construction programme of the Government of India. This submarine has been completely built by Mazagon Dock Shipbuilders Limited (MDL) taking advantage of the successful technology transfer from Naval Group during the construction and trials of the first three boats. Six submarines of the P75 programme have been fitted with a number of equipment, built in India by qualified and highly trained industrial Micro, Small & Medium Enterprises (MSMEs) which form the sound base of submarine building ecosystem of India.

Admiral Karambir Singh, Chief of the Naval Staff unveils the commissioning plaque of INS Vela

IAI and DRDO's MRSAM for India

MRSAM is an advanced, groundbreaking air and missile defence system, jointly developed by IAI and DRDO for the Indian Armed Forces. During development, IAI collaborated with Israeli and Indian industries, including Rafael, Tata, BEL, L&T, BDL and many private vendors. The system provides the ultimate protection against a variety of aerial platforms. It is used by the Indian Air Force, the Indian Armed Forces, Indian Navy, Air force and the Israeli Defence Force. The system incorporates an advanced phased array radar (MF-STAR or digital MMR), a command and control centre, mobile launchers and interceptors and an advanced RF seeker.

Last year, IAI and the DRDO concluded successful tests of the system at a test range in India. The flight test demonstrated several extreme reference scenarios, validating the system's capabilities. As part of the test, the MRSAM interceptor was launched from a land-based mobile launcher and successfully hit its threats. The scenario began with the system's digital MMR radar zeroing in on the threat and then launching the MRSAM interceptor toward its operational trajectory. The interceptor acquired the target and successfully intercepted it

IAI has always been one of the main pillars in supplying strategic and advanced equipment to India, providing cutting-edge technology for land, maritime, aerospace, and homeland security. IAI's systems, such as the unmanned aerial systems (UAS), radars, special-mission aircraft and air defence systems, have been in use in India for many years and with high levels of satisfaction from our customers.

In the recent decade, IAI entered into more and more strategic collaborations with local Indian firms, both PSU and private, in order to integrate strategic state-of-the-art systems for India's Ministry of Defence in various fields and in accordance with the Make in India policy.

MRSAM trials

Barak ER

In 2021, IAI kept the same policy and expand our collaborations with local Indian defence companies to be significant and important partners.

During the Covid-19 pandemic, IAI continued bilateral work in India. Our professional crews in Bangalore and New-Delhi supported all relevant projects. In addition, we advanced our mutual partnerships with local Indian industries with no interruption, according to 'Make in India' policy.

IAI is home to the world's most advanced UAV's and keeps its systems updated with the requirements of the modern battlefield. Today we propose an improved propulsion system, advanced avionics, completely automatic remote takeoff and landing, a wide range of possible payloads weighing up to a ton, a maximum flight altitude of 45,000 feet, advanced satellite communications systems and capability to complete long range stand-off missions in difficult regions and under extreme weather conditions. In addition, we offer upgrades to the command and control centre, to an advanced control center equipped with a user friendly touch screen and vocal notifications and commands.

Text and photos: IAI

Lockheed Martin hosts its 8th Annual Suppliers Conference

Reinforcing its commitment to Indian government's initiatives such as 'Make in India' and 'Aatmanirbhar Bharat', Lockheed Martin announced the culmination of the 8th edition of its annual Suppliers Conference on 11 November 2021.

Themed "Partnership for Aatmanirbhar Bharat and Make for the World", the two-day conference was hosted in association with Society of Indian Defence Manufacturers (SIDM) and Confederation of Indian Industry (CII). The event saw 135 companies of all sizes large, MSMEs and start-ups participating in the conference and receiving the opportunity to showcase their company to key stakeholders from the government and industry. More than 250 delegates participated in person while more than 200 delegates participated virtually through Society of Indian Defence Manufacturers CII Hive platform. The two-day event also saw more than 110 business to business meetings organised.

Mr. Murugesh R Nirani, Minister for Large & Medium Scale Industries, Government of Karnataka was the chief guest at the inaugural session of the conference on 10 November 2021 wherein he reiterated the role played by Karnataka in creating an aerospace and defence ecosystem in India. The session was also addressed by representatives from Lockheed Martin, Ministry of Defence, Society of Indian Defence Manufacturers and Confederation of Indian Industry.

Lockheed Martin RMS Global Supply Chain organisation and the Aegis Programme Office recognised SASMOS HET Technologies Limited for its outstanding support, dedication and commitment to the success of the Aegis Low Noise Amplifier (LNA) programme in the presence of Mr. Murugesh R Nirani.

"In line with Prime Minister Narendra Modi's clarion call for creating an Aatmanirbhar Bharat in defence manufacturing, Lockheed Martin continues to support the growth of an indigenous defence manufacturing ecosystem in India," stated William L. Blair, Vice President and Chief Executive, Lockheed Martin India.

Photo: Ralph Duenas

"Hosting the annual Suppliers Conference is one such initiative from our end to advance the defence, aerospace and start-up ecosystem in India, and strengthen the country's strategic security and industrial capabilities," Blair said. "Like previous editions, this year too, we saw an encouraging response from our supply chain network, MSMEs, start-ups and the industry at large who contributed to productive conversations on realising the government's vision of Make in India, Make for the World."

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

A key announcement from the event was Lockheed Martin's partnership with Bengaluru-based Rossell Techsys for work on the company's MH-60R helicopters. Rossell Techsys has been awarded a contract with Lockheed Martin to build Electrical Wire Harness and Interconnect System (EWIS) parts in support of Lockheed Martin's MH-60R helicopter that are being supplied to the Indian Navy. As part of the contract received from Lockheed Martin, Rossell Techsys shall perform "Build to Print" (BTP) manufacture of the wire harnesses that will be installed on the MH-60R. Manufacture of these parts is being performed in the "Centre of Excellence" (COE), set up by Rossell Techsys for Lockheed Martin platforms. The manufacture of parts has commenced, with the first parts having successfully undergone acceptance by Lockheed Martin. The contract shall also enable Lockheed Martin to obtain offset credits towards this platform sale.

Lockheed Martin also highlighted that the company was working with the US Government to secure licenses to allow parts for the Legion-ES infrared search and track sensor system and Sniper Advanced Targeting Pod to be manufactured in India and has plans to start sending out requests for quotations before the end of the year.

The event reiterated Lockheed Martin's resolve to develop the capabilities of suppliers and to give them access to the global supply chain to manufacture in India, from India, for India and the world.

Sniper Advanced Targeting Pod

Commissioning of Visakhapatnam and Vela

November was a landmark month for the Indian Navy with commissioning of 'Visakhapatnam', the first stealth guided missile destroyer ship of the Project 15B in the presence of Raksha Mantri Mr. Rajnath Singh on 21 November 2021. Commissioning of Vela, the fourth submarine of Project-75 took place on 25 November 2021 and the Chief Guest for the event was Chief of Naval Staff. This was followed by the launch of first ship of Survey Vessel Large project, Sandhayak in early December 2021.

Visakhapatnam has been constructed using indigenous steel DMR 249A and is amongst the largest destroyers constructed in India with an overall length of 163m and displacement of over 7400 tonnes. The ship has a significant indigenous content of approximately 75% contributing towards AtmaNirbhar Bharat. The ship is a potent platform capable of undertaking multifarious task and missions spanning the full spectrum of maritime warfare. Visakhapatnam is equipped with array of weapons and sensors, which includes supersonic surface-to-surface and surface-to-air missiles, medium and short-range guns, anti-submarine rockets and advanced electronic warfare and communication suite. The ship is propelled by a powerful combined gas and gas propulsion which enables her speed of over 30 knots. The ship has the capability of embarking two integrated helicopters to further extend her reach. The ship boasts of a very high level of automation with sophisticated digital networks, Combat Management System and Integrated Platform Management System.

Six submarines are being constructed under the Project-75 and with the commissioning of Vela, the project will have crossed the half way mark. These submarines are being constructed at MDL and construction is based on the French Scorpene class design (Naval Group, the French collaborator for this project). The submarine has been slotted to join the submarine fleet of the Western Naval Command. The indigenous construction of submarines is indicative of the maturity of the Indian construction capability as well as the realisation of 'Atma-Nirbharta'. Vela is the fourth submarine and has completed most of its trials and is combat worthy and ready to take on operational tasking.

'Sandhyak' is the first of the four Survey Vessels (Large) (SVL) Project being built by Garden Reach Shipbuilders & Engineers (GRSE), Kolkata for Indian Navy. The contract for building four SVL ships was signed between MoD and GRSE on 30 October 2018. These large Survey ships envisaged to replace the existing Sandhayak Class survey ships are equipped with new generation hydrographic equipment including AUVs, ROVs, 11m survey boats and advanced indigenous data acquisition systems to collect and analyse for collecting oceanographic and geophysical data in the Indian Ocean Region.

The curtain raiser for the commissioning ceremony and the launch was held on 16 November 2021 by VAdm SN Ghormade, the Vice Chief of Naval Staff (VCNS) with Chief of Materiel, Controller of Warship Production & Acquisition, Director General of Naval Design, Assistant Chief of Naval Staff (Submarines), Assistant Chief of Naval Staff (Policy & Plans), Director (Submarines & Heavy Engineering), MDL and Director (Shipbuilding), GRSE in attendance. Speaking on the occasion, the VCNS stated that the event highlighted the capability and capacity of, not just the Indian Navy but also of MDL, Original Equipment Manufacturers (OEMs) and MSMEs in realising the National Objectives of "Make in India" and "AtmaNirbhar Bharat".

On the occasion, VCNS also brought out that presently, 39 naval ships and submarines were being constructed at various shipyards. This in turn had created enormous opportunities for not only the indigenous shipbuilding industry but also the associated support industries.

VCNS also brought out that the commissioning ceremony also coincided with the 'Azadi ka Amrit Mahotsav' and 'Swarnim Vijay Varsh' celebrations, and the induction of INS Visakhapatnam and INS Vela, was thus not only another step towards strengthening our defence preparedness but also "our humble tribute to the sacrifices made by our freedom fighters for the independence of the nation and our brave soldiers during the 1971 War".

INS Visakhapatnam (P-15B) commissioned into Indian Navy

INS Visakhapatnam, a P15B stealth guided missile destroyer, was commissioned into the Indian Navy in the presence of Raksha Mantri Mr. Rajnath Singh at the Naval Dockyard, Mumbai on 21 November 2021. The event marked the formal induction of the first of the four 'Visakhapatnam' class destroyers, indigenously designed by the Indian Navy's in-house organisation Directorate of Naval Design and constructed by Mazagon Dock Shipbuilders Limited, Mumbai.

In his address, the Raksha Mantri termed INS Visakhapatnam as a symbol of the growing maritime prowess of the country and a major milestone in achieving Prime Minister Mr. Narendra Modi's vision of 'Make in India, Make for the World'. He added that the ship is a reminder of ancient and medieval India's maritime power, shipbuilding skills and glorious history. Mr. Rajnath Singh exuded confidence that the state-of-the-art ship, equipped with latest systems and weapons, would strengthen the maritime security and protect the interests of the Nation. He defined the ship as one of the most technologically advanced guided missile destroyers in the world which would cater to the present and future requirements of the Armed Forces and the Nation as a whole.

Mr. Rajnath Singh appreciated the self-reliance efforts of the Indian Navy, terming Navy's order of 39 of the 41 ships and submarines from Indian shipyards as a testament to their commitment towards achieving 'Aatmanirbhar Bharat'. He described the development of Indigenous Aircraft Carrier 'INS Vikrant' as an important milestone in their path to achieve 'Aatmanirbharta'. "The carrier will increase our reach from the Indian Ocean to the Pacific and Atlantic Ocean. Its commissioning will be a golden moment in the history of the Indian Defence. It will be the best occasion to celebrate the 75th anniversary of India's independence and the 50th anniversary of India's victory in 1971 war," he stated.

The Raksha Mantri praised the Indian Navy's consistent efforts to participate in various outreach programmes of the industries and increase indigenised items under 'Float', 'Move' and 'Fight' categories.

Saying that global security reasons, border disputes and maritime dominance have forced countries to move towards strengthening their military power, Mr. Rajnath Singh exhorted the public and private sector to take advantage of Government's policies, work together and make India an indigenous shipbuilding hub. He listed out a number of reforms undertaken by the Government through which the public and private sector companies can make their mark in the

international market. The steps include simplification of licensing process; speeding up Acceptance of Necessity (AoN) & Request for Proposal (RFP) process; setting up of Defence Industrial Corridors in Uttar Pradesh & Tamil Nadu; positive indigenous lists of over 200 items; Defence Acquisition Procedure 2020 and earmarking around 64 per cent of its modernisation funds under capital acquisition budget for 2021-22 for procurement from domestic companies.

The Raksha Mantri lauded the Indian Navy for taking forward the Prime Minister's vision of SAGAR (Security and Growth for All in the Region) with the spirit of friendship, openness, dialogue and co-existence with the neighbours.

INS Visakhapatnam measures 163m in length, 17m in breadth with a displacement of 7,400 tonnes and can rightfully be regarded as one of the most potent warships to have been constructed in India. The ship is propelled by four powerful Gas Turbines, in a Combined Gas and Gas (COGAG) configuration, capable of achieving speeds in excess of 30 knots. The ship has enhanced stealth features resulting in a reduced Radar Cross Section (RCS) achieved through efficient shaping of hull, full beam superstructure design, plated masts and use of radar transparent materials on exposed decks.

The ship is packed with sophisticated state-of-the-art weapons and sensors such as Surface-to-Surface missile and Surface-to-Air missiles. It is fitted with a modern surveillance radar which provides target data to the gunnery weapon systems of the ship. The anti-submarine warfare capabilities are provided by the indigenously developed rocket launchers, torpedo launchers and ASW helicopters. The ship is equipped to fight under Nuclear, Biological and Chemical (NBC) warfare conditions.

A unique feature of this ship is the high level of indigenisation incorporated in the production, accentuating the national objective of 'Aatmanirbhar Bharat'. Some of the major indigenised equipment/ system onboard INS Visakhapatnam include Combat Management System, Rocket Launcher, Torpedo Tube Launcher, Integrated Platform Management System, Automated Power Management System, Foldable Hangar Doors, Helo Traversing system, Close-in Weapon System and the Bow mounted SONAR.

Named after the historic city of Andhra Pradesh on the east coast, Visakhapatnam, the 'City of Destiny', the ship has a total complement of about 315 personnel. Enhanced crew comfort is a significant feature of INS Visakhapatnam, which has been ensured through ergonomically designed accommodation based on 'modular' concepts. The ship will be under the command of Captain Birendra Singh Bains, a Navigation and Direction specialist.

Chief of the Naval Staff Admiral Karambir Singh, Member of Parliament Arvind Sawant, Flag Officer Commanding-in-Chief, Western Naval Command Vice Admiral R Hari Kumar, Chairman & Managing Director, Mazagon Dock Shipbuilders Limited Vice Admiral Narayan Prasad (Retd) and other senior civil & military officials of Ministry of Defence were present during the commissioning ceremony of INS Visakhapatnam.

(All photos: Indian Navy and MoD)

2nd sea trials of IAC

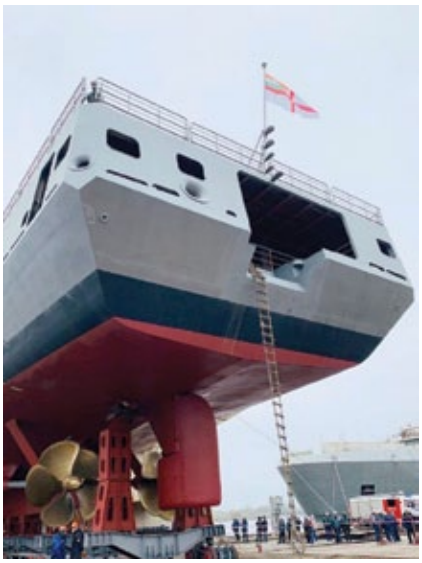
Mr. Sarbananda Sonowal, Minister of Ports, Shipping and Waterways visited the Indigenous Aircraft Carrier (IAC) 'Vikrant' during sea trials on 31 October 2021. The ship had sailed out for the second Sea Trials on 24 October 2021. The maiden sea sortie of the ship was successfully undertaken on 21 August 2021. During the maiden Sea Trials, ship's performance, including hull, main propulsion, PGD and auxiliary equipment was satisfactory.

The IAC designed by Indian Navy's Directorate of Naval Design (DND) is being built at Cochin Shipyard Limited (CSL), a Public Sector Shipyard under the Ministry of Ports, Shipping & Waterways (MoPS&W). The indigenous design and construction of the aircraft carrier by Indian Navy and Cochin Shipyard Ltd. is a shining example in the Nation's quest for AatmaNirbhar Bharat and 'Make in India' initiative with more than 76% indigenous content. This has led to growth in indigenous design and construction capabilities, besides development of large number of ancillary industries, with employment opportunities for over 2000 CSL personnel and about 12000 employees in ancillary industries.

Indigenous content towards procurement of equipment, besides work by CSL and their subcontractors is being directly invested back into the Indian economy. Around 550 Indian firms including about 100 MSMEs are registered with CSL, who are providing various services for construction of IAC.

The ship is now progressing with 2nd phase of Sea Trials, during which detailed trials and testing of propulsion machinery, electrical and electronics suites, deck machinery, lifesaving appliances and ship systems is being progressed.

Launch ceremony of Tushil (P1135.6) follow-on frigate for the Indian Navy

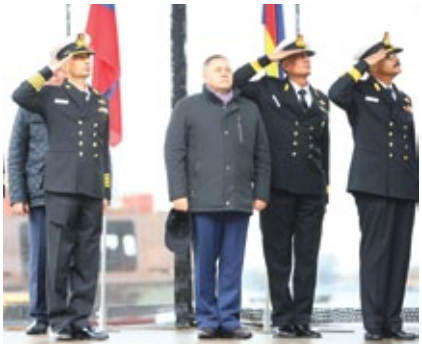


The 7th Indian Navy frigate of P1135.6 class was launched on 28 October 2021 at Yantar Shipyard, Kaliningrad, Russia in the presence of HE D. Bala Venkatesh Varma, Ambassador of India (Moscow) and senior dignitaries of the Russian Federation and officials of the Indian Navy. During the ceremony, the ship was formally named as 'Tushil' by Mrs. Datla Vidya Varma. Tushil is a Sanskrit word meaning Protector Shield.

Based on an Inter-Governmental Agreement (IGA) between the Government of Republic of India and Government of Russian Federation for construction of two ships of Project 1135.6 ships in Russia and two ships in India at Goa Shipyard Limited (GSL), the contract for construction of two ships was signed between India and Russia in October 2018.

The construction of these ships is based on Indian Navy's specific requirements to meet the entire spectrum of naval warfare in all three dimensions of air, surface and sub-surface. The ships with a potent combination of state-of-art Indian and Russian weapons and sensors are equipped to operate in littoral and blue waters, both as a single unit and as consort in a naval task force. They feature "stealth technology" in terms of low radar and under water noise signatures. These ships are being equipped with major Indian supplied equipment such as surface to surface missiles, sonar system, surface surveillance radar, communication suite and ASW system along with Russian surface to air missiles and gun mounts.

Mr Ilya Samarin, Director General, Yantar Shipyard, Kaliningrad, in his address dwelt upon the challenges faced by the Shipyard in executing the complex shipbuilding project. Despite challenges posed by the ongoing pandemic, production of the ships was continued by utilisation of innovative solutions. He thanked the Indian Government for their unstinted support and reiterated shipyard's commitment to deliver the ships as per contractual timelines. HE D. Bala Venkatesh Varma, Ambassador of India (Moscow), highlighted the long standing tradition of Military Technical Cooperation between India and Russia. He acknowledged the efforts put in by the Yantar Shipyard to ensure that the ship was launched as per contractual timelines overcoming the challenges imposed by COVID-19.



Delivery of Y 12704 First ship of Project 15B for the Indian Navy

Y12704 (Visakhapatnam), the lead ship of Project 15B stealth guided missile destroyers being built at Mazgaon Docks Limited (MDL), was delivered to the Indian Navy on 28 October 2021. The contract for four ships of Project 15B, as the Visakhapatnam class ships are known, was signed on 28 January 2011. This project is a follow-on of the Kolkata class (Project 15A) destroyers commissioned in the last decade.

Designed by Directorate of Naval Design, Indian Navy's in-house design organisation; and built by Mazagon Dock Shipbuilders Ltd, Mumbai; the four ships are christened after major cities from all four corners of the country viz. Visakhapatnam, Mormugao, Imphal and Surat. The keel of Visakhapatnam was laid in October 2013 and the ship was launched in April 2015. The design has largely maintained the hull form, propulsion machinery, many platform

equipment and major weapons and sensors as the Kolkata class to benefit from series production.

The 163 metres long warship has a full load displacement of 7400 tonnes and maximum speed of 30 knots. The overall indigenous content of the project is approximately 75%. Apart from myriad indigenous equipment in the 'Float' and 'Move' categories, the destroyer is also installed with major indigenous weapons which include:

Medium Range Surface-to-Air Missiles (BEL, Bangalore).

BrahMos Surface-to-Surface Missiles (BrahMos Aerospace, New Delhi).

Indigenous Torpedo Tube Launchers (Larsen & Toubro, Mumbai).

Anti-Submarine Indigenous Rocket Launchers (Larsen & Toubro, Mumbai).

76mm Super Rapid Gun Mount (BHEL, Haridwar).

The delivery of Visakhapatnam is an affirmation of the impetus being given by the Government of India and the Indian Navy towards 'Aatma Nirbhar Bharat' as part of 75 years of Indian Independence.

IAI upgrading Indian Navy's Ka-28 helicopters

IAI's Skimmer ASW/ASuW Maritime Mission Suite to be fitted on Ka-28 helicopters of the Indian Navy

According to some buzz/sources and overheard at the recently concluded MAKS Moscow Airshow in July 2021, as part of the life extension programme of the Indian Navy's Kamov 28 helicopter fleet, the technical life extension of the platform is to be performed by the OEM (Kamov) in Russia, while the integration of the advanced maritime mission suite will be performed by Israel Aerospace Industries Ltd. in India.

As part of the programme, the helicopters will be equipped with IAI's advanced Skimmer solution for addressing all modern naval ASW/ASuW challenges. The Skimmer package includes sensors and systems such as advanced Sonar & Sonobuoys, Radar, ESM, Data Link, communication, operator stations, weapons integration and more. The Skimmer integrates together advanced mission systems, sensors and avionics such as: Radar, Electronic Warfare Support Measures (ESM), Electro Optic Payloads, Datalink, Communication Intelligence (COMINT), Sonar, Sonics, Mission Management and Monitoring Systems, Anti-Ship Missiles (ASM) as well as other Weapons. The Skimmer meets the specific naval helicopter mission requirements for Anti-Submarine Warfare (ASW), Anti Surface Warfare (ASuW), Coastguard Protection, Special Operations, Amphibious Assault, and more.

"The extremely cost-effective, optimised Skimmer Naval Helicopter Packages have the flexibility and growth potential to be adapted to the continually changing operational requirements", according to IAI officials.

The Indian Navy has been operating the Kamov-28 helicopters for years and the helicopter is considered reliable and dependable. Once the task is completed, IAI's Skimmer package will place the enhanced helicopters at the forefront of marine battle technology for years to come.

Highlights

- State-of-the-art Radar
- Acoustic (Sonar, Sonics, Sonobuoys)
- Electro Optic Payload
- EW (ESM, Missile Warning)
- Mission Management and Monitoring Station
- Weapons (ASM and other Missiles)
- Advanced Avionics
- NAV/COM (AIS, IFF, Satcom, Datalink)

(Photos of Ka-28 by Simon Watson)

Indian Navy expands maritime reconnaissance capabilities with delivery of 11th P-8I

Boeing is continuing to expand the Indian Navy's long-range maritime reconnaissance anti-submarine warfare capabilities with the delivery of the country's 11th P-8I on 18 October 2021. The patrol aircraft is an integral part of the Indian Navy's fleet and has surpassed 30,000 flight hours since it was inducted in 2013.

This is the third aircraft to be delivered under an option contract for four additional aircraft that the Indian Ministry of Defence awarded in 2016. The Indian Navy was the first international customer for the P-8 and today operates the largest non-US fleet. The P-8 is also operated by the US Navy, the Royal Australian Air Force and the United Kingdom's Royal Air Force.

In addition to maritime reconnaissance and anti-submarine warfare capabilities, the P-8I has been deployed to assist during disaster relief and humanitarian missions.

Boeing is supporting India's growing P-8I fleet by providing training of Indian Navy flight crews, spare parts, ground support equipment and field-service representative support. Boeing is completing construction on the Training Support & Data Handling (TSDH) Centre at INS Rajali, Arakkonam, in Tamil Nadu, and a secondary centre at the Naval Institute of Aeronautical Technology, Kochi, as part of a training-and-support package contract signed in 2019. The indigenous, ground-based training will allow the Indian Navy crew to increase mission proficiency in a shorter time, while reducing the on-aircraft training time resulting in increased aircraft availability for mission tasking.

Boeing's aircraft and services play an important role in mission-readiness for the Indian Air Force and Indian Navy. Boeing is focused on delivering value to Indian customers with advanced technologies and is committed to creating sustainable value in the Indian aerospace sector – developing local suppliers, and shaping academic and research collaborations with Indian institutions. Boeing has strengthened its supply chain with more than 275 partners in India and a joint venture to manufacture fuselages for Apache helicopters. Annual sourcing from India stands at approximately $1 billion. Boeing currently employs 3,000 people in India, and more than 7,000 people work with its supply chain partners.

India's MoD signs contract for procurement of arms for P-8I

The Indian Ministry of Defence signed a contract on 21 October 2021 with the US Government under Foreign Military Sale (FMS) for procurement of MK 54 Torpedo and Expendable (Chaff and Flares) for the Indian Navy at a cost of Rs. 423 Crores. These weapons are the outfit of the P-8I which is used for Long range Maritime Surveillance, Anti-Submarine Warfare and Anti-Surface Warfare (ASV).

Rolls-Royce keen to partner the Indian Navy's electrification journey for its 'Fleet of the Future'

Kishore Jayaraman, President – India and South Asia, Rolls-Royce and Abhishek Singh, Senior Vice President – Defence, India and South East Asia, Rolls-Royce in a virtual press conference with the media

As part of the UK's Carrier Strike Group tour, Rolls-Royce showcased to Indian Navy customers its capabilities to design, build and deliver customised power and propulsion solutions for India's naval modernisation requirements. The company also expressed its keenness to explore opportunities for partnering the Navy with end-to-end solutions for electrification of India's future warships.

Speaking about tour, Kishore Jayaraman, President– India and South Asia, Rolls-Royce stated, "As India envisions the fleet of the future, our commitment to support the country's defence modernisation and self-reliance goals remains as strong as ever. The Carrier Strike Group tour is a significant opportunity for Rolls-Royce to showcase the results of decades of innovation in naval power and propulsion. Our experience of supporting the electrification of the Royal Navy's warships over many years is of particular significance, including the design and deployment of the world's first hybrid-electric naval system. We believe that we can bring great learnings and value to any future programme envisioned by the Indian Navy for developing electric warships."

Rolls-Royce is the only manufacturer in the world that has provided navalised marine gas turbine generators into front-line integrated full electric propulsion (IFEP) powered destroyers and aircraft carriers. Being a key member of the Power and Propulsion Sub-Alliance, Rolls-Royce was responsible for the design, procurement, manufacture, integration, test and delivery of the Queen Elizabeth Carrier ships' power and propulsion system, which includes the mighty MT30 marine gas turbine and a low voltage electrical distribution system.

Abhishek Singh, Senior Vice President– Defence, India and South East Asia, Rolls-Royce stated, "The HMS Queen Elizabeth visiting India is one of the finest examples of technological excellence in naval warfare. We are looking forward to familiarising our Indian customers with Rolls-Royce's capabilities aboard this majestic warship and to explore areas for collaboration to further strengthen the might and range of the Indian Navy."

What's on-board the mighty Queen Elizabeth Class carriers

The Royal Navy's new Queen Elizabeth Class (QEC) aircraft carriers operate an IFEP system that is one of the most advanced propulsion systems offering increased power, flexibility and reliability – best suited for large warships. It provides two MT30 marine gas turbine alternators per ship, rated at 36MW, with the power to propel these vessels beyond 25knots. The MT30 alone delivers huge design benefits through its power density, significantly reducing the number of gas turbines required to power advanced naval platforms. The MT30 also guarantees its power throughout the 50-year service life expectancy of the ship. The QEC also feature a complete Rolls-Royce low voltage (LV) electrical distribution system that distributes enough electricity to power the equivalent of 5,000 family homes.

As electrical power system integrators, Rolls-Royce provides solutions for both hybrid and all-electric naval vessels, optimising performance to satisfy electrical load demands of the future such as advanced sensor, propulsion and combat systems. It is also an experienced provider of low voltage (LV) electrical power distribution systems for a range of warship and submarine applications.

MBDA's partnership with the Indian Navy

Sea Ceptor system performing a rapid salvo firing

With a strong reputation as a reliable partner that has supported the Indian Navy for over 50 years, European missile firm MBDA understands the importance of operational capability and sovereignty to the Indian Navy.

MBDA continues to deepen its relationship with Indian industry, as seen by the recent formation of a joint venture with long-standing partner Larsen & Toubro to deliver a series of important missile programmes under the Make in India category.

The highlight of these is that Larsen & Toubro MBDA Missile Systems Ltd (LTMMSL) is currently offering Sea Ceptor, the latest generation proven all-weather air defence system, for the Indian Navy's Short Range Surface to Air Missile (SRSAM) requirement.

Armed with highly advanced new technologies but proven and in-service today, Sea Ceptor would provide Indian Navy ships with complete protection against all known and projected air targets including saturation attacks across 360° simultaneously. Sea Ceptor utilises the CAMM missile that features a next generation all-weather fully active radio frequency-seeker, two-way datalink and soft- vertical launch system to provide a step-change in performance compared with previous generation systems.

Sea Ceptor protects both the ship armed with the system and enables that ship to also protect other vessels, including high value units such as aircraft carriers. The weapon system has the capability to intercept and thereby neutralise the full range of current and future threats, including combat aircraft and the new generation of sea skimming supersonic anti-ship missiles cruising. With Sea Ceptor having no minimum engagement altitude – it also able to engage surface targets such as fast attack craft – the system provides an impenetrable barrier to all threats.

MBDA also has a strong pedigree as a provider of the latest and most capable aircraft weaponry, having provided a number of different strike and air-to-air weapon systems that have provided excellent front-line capability to the Indian Naval Air Arm over the years such as the Magic II air-to-air missiles on Sea Harrier, or the Sea Eagle anti-ship missile that armed a number of Indian Naval Air Arm aircraft.

MBDA produces a number of weapon systems that are already in the inventory of the Indian Armed Forces that could be invaluable to current or future carrier based combat aircraft of the Indian Navy. This includes air-to-air weapons such as the famous Meteor beyond visual range air-to-air missile, the MICA and ASRAAM close combat air-to-air missile, or the Mistral ATAM air-to-air missile system for helicopters. For anti-ship and strike roles there is also the AM39 version of the Exocet missile that can arm a wide array of maritime aircraft, from naval fighter aircraft to maritime patrol aircraft and naval helicopters.

Boris Solomiac, MBDA General Delegate India

Fly Navy Fly!

Navy Chief Admiral Karambir Singh presented the book to the Supreme Commander, President Ram Nath Kovind

India's Naval Air Arm turned 68 earlier this year, and none can contest that it has been vital since inception. From the liberation of Goa through to present-day natural disasters, naval aircraft — whether fighters, submarine-hunters, or helicopters — have been committed to operations across India and the region. In 2021, Indian Naval Aviation is celebrating its 'finest hour,' the strike operations conducted by the aircraft carrier INS Vikrant and her embarked Sea Hawk fighters and Alizé anti-submarine aircraft in the 1971 war. For this, and all their sterling contributions to the nation in times of war and peace over 68 years, Indian Naval Aviation was awarded the President's Colours on 6 September 2021 at INS Hansa, Goa.

The event also saw a comprehensive history of Naval Aviation released by Navy Chief Adm Karambir Singh, and presented to the Supreme Commander, President Ram Nath Kovind. The book 'Fly Navy, Fly' is an expanded update of Vayu founder-editor Pushpindar Singh's seminal 'Fly Navy,' first published in 2006. Co-authored with Angad Singh, the project was essentially a labour of love, involving over three years of meticulous research and photography across the length and breadth of India, to produce a work that would surpass the original in every aspect, and serve — in the words of the book's introduction — as a "tribute to the intrepid spirit of the men and women who ensure the Naval Ensign flies proud, from the wavetops to the skies." Containing vital inputs from Naval Air stalwarts such as Admiral Arun Prakash, a lavish cover designed by Angad Maolankar (also responsible for Vayu cover art) and a great deal of support from the Indian Navy, the release of Fly Navy, Fly was nevertheless a bittersweet event, marred by the absence of Pushpindar Singh, who was lost to the pandemic in May 2021.

Still, he was remembered fondly by serving and retired, civilian and uniformed alike at the Colours ceremony — a mark of the tremendous goodwill he enjoyed in the Indian aviation community. And he would doubtless be pleased that the final book to bear his name is devoted to an air arm he was incredibly passionate about, and his last published words are an exhortation to FLY NAVY!

Text: Angad Singh. All photos by Angad Singh except where mentioned

Co-author Angad Singh with 1971 War legend, Rear Admiral SK Gupta, MVC (Photo: Angad Maolankar)

Authors: Pushpindar Singh (L) and Angad Singh (R)

Fly Navy, Fly

Title: Fly Navy, Fly — A History of Indian Naval Aviation

Publisher: The Society for Aerospace Studies

ISBN: 978-93-82811-08-4

Pages: 188

Price: INR 1800

Some scenes from the day at INS Hansa, Goa

(All photos: Angad Singh)

Exercises and visits ... ... over the past few months

Exercise Indra Navy

The 12th edition of exercise Indra Navy, a biennial bilateral maritime exercise between Indian Navy and Russian Navy was held in the Baltic Sea from 28 to 29 July 2021. Initiated in 2003, Ex Indra Navy epitomises the long-term strategic relationship between the two navies. Indra Navy has matured over the years with increase in scope, complexity of operations and level of participation. The primary aim of this year's edition was to further consolidate inter-operability built up by the two Navies over the years and also to enhance understanding and procedures for multi-faceted maritime operations. The scope of this edition included wide-ranging and diverse activities across the spectrum of maritime operations.

The Indian Navy was represented by the stealth Frigate INS Tabar whilst the Russian Federation Navy was represented by Corvettes RFS Zelyony Dol and RFS Odintsovo of the Baltic Fleet. The exercise was progressed over two days and included various facets of fleet operations such as anti-air firings, underway replenishment drills, helicopter ops, boarding drills and seamanship evolutions.

Exercise Indra-21 (Army)

The Indo - Russia joint training Exercise INDRA 2021 commenced at Prudboy Ranges, Volgograd on 4 August 2021 with an impressive opening ceremony that saw the unfurling of the National Flags of both countries. The aim of the exercise was to facilitate joint training between Indian and Russian Armies to jointly plan and conduct counter terror operations under the United Nations mandate. The conduct of the exercise also entailed academic discussions between expert groups of both contingents. The exercise focussed on unit level joint planning and conduct of anti-terrorist operations and included cordon and search operations, intelligence gathering and sharing, perception management, humanitarian laws and hostage rescue in simulated settings.

Both the contingents, comprising of 250 soldiers from each side 'displayed great enthusiasm and professionalism' while practicing joint drills during the conduct of the exercise. During the validation phase, Mechanised Forces and Special Sorces practiced integrated live firing and specialised joint operations which included clearance of rebel stronghold in an urban setting. The troops not only learnt about each others organisations, but also exchanged ideas and best practices being followed in Peace Keeping Operations under aegis of the United Nations.

Indian Army participates at International Army Games, Russia

A 101 member contingent of the Indian Army proceeded to Russia to participate in the International Army Games 2021 from 22 August to 4 September 2021. The contingent participated in Army Scout Masters Competition (ASMC), Elbrus Ring, Polar Star, Sniper Frontier and Safe Route games showcasing various drills in High Altitude Area terrain, operations in snow, sniper actions, combat engineering skills in obstacle ridden terrain in the various competitions. The contingent also contributed two observers (one each) for the Open Water and Falcon Hunting games in which Pontoon Bridge laying and UAV crew skills were showcased by the participating teams.

INS Tabar exercises with French Navy

INS Tabar, on completion of port visit to Brest, France undertook a maritime partnership exercise with FNS Aquitaine, a French naval Frigate in the Bay of Biscay on 15 and 16 July 2021. A twin engine helicopter (NH 90) from FNS Aquitaine and four Rafale fighter aircraft from French Navy also participated in the exercise. A wide range of operations like Anti - Submarine, Surface Manoeuvers, Replenishment at Sea approach, Firing on target, Visit Board Search & Seizure (VBSS), Steam Past, Air Defence, Air Picture Compilation, Vertical Replenishment and crossdeck operations were exercised by the ships.

INS Talwar in Mombasa for Exercise Cutlass Express 2021

Indian Naval Ship Talwar participated in Exercise Cutlass Express 2021 from 26 July till 6 August along the East Coast of Africa. The exercise is an annual maritime exercise conducted to promote national and regional maritime security in East Africa and the Western Indian Ocean. The 2021 edition of the exercise involved participation of 12 Eastern African countries, US, UK, India and various international organisations like International Maritime Organisation (IMO), United Nations Office on Drugs and Crime (UNODC), Interpol, European Union Naval Forc (EUNAVFOR), Critical Maritime Routes Indian Ocean (CRIMARIO) and EUCAP Somalia. Indian Navy is participating in the exercise in a 'trainer role'.

The exercise focusses on East Africa's coastal regions and is designed to assess and improve combined maritime law enforcement capacity, promote national and regional security and increase interoperability between the regional navies.

36th edition of India–Indonesia CORPAT

Indian Naval Ship (INS) Saryu, an indigenously built Offshore Patrol Vessel undertook coordinated patrol (CORPAT) with Indonesian naval Ship KRI Bung Tomo on 30-31 July 2021. The 36th edition of CORPAT between India and Indonesia also witnessed participation of Maritime Patrol Aircraft from both nations. The exercise was conducted as a 'non-contact, at sea only' exercise in view of COVID-19 pandemic and highlighted the high degree of mutual trust and confidence, synergy and cooperation between the two friendly navies.

India and Indonesia have been carrying out Coordinated Patrols along the International Maritime Boundary Line (IMBL) twice a year since 2002, with an aim of keeping this vital part of the Indian Ocean Region safe and secure for commercial shipping, international trade and conduct of legitimate maritime activities. CORPATs help build understanding and interoperability between navies, and facilitate institution of measures to prevent and suppress Illegal Unreported Unregulated (IUU) fishing, drug trafficking, maritime terrorism, armed robbery and piracy.

Eastern Fleet Ships on overseas operational deployment

In pursuit of India's 'Act East' policy and to enhance military cooperation with friendly countries, a Task Force of Indian Navy's Eastern Fleet is on an Overseas Deployment to South East Asia, the South China Sea and Western Pacific for over two months. The deployment of the Indian Navy ships seeks to underscore the operational reach, peaceful presence and solidarity with friendly countries towards ensuring good order in the maritime domain

and to strengthen existing bonds between India and countries of the Indo Pacific.

The Indian Naval task group comprises Guided Missile Destroyer Ranvijay, guided missile frigate Shivalik, anti-submarine corvette Kadmatt and guided missile corvette Kora. The latter three ships are indigenously designed and are equipped with a versatile array of weapons and sensors, and are Made in India by defence shipyards.

During the deployment in the Indo Pacific, the ships will participate in bilateral exercises with Vietnamese Peoples' Navy, Republic of Philippines Navy, Republic of Singapore Navy (SIMBEX), Indonesian Navy (Samudra Shakti) and Royal Australian Navy (AUS-INDEX). Further, they would also participate in multilateral exercise Malabar-21 alongside the Japanese Maritime Self Defence Force, Royal Australian Navy and the United States Navy in the Western Pacific.

The Indian Navy undertakes regular deployments to friendly foreign countries and Indian and the Pacific Ocean regions in furtherance of the Prime Minister's initiative of 'Security and Growth for All in the Region – SAGAR'. Further, such engagements build 'Bridges of Friendship' and strengthen international cooperation. These maritime initiatives enhance synergy and coordination between the Indian Navy and friendly countries, based on common maritime interests and commitment towards Freedom of Navigation at sea. Besides regular port calls, the task group will operate in conjunction with friendly navies, to build military relations and develop interoperability in the conduct of maritime operations.

Indian Navy and UAE Navy bilateral Exercise Zayed Talwar 2021

The Indian Navy undertook bilateral Exercise Zayed Talwar 2021 with the UAE Navy on 7 August 21 off the coast of Abu Dhabi. INS Kochi, with two integral Sea King MK 42B helicopters, deployed in the Persian Gulf, participated in the exercise. UAE participated with UAES AL - Dhafra, a Baynunah class guided missile corvette and one AS–565B Panther helicopter. As part of the exercise, the ships undertook tactical manoeuvres, over the horizon targeting, search and rescue and electronic warfare exercises to enhance interoperability and synergy between the two navies. Helicopters were extensively used all through the exercise ranging from search and rescue serial to passing of targeting data to ships for simulated missile engagement drills.

INS Shivalik and Kadmatt at Brunei

In pursuance of India's 'Act East' Policy, Indian Naval Ships Shivalik and Kadmatt arrived at Muara, Brunei as part of their deployment to South East Asia on 9 August 2021. During the stay at Muara, Brunei, the crew of both the ships participated in various bilateral professional interactions with Royal Brunei Navy.

The exercise provided an opportunity to both the navies to enhance inter-operability, gain from best practices and develop common understanding of procedures for Maritime Security Operations. The harbour interactions and exercises at sea aimed to consolidate the strong bond shared by the two navies and would be another step towards strengthening India-Brunei defence relations. The bilateral exercise concluded with a Passage Exercise with Royal Brunei Navy at sea on 12 August 2021.

Indian Navy Ships Shivalik and Kadmatt are the latest indigenously designed and built, multi-role guided missile stealth frigate and anti-submarine corvette respectively, and form part of the Indian Navy's Eastern Fleet based at Visakhapatnam under the Eastern Naval Command. The two ships are equipped with a versatile array of weapons and sensors, can carry multi-role helicopters, and represent the maturation of India's warship-building capabilities.

On completion of bilateral exercise with Royal Brunei Navy, the ships then headed to Guam to participate in exercise Malabar-21 with the Japanese Maritime Self Defence Force (JMSDF), Royal Australian Navy (RAN) and the United States Navy (USN).

INS Tabar at Bergen, Norway

INS Tabar, as part of the ongoing deployment, entered Bergen harbour on 5 August 2021. The ship was received by the Liaison Officer of Royal Norwegian Navy and the Indian Defence Attaché. Commodore Trond Gimmingsrud, Chief of Royal Norwegian Naval Fleet and Mr. Christian Hafstad, the Deputy Harbour Master of Bergen Harbour visited the ship and interacted with the Commanding Officer on jetty as per prevailing Covid protocols. The Norwegian officials expressed their happiness on receiving an Indian warship and hoped to see more such similar engagements in future to consolidate the relations between the two countries.

On completion of port visit, in a landmark first for the Indian Navy, INS Tabar participated in a Maritime Partnership Exercise with Royal Norwegian Navy ship, HNoMS Storm, a Skjold class FAC (M) on 8 August. A range of operations like surface manoeuvers, Visit Board Search & Seizure exercise (VBSS) and vertical replenishment by helicopter were exercised.

INS Talwar exercises with Kenyan naval ship

Post conclusion of exercise Cutlass Express INS Talwar undertook a Maritime Partnership Exercise with a Kenya Navy Ship Shujaa, an Offshore Patrol Vessel, on 7 August. Basic manoeuvring exercises were undertaken by the ships to enhance interoperability and strengthen maritime cooperation. On completion of exercise, INS Talwar thanked the Kenyan Navy for hosting them at Mombasa and KNS Shujaa appreciated Indian Navy for ensuring maritime safety in the southern IOR especially, East Coast of Africa.

Al-Mohed Al-Hindi Exercise between IN and Saudi Arabian Navy

The Indian Navy's visit to Kingdom of Saudi Arabia was set rolling with the Flag Officer Commanding Western Fleet (FOCWF), Rear Adm Ajay Kochhar visiting the Fleet Cdr of Royal Saudi Navy's Eastern Fleet, Rear Adm Majid Al Qahtani on 10 August. This was held at King Abdul Aziz Naval Base, which is the Headquarters for Saudi Eastern Fleet. The FOCWF also visited the King Fahd Naval Academy and met with the Commandant Rear Admiral Faisal Bin Fahd Al Ghufaily. Dr Ausaf Sayeed, Indian Ambassador to Kingdom of Saudi Arabia, visited INS Kochi at Al Jubail where he held a press conference onboard along with the FOCWF and the Commanding Officer of the ship.

INS Tabar at Portsmouth, UK

(photo: @Casper271085*)*

INS Tabar entered Portsmouth harbour on 13 August as part of her goodwill visit. She was received by Commodore JJ Bailey, Portsmouth Naval Base Commander, the Indian NA, the Royal Navy NA in Delhi and other officials of the Royal Navy.

After arrival in harbour, Captain Mahesh Mangipudi, Commanding Officer (CO), accompanied by Indian NA and ten personnel of the ship paid homage at the historic Southsea Naval Memorial. Later, the CO paid courtesy call on Councillor Frank Jonas, Lord Mayor of Portsmouth at the Portsmouth Guildhall. This was followed by a courtesy call on Commodore JJ Bailey, the Portsmouth Naval Base Commander, at his office. Both officials welcomed the ship's visit to Portsmouth and conveyed warm greetings to the ship and her crew. On completion of the interactions, the CO presented both dignitaries with the ship's crest.

Earlier, the ship commenced Exercise Konkan 2021 on 12 August with a maritime interception exercise with HMS Westminster off Portsmouth. Exercise Konkan 2021 continued between Tabar and Westminster on 16 August after the departure of Tabar from Portsmouth. On entering harbour, the Final Planning Conference for Exercise Konkan 2021 was held in non-contact form between the Ops Teams of Tabar and Westminster.

As part of the harbour engagements of Exercise Konkan 2021, a number of professional interactions were held between the two sides on 13 August. These included Subject Matter Expert (SME) exchanges on electric propulsion, unmanned surface vessels and electronic navigation. A visit to the Joint Maritime Security Centre at Potsdown Hill was also held for a team from Tabar.

Exercise Konkan 2021

Exercise Konkan 2021 was held between INS Tabar and HMS Westminster on 16 August in the English Channel. The exercise included the participation of integral helicopters of the two ships and the Falcon Electronic Warfare aircraft. A wide range of exercises including co-ordinated anti-submarine procedures, firing drills, combined maritime picture compilation, combat formation maneuvering and replenishment at sea were conducted. These along with the diverse professional engagements held earlier in harbour, have enabled Exercise Konkan 2021 "consolidate interoperability and helped cement the strong bonds of friendship the between the two navies".

Exercise Zair-al-Bahr conducted between Indian Navy and Qatar Navy

The second edition of Exercise Zair-Al-Bahr between the Indian Navy and Qatar Emiri Naval Force (QENF) was conducted from 9-14 August in the Persian Gulf. The present edition of the exercise included a three day harbour phase followed by a two day sea phase. The sea phase comprised of tactical maritime exercises involving surface action, anti-piracy exercises, air defence, maritime surveillance, boarding operations and SAR exercises. In the sea phase of the exercise, Indian Navy stealth frigate INS Trikand, QENF missile boats of Barzan and Damsah class, fast-attack craft of MRTP 34 class and Rafale fighter aircraft participated.

The 2nd edition of exercise Zair-Al-Bahr "will contribute towards the Indian Navy's efforts to consolidate Inter-operability and forge strong bonds of friendship with the Qatari Navy. The bilateral maritime exercise between two navies would further strengthen the maritime exchanges between the two countries and enhance maritime security in the region".

Bilateral maritime exercise between Vietnam and India

In continuation with ongoing deployment of Indian Navy ships in the South China Sea, INS Ranvijay and INS Kora undertook bilateral maritime exercise with Vietnam People's Navy (VPN) frigate VPNS Ly Thai To (HQ-012) on 18 August. The Indian Naval ships arrived at Cam Ranh, Vietnam on 15 August for harbour phase which included professional interactions with VPN maintaining extant Covid-19 protocols. The sea phase included surface warfare exercises, weapon firing drills and helicopter operations. Regular interactions between the two navies over the years have enhanced their interoperability and adaptability. This has ensured a quantum jump in the complexity and scale of professional exchanges. Defence ties between the two countries have been robust. In June this year, the two countries undertook a defence security dialogue and Indian Naval ships have been frequently visiting Vietnamese Ports. Training cooperation between the two navies has been on the rise over the years.

'Joint guidance for the Australia and India navy to navy relationship' signed

A 'Joint Guidance for the Australia – India Navy to Navy Relationship' document was signed between the Indian Navy and Royal Australian Navy on 18 August 2021. The signing ceremony was held virtually between Adm Karambir Singh, Chief of the Naval Staff, Indian Navy and Vice Admiral Michael J Noonan, Chief of Navy, Australian Navy. The document is aligned to the '2020 Comprehensive Strategic Partnership' agreed by the Prime Ministers and aims to ensure shared approached to regional and global security challenges. The Joint Guidance would serve as a guideline document to showcase the intent of both the Navies to work together bi/multi-laterally. The broad scope of the guidance is focussed on developing mutual understanding, cooperate for regional security, collaborate in mutually beneficial activities and to develop interoperability.

The highlights of document include close cooperation in regional and multilateral fora, including Indian Ocean Naval Symposium (IONS), Western Pacific Naval Symposium (WPNS), Indian Ocean Rim Association (IORA) and Expert Working Groups subordinate to the ASEAN Defence Ministers' Meeting Plus framework. Bilateral defence relations between India and Australia have strengthened over the years. 'Comprehensive Strategic Partnership', Mutual Logistics Support Agreement, conduct of trilateral Maritime Security Workshop and RAN participation in Exercise Malabar are significant milestones which underline the role played by both Navies in bolstering this relationship in recent times. The document would be "pivotal in consolidating the shared commitment to promote peace, security, stability and prosperity in the Indo - Pacific region".

INS Shivalik and Kadmatt arrive at Guam for Exercise Malabar

Indian Naval Ships Shivalik and Kadmatt arrived at Guam, an Island Territory of the USA on 21 August 21 as part of their on-going deployment to nations in South East Asia and the Pacific Ocean. The two ships will participate in the annual Exercise Malabar-21, between navies of Australia, India, Japan and the USA. Malabar series of maritime exercises commenced in 1992 as a bilateral IN-USN exercise and has grown in stature over the

years to include four prominent navies in the Pacific and Indian Ocean Region. As part of the Exercise, Vice Admiral AB Singh, Flag Officer Commanding-in-Chief, Eastern Naval Command will have operational discussions with Rear Admiral Leonard C. "Butch" Dollaga, Commander CTF-74 focussing on developing an action plan and coordinated operations in the maritime domain. Flag Officer Commanding Eastern Fleet, Rear Admiral Tarun Sobti would be embarked onboard INS Shivalik during the conduct of Sea Phase commencing 26 August 21.

Exercise between IN and Philippine Navy

Two ships of the Indian Navy, namely INS Ranvijay (Guided Missile Destroyer, D55) and INS Kora (Guided Missile Corvette, P61), on deployment to the Western Pacific, carried out a Maritime Partnership Exercise with BRP Antonio Luna (Frigate, FF 151) of the Philippine Navy on 23 August 21 in the West Philippine Sea. The joint evolutions conducted during the exercise included several operational manoeuvers and the participating ships of both navies "were satisfied with the consolidation of interoperability achieved through this operational interaction at sea".

The Indian naval ships are currently deployed to the Western Pacific with an aim to strengthen maritime security collaboration with partner nations. The interaction with BRP Antonio Luna was, therefore, an opportunity for the Indian Navy to consolidate its bilateral relations with the Philippine Navy. In compliance with the prevailing pandemic guidelines, the exercise was conducted in contactless manner and all necessary health and safety protocols were strictly observed.

Arrival!

Indo-Kazakhstan joint training exercise

As part of military diplomacy and to strengthen the growing strategic relation with Kazakhstan, the 5th edition of Indo-Kazakhstan Joint Training Exercise, "KAZIND-21" was conducted at Training Node, Aisha Bibi, Kazakhstan, from 30 August to 11 September 2021. The Indian Army contingent was represented by a battalion of The Bihar Regiment consisting of a total of 90 personnel led by a Contingent Commander. The Kazakhstan Army was represented by a company group.

The Exercise provided an opportunity to the Armed Forces of India and Kazakhstan to train for Counter Insurgency/Counter Terrorism operation in mountainous, rural scenario under UN mandate. The scope of Joint Exercise included professional exchange, planning and execution of operation in counter terrorism environment at sub unit level and sharing expertise on skills at arms, combat shooting and experiences in counter insurgency/counter terrorism operations.

Indian Navy's maiden exercise with Algerian Navy

As part of her ongoing goodwill visit to Europe and Africa, INS Tabar took part in a Maritime Partnership Exercise with Algerian Navy ship 'Ezzadjer' on 29 August 2021. The landmark exercise, held off the Algerian coast, saw participation of a frontline Algerian warship, 'Ezzadjer'. As part of the exercise, diverse activities including co-ordinated manoeuvring, communication procedures and steam past were undertaken between the Indian and Algerian warships. The exercise enabled the two navies to understand the concept of operations followed by each other, enhanced interoperability and opened the possibility of increasing interaction and collaboration between them in future.

INS Tabar exercises with Moroccan Navy

INS Tabar, as part of her overseas deployment, made a port call at Casablanca in Morocco on 25 and 26 August 2021. Upon leaving the harbour on 26 August, the ship participated in a Maritime Partnership Exercise with Royal Moroccan Navy ship 'Lieutenant Colonel Arrahman' off Casablanca port. Evolutions like communication drills, replenishment at sea procedures and naval manoeuvres were undertaken during the exercise. The exercise concluded with the traditional 'Steam Past' between the two ships to bid farewell to each other.

Indian Army and Exercise ZAPAD in Russia

A 200 personnel contingent of Indian Army participated in Exercise ZAPAD 2021, a Multi Nation exercise held at Nizhniy, Russia from 3 to 16 September 2021. ZAPAD 2021 is one of the theatre level exercises of Russian Armed Forces and focusses primarily on operations against terrorists. Over a dozen countries from Eurasian and South Asian Region participated in this signature event.

The NAGA Battalion group that participated in the exercise featured an all Arms combined task force. The exercise aims to enhance military and strategic ties amongst the participating nations while they plan and execute this exercise. The Indian contingent had been put through a strenuous training schedule which encompassed all facets of conventional operations including mechanised, airborne and heliborne, counter terrorism, combat conditioning and firing.

28th Edition of Singapore-India 'SIMBEX'

The 28th edition of Singapore-India Maritime Bilateral Exercise (SIMBEX) was conducted from 2 to 4 September 2021. The Indian Navy was represented by Guided Missile Destroyer INS Ranvijay with a ship borne helicopter, ASW Corvette INS Kiltan and Guided Missile Corvette INS Kora and one P8I Long Range Maritime Patrol Aircraft. Participants from the RSN included one Formidable Class Frigate, RSS Steadfast, embarked with an S-70B naval helicopter, one Victory Class Missile Corvette, RSS Vigour, one Archer Class Submarine and one Fokker-50 Maritime Patrol Aircraft. Four F-16 fighter aircraft of the Republic of Singapore Air Force (RSAF) also participated in the exercise during the Air Defence Drills.

Initiated in 1994, SIMBEX is the Indian Navy's longest uninterrupted bilateral maritime exercise with any foreign navy.

INS Tabar's visit to Alexandria

As part of her ongoing overseas deployment, INS Tabar entered Alexandria harbour in Egypt on 3 September 2021. The ship was received by officials from the Egyptian Navy and the Indian Defence Attache. Mr. Ajit Gupte, Ambassador of India to Egypt paid a visit to the ship and was provided a walk around and briefing on activities related to the ship's deployment. Later, in the evening, a reception was hosted onboard, for which Rear Admiral Ayman al-Daly, Commander of Alexandria Naval Base, was the Chief Guest. The event was attended by a number of senior officers from the Egyptian Navy, the Alexandria government and a large number from the Indian diaspora. In addition, Commanding Officers and officers of Hellenic Navy ships Hydra and Lesbos and Cyprus Navy ship Andreas Loannides, which were visiting Alexandria for Exercise Bright Star with Egypt, were also present for the reception.

Royal Australian Navy and Indian Navy in bilateral Exercise AUSINDEX

Indian Navy Task Group comprising IN Ships Shivalik and Kadmatt, under the Command of Flag Officer Commanding, Eastern Fleet, Rear Admiral Tarun Sobti, participated in the 4th edition of AUSINDEX from 6 to 10 September 2021. Royal Australian Navy (RAN) Anzac Class Frigate, HMAS Warramunga which participated in Exercise MALABAR along with the IN units was also part of the exercise. This edition of AUSINDEX includes complex surface, sub-surface and air operations between ships, submarines, helicopters and long range maritime patrol aircraft of the participating navies.

The participating Indian Naval Ships Shivalik and Kadmatt are the latest indigenously designed and built guided missile stealth frigate and anti-submarine corvette respectively. They form part of the Indian Navy's Eastern Fleet based at Visakhapatnam under the Eastern Naval Command. Commenced in 2015 as a bilateral IN-RAN maritime exercise, AUSINDEX has grown in complexity over the years and the 3rd edition of the exercise, held in 2019 in the Bay of Bengal, included anti-submarine drills for the first time.

Indian Navy exercises with German frigate Bayern

Indian Navy Ship INS Trikand exercised with German frigate Bayern in the Gulf of Aden on 26 August 2021. The exercise included cross deck helicopter landings and Visit Board Search & Seizure VBSS. The Exercise between Trikand (Mission Deployed in region for anti-piracy patrol) and Bayern was on her Indian Ocean leg of Indo-Pacific Deployment 2021. The objective was for enhanced interoperability and "facilitated exchange of best practices" between partner navies in the maritime domain .

Maritime partnership exercise with Egyptian Navy

INS Tabar undertook a maritime partnership exercise with ENS Alexandria, a frontline frigate of the Egyptian Navy, in the Mediterranean Sea. The exercise involved multiple activities covering a wide range of naval operations. These included drills for transit through asymmetric threat environment, operations for interdicting suspect vessels at sea, communication procedures, joint development of maritime domain picture and replenishment at sea drills. A highlight of the exercise was the cross-deck helo operations that involved helo recovery procedures and airborne light replenishment drills between the two ships.

SCO Exercise 'Peaceful Mission' at Orenburg, Russia

The 6th Edition of SCO Exercise Peaceful Mission 2021 hosted by Russia started at Orenburg Region of South West Russia on 20 September. The aim of the exercise was to foster close relations between SCO Member States and to enhance abilities of the military leaders to command multinational military contingents. An Indian military contingent comprising of an all arms combined force of 200 personnel from Indian Army and Indian Air force participated.




15th Indo-Nepal joint exercise 'Surya Kiran'

15th Edition of Indo-Nepal Joint Military Training, Exercise Surya Kiran between Indian Army and Nepali Army commenced 20 September 2021 at Pithoragarh (UK). During this exercise, an Infantry Battalion from Indian Army and an equivalent strength from Nepali Army shared their experiences gained during the conduct of various counter-insurgency operations over a prolonged period in their respective countries. As part of the exercise, both the Armies familiarised themselves with each other's weapons, equipment, tactics, techniques and procedures of operating in a counter-insurgency environment in mountainous terrain. The last edition of Exercise Surya Kiran was conducted in Nepal in 2019.



Indian Navy and Indonesian Navy participate in Exercise 'Samudra Shakti'

Indian Naval Ships Shivalik and Kadmatt arrived at Jakarta, Indonesia on 18 September 2021 to participate in the 3rd edition of Bilateral Exercise 'Samudra Shakti' with the Indonesian Navy. The exercise aimed to strengthen the bilateral relationship, enhance mutual understanding and interoperability in maritime operations between the two navies. The participating Indian Navy ships Shivalik and Kadmatt are amongst the latest indigenously

designed and built multi-role guided missile stealth frigate and anti-submarine corvette respectively, and form part of the Indian Navy's Eastern Fleet, based at Visakhapatnam, under the Eastern Naval Command. Indian Navy's Anti-Submarine Warfare capable Long Range Maritime Reconnaissance Aircraft P8I also participated in the exercise. KRI Bung Tomo, KRI Malahayati and maritime patrol and reconnaissance aircraft CN-235 represented the Indonesian Navy.

India/Sri Lanka joint exercise 'Mitra Shakti 21'

The 8th Edition of India Sri Lanka bilateral joint Exercise Mitra Shakti was conducted at Combat Training School, Ampara in Sri Lanka from 4 to 15 October 2021. An all arms contingent of 120 personnel of the Indian Army participated in the exercise along with a battalion of the Sri Lankan Army. The exercise involved tactical level operations at sub unit level in an international Counter Insurgency and Counter Terrorism environment and will go a long way in further strengthening the relationship between both the South Asian Nations and will act as a catalyst in bringing synergy and cooperation at grass root level between both Armies. The 7th Edition of Exercise Mitra Shakti was conducted at Foreign Training Node (FTN), Pune, Maharashtra (India) in 2019.

BNS Somudra Avijan at Visakhapatnam to commemorate Swarnim Vijay Varsh

Bangladesh Naval Ship (BNS) Somudra Avijan arrived Visakhapatnam on a five-day visit to the Eastern Naval Command (ENC) on 3 October 2021. This visit by the Bangladesh Navy was to commemorate together the birth centenary of father of the nation, Bandhu Sheikh Mujibur Rahman and Swarnim Vijay Varsh marking the 50th anniversary of 1971 Indo-Pak war, which led to liberation of Bangladesh. The officers and crew of BNS Somudra Avijan were accorded a traditional welcome by the representatives of the ENC and the Eastern Fleet, with the navy band in attendance.

Fifth edition of Japan-India 'JIMEX'

The 5th edition of the bilateral maritime exercise **JIMEX,** between Japan and India, was conducted in the Arabian Sea from 6–8 October 2021.The exercise saw the ships and aircraft of Japan Maritime Self Defence Force **JMSDF** and Indian Navy engaging in a high tempo of operations focused on air, surface and sub-surface dimensions of maritime operations as well as the air domain.

The *IN*, under the command of RAdm Ajay Kochhar, Flag Officer Commanding Western Fleet, participated with guided missile destroyer, INS Kochi (with Sea King MK 42B helicopter) and the guided missile frigate INS Teg (with SAR capable Chetak helicopter). The IN also fielded a P8I, a shore-based maritime reconnaissance aircraft and MiG 29K fighters. The JMSDF was led by RAdm Ikeuchi Izuru, Commander, Escort Flotilla Three comprising of the Izumo Class helicopter carrier Kaga and the guided missile destroyer Murasame. Both ships participated with integral SH60K helicopters.

India–UK Exercise 'Ajeya Warrior'

The 6th Edition of India-UK Joint Company Level Military Training Exercise Ajeya Warrior commenced at Chaubatia, Uttarakhand and culminated on 20 October 2021. The exercise is part of an initiative to develop inter-operability and sharing expertise with friendly foreign nations. During this exercise, an Infantry Company from Indian Army and an equivalent strength from UK Army shared their experiences gained during the conduct of various military operations in their respective countries and during overseas engagements.

17th edition of Indo-US Exercise 'Yudh Abhyas 2021'

As part of the ongoing Indo-US Defence Cooperation, the Joint Military Training Exercise "Ex Yudh Abhyas 2021" was conducted at Joint Base Elmendorf Richardson, Alaska (USA) from 15 to 29 October 2021. The contingent, comprising of 350 personnel of an Infantry Battalion Group departed on 14 October 2021. Exercise Yudh Abhyas is the largest running joint military training and defence cooperation endeavor between India and USA. This was the 17th Edition of the joint exercise which is hosted alternately between both countries. The previous version of this exercise was held at Mahajan Field Firing Ranges in Bikaner, Rajasthan in February 2021. This exercise is another step in the growing military cooperation between the two countries.

Indian Army team wins gold in Exercise 'Cambrian Patrol' (UK)

A team from 4/5 Gorkha Rifles (Frontier Force) which represented the Indian Army at the prestigious Cambrian Patrol Exercise at Brecon, Wales, UK from 13-15 October 2021 was awarded a gold medal. Ex Cambrian Patrol organised by the UK Army is considered the ultimate test of human endurance, team spirit and is sometimes referred as the Olympics of Military Patrolling among militaries in the world. The Indian Army team participated in the event and competed against a total of 96 teams which included 17 international teams representing Special Forces and prestigious regiments from around the world.

Indo-Sri Lanka Exercise 'Mitra Shakti'

The 8th Edition of joint military exercise between the Indian Army and the Sri Lankan Army, Exercise Mitra Shakti was conducted from 4-16 October 2021, culminated at Combat Training School, Ampara. Exercise Mitra Shakti, based on counter insurgency and counter terrorism operations in semi urban terrain is the largest bilateral exercise being undertaken by the Sri Lankan Army and it forms a major part of India and Sri Lanka's growing defence partnership.

Indian Navy's First Training Squadron (1TS) visits Sri Lanka

The 1st Training Squadron (comprising Indian Naval Ships Sujata, Magar, Shardul, Sudarshini, Tarangini and Coast Guard Ship Vikram) was on a four day visit to Sri Lanka from 24-28 October 2021 as part of their Overseas Deployment for the 100th and 101st Integrated Officers Training Course. The deployment is aimed to broaden the horizons of young officers and officer-trainees by exposing them to the socio-political and maritime facets of different countries in the Indian Ocean Region.

The 1st Training Squadron based at Kochi provides the 'first sea legs' to the Executive Officers of the Indian Navy on completion of their ab-initio training at the Indian Naval Academy. The Squadron comprises seven indigenously built ships, namely, Indian Naval Ships Tir, Sujata, Magar, Shardul, Coast Guard Ship Vikram and two Sail Training Ships INS Sudarshini and INS Tarangini. The Squadron is currently helmed by Captain Aftab Ahmed Khan, Senior Officer First Training Squadron who also dons the dual hat of Commanding Officer, INS Tir.

Indian Navy participates in Exercise Malabar

Indian Navy participated in the sea phase of Exercise Malabar 2021 from 26–29 August 2021 along with the US Navy (USN), Japanese Maritime Self Defence Force (JMSDF) and the Royal Australian Navy (RAN).

Malabar series of maritime exercise commenced in 1992 as an IN-USN Exercise. In 2015, JMSDF joined Malabar as a permanent member. The 2020 edition witnessed participation of the Royal Australian Navy. This year marks the 25th edition of Ex Malabar, being hosted by USN in the Western Pacific.

The Indian Navy's participation included INS Shivalik and INS Kadmatt and P8I MPA led by Rear Admiral Tarun Sobti, VSM, Flag Officer Commanding Eastern Fleet. The US Navy was represented by USS Barry, USNS Rappahannock, USNS Big Horn and the P8A patrol aircraft. The Japanese Maritime Self Defence Force was represented by JS Kaga, Murasame and Shiranui, in addition to a submarine and P1 patrol aircraft. The Royal Australian Navy was represented by HMAS Warramunga.

The IN ships sailed from Guam where they participated in Operational Turn Around from 21-24 August 2021. During this phase, the Flag Officer Commanding-in-Chief, Eastern Naval Command Vice Adm AB Singh, AVSM, VSM exchanged views with counterparts in the US Navy.

MALABAR-21 witnessed complex exercises including anti-surface, anti-air and anti-submarine warfare drill, and other manoeuvres and tactical exercises. The exercise also provide an opportunity for participating navies to derive benefit from each other's expertise and experiences.

Exercise Malabar 2021 – Phase II

The Indian Navy (IN) also participated in the Second Phase of Multilateral Maritime Exercise Malabar along with the Japan Maritime Self Defence Force (JMSDF), Royal Australian Navy (RAN) and the United States Navy (USN). The exercise was conducted in the Bay of Bengal from 12–15 October 2021. First Phase of the exercise was conducted in the Philippines Sea from 26–29 August 2021.

The Indian Navy's participation included INS Ranvijay, INS Satpura, P8I long range maritime patrol aircraft and a submarine. The US Navy was represented by the aircraft carrier USS Carl Vinson along with two destroyers, USS Lake Champlain and USS Stockdale. The JMSDF was represented by JS Kaga and JS Murasame whilst, the Royal Australian Navy was represented by HMAS Ballarat and HMAS Sirius.

The Second Phase of the exercise was to build upon the synergy, coordination and inter-operability developed during the First Phase of the exercise and focussed on advanced surface and anti-submarine warfare exercises, seamanship evolutions and weapon firings.

Reflections on India's Vikrant-centric Carrier Battle Group by

Vice Admiral Pradeep Chauhan, AVSM & Bar, VSM, IN (Retd)

Director-General, National Maritime Foundation

INS Vikrant (IAC-I). Photo: Indian Navy

The successful completion of the five-day sea trials (from 4 to 8 August 2021) of the long-delayed indigenous aircraft carrier, the new Vikrant, is a seminal event and one that has been justifiably met with elation and a palpable sense of maritime pride.[1] "Maritime" is quite clearly the prevailing geopolitical flavour. On the very next day (9 August 2021) Prime Minister, Mr. Narendra Modi, personally chaired a High Level Open Debate at the UN Security Council, on the theme "Enhancing Maritime Security: A case for International Cooperation", emphatically bringing "Maritime India" to the front and centre of the global maritime discourse and dominating India's eighth rotational membership of this apex intergovernmental organisation.[2] The additional fact that this demonstration of Indian naval capacity and capability has been made in the Swarnim Vijay Varsh commemorating the 50th anniversary of the victory of Indian arms against Pakistan in the 1971 conflict that resulted in the creation of Bangladesh, and, given that it has been almost in tandem with India's record medal haul in the Tokyo Olympics (23 July to 8 August 2021), the voyage of the Vikrant has certainly added to the series of adrenaline spikes and generated a palpable surge of nationalistic pride. It is clear from the available evidence that India is rising — peacefully, responsibly, and with impressive rapidity, even in these pandemic-afflicted times. It is particularly germane to assert that this rise is occurring in an increasingly interconnected world — even if is not entirely a 'globalised' one — and that it is

[1] Asian News International (ANI), "Indeed a Historic Moment for India, says Vice Admiral AK Chawla on IAC Vikrant's Successful Maiden Sea Voyage", 09 August 2021, https://www.aninews.in/news/national/general-news/indeed-a-historic-moment-for-india-says-vice-admiral-ak-chawla-on-iac-vikrants-successful-maiden-sea-voyage20210809063905/

[2] Geeta Mohan, "UNCLOS "Laws of the Seas' at heart of UN Security Council Consensus, China on board", India Today (online) , New Delhi, 10 August 2021, https://www.indiatoday.in/india/story/unclos-law-of-sea-un-security-council-maritime-security-open-debate-india-presidency-1838903-2021-08-10

largely being shaped by the oceans. This is true whether by way of trade, technology and connectivity, or by way of food-security, or in terms of new and clean energy sources, or in dealing with the cumulative impacts of geophysical and anthropomorphic causes of climate change. Indeed, the current century and very possibly the next one, too, are very likely to be maritime-centric ones. India's polity appears to be finally coming around to the fact that over the foreseeable future, India will be either be a "maritime" power, or it will not be a power at all. For India, therefore, the sustenance of its rise demands that the country enhance, in significant manner, its investment in all of the various dimensions of maritime power, including the 'military' components of India's maritime power, which are manifested by the Indian Navy. Such investment involves infrastructure and 'capacity' as represented by surface, sub-surface, and airborne combat and combat-supporting platforms (whether these be manned, minimally manned, or unmanned, semi-autonomous or autonomous) and associated equipment. It also involves 'capability' as connoted by the quality of personnel, their training and the overall development of the human resource, both in and out of uniform.

Yet, it is also evident that not everyone is exulting in this resurgence of 'Maritime India'. There are, unfortunately, a small number of vested constituencies, both within the country and beyond its shores, that have been highlighting the adverse economic impact of the ongoing COVID-19 pandemic and calling for a renewed examination of the desirability and the defensibility of aircraft carriers in the prevailing economic and security environments, as also those expected to prevail over foreseeable future.[3] Sadly, the debate over how best to optimise — if not maximise — India's air and aerospace power and apply it effectively in the pursuit of the nation's interests, over the land and also over the vast oceanic expanse of the Indo-Pacific (or even just that of the Indian Ocean), seems somehow meaner, more small-minded and partisan, more bigoted and stultified, and, perhaps, even more dumbed-down than has thus far been the case.

That said, it can hardly be argued that given the economic challenges that the ongoing COVID-19 pandemic has brought in its wake, the need to distinguish 'cost' from 'cost-effectiveness', and to not be fixated upon the obvious question of "can we afford to?" but to also examine the less obvious one of "can we afford not to?", is pressing. In short, the need to prevent 'hope' from being stifled by 'hype' is more urgent than ever before.

India's military air-power now encompasses all three Defence Forces, as also several of the country's 'central armed forces'. Within the latter grouping, the Indian Coast Guard is predominant in terms of the number and variety of its air-assets, as also its competence and experience in utilising them. However, the Air Wing of the Border Security Force (BSF), too is an increasingly significant deployer of air power. Each force adds to the India's overall deployment of air-power, not only within the country but in some or all of its maritime zones as well.

Unfortunately, the relentless barrage of social media platforms continues to be characterised by inadequately informed opinions to which members of the lay public are repeatedly subjected. Thus, the debate over the relative efficacy of the Indian Navy's carrier-borne airpower versus that of the Indian Air Force supported by replenishment-tanker aircraft rages on, quite like the forest fires that engulf nation-states from time to time. The flames generated by predominantly emotive arguments are temporarily doused by informed understanding, but, are periodically fanned into a blaze by factional loyalties coupled with a goodly dose of ignorance. Amidst all this conflagration, the only thing of lasting value that is being reduced to cinders is, of course, India and India's geopolitical aspirations in times of peace, tension, and conflict. It must, of course, be borne in mind that emotive arguments tend to breed equally emotive ones, and the solution, if there is one to be found, lies in a rational examination of the facts as we know them and such reasonable deductions as can be made from these facts.

If media reports are to be given credence (their poor past-record notwithstanding), the incumbent Chief of Defence Staff (CDS) and the recently established Department of Military Affairs (DOMA) within the Ministry of Defence (MoD) seem to think that submarines and aircraft carriers can be simplistically placed in an 'either-or' conditionality, and primacy accorded to the former.[4] The truth, of course, regardless of whether

[3] Bharat Karnad, "INS Vikrant – A Naval Liability", Chanakya Forum, 9 Aug 2021, https://chanakyaforum.com/ins-vikrant-a-naval-liability/
See also: Rahul Bedi, "Why Indian Navy's Proposal to Acquire a Third Aircraft Carrier May Not Materialise", The Wire, 5 December 2020, https://thewire.in/security/navy-third-aircraft-carrier-proposal-materialise-submarine

[4] Press Trust of India, "Submarines a Priority over Aircraft Carriers for Navy, says CDS Gen Bipin Rawat; Announces Plan to Look at Overseas Bases for Logistics", First Post, 17 February 2020, https://www.firstpost.com/india/submarines-a-priority-over-aircraft-carriers-for-navy-says-cds-gen-bipin-rawat-announces-plan-to-look-at-overseas-bases-for-logistics-8050811.html

this is a view of the MoD or merely that of a section of the media, is that like most simplistic responses to complex questions, this entire approach, is foundationally flawed. Sadly, space will not permit a detailed analysis of both, submarines and aircraft carriers, so this article will merely attempt to provide some clarity in terms of aircraft carriers and a separate one will deal with the fallacies inherent in an 'either-or' argument. In short, while the criticality of the maritime domain — and that of the military maritime domain is a given, of immediate interest and urgency is the need for answers to the questions of whether aircraft carriers are indeed, quite as central as is being averred by the present Chief of the Naval Staff,[5] and whether they do, indeed, provide the biggest bang for our collective buck.

There are two fundamental threads along which these questions tend to be addressed. The first argues for and against the undeniably high 'cost' of aircraft carriers when compared with what an air force can deliver by way of equivalent aerospace capability. The second proceeds down the path of 'cost-effectiveness' and seeks to examine the survivability (defensibility) of aircraft carriers in the prevailing and predicted battle-milieu.

It is certainly true that a contemporary (and future-ready) aircraft carrier costs a large amount of money, whether it is procured from abroad or constructed indigenously. Along with its complement of aircraft, it is also expensive to operate and to maintain, especially when costs are computed over the several decades of its operational life. Open-source inputs have pegged the final cost of the Vikramaditya at some Rs. 12,500 Crore[6], while the indigenous construction of the Vikrant, which will displace some 40,000-tonne aircraft carrier will, according to some reports, cost the exchequer some Rs. 23,000 Crore[7] (this figure is understood to include the cost of shore-based shipyard equipment and infrastructure needed by the Cochin Shipyard, which is where the Vikrant is being built). Some argue that the roles that are envisaged for the aircraft carrier could well be performed by shore-based air power (of the Indian Air Force), with the clincher being the addendum, at a much lower cost. So, it becomes pertinent to examine how much an equivalent air force capacity and capability would cost. This cannot, of course, not be limited to the capital cost of a single airbase. The fact is that an aircraft carrier can move a thousand kilometres in a single day. In order to match this mobility, one would need multiple 'coastal', 'inland' and 'forward' IAF airbases. There would be equally forbidding costs to be borne in the construction and periodic maintenance of the ground and aerial assets in each of these air bases. For instance, just the replacement cost (not the capital cost, mind you!) of one single runway on an existing air force base can easily exceed Rs. 600 Crore. In the case of a Greenfield airbase, this 'construction cost' would have to take into account the costs of land-levelling and development, as also the cost of acquiring additional land necessary for safe take-off and departure flight-patterns and landing-approaches. At the USA's Atlanta airport, for example, the 2013 cost of adding a fifth runway capable of routinely handling jet aircraft was $1.24 billion, which is about Rs. 8,700 Crore. In the case of a fighter base, one would need to additionally account for the cost of one or more parallel taxi-tracks, bombproof shelters and hangars, the Air Traffic Control (ATC) building and associated facilities, a variety of radars, robust structures to house navigational beacons and communication equipment. To this will need to be added the costs of installing self-defence wherewithal — not the missiles and/or guns themselves, but their emplacements, ammunition-storage structures, and so forth. When these requirements (all of which are already included in the cost of the aircraft carrier) are aggregated, one ends up with a cost-figure that significantly exceeds even the overall cost of construction of an indigenous aircraft carrier. Just the brick-and-mortar installation-cost of a single USAF base (not including the cost of each aircraft, or the cost of their deployment, or personnel costs) has been quantified in a comprehensive analytical study of 2013 by the RAND corporation, which is available in the open domain.[8] Even if we were to discount any additional costs as a result of inflation from 2013 to the present day, the cost is US$ 13 billion (Rs. 91,000 Crore). It is clear that the capital-cost of just the construction of a single air base exceeds that of the aircraft carrier. However, as has already been indicated, the mobility of an aircraft carrier means that it 'virtualises' a number of static airbases, each of which costs a great more than does the ship! Once the emotive content is removed from the comparative equation, the aircraft carrier, with its operational life of some 45-50 years, is readily seen to offer a far cheaper option.

INS Vikrant (IAC-I). Photo: Indian Navy

[6] Sudhi Ranjan Sen, "Final trials for INS Vikramaditya, Rs. 12,500-crore Ship, in June", NDTV website, 25 Jan 2013, https://www.ndtv.com/india-news/final-trials-for-ins-vikramaditya-rs-12-500-crore-ship-in-june-511306

[7] Ravi Sharma, "India's First Indigenous Aircraft Carrier is Fast Getting Ready at the Cochin Shipyard", Frontline e-magazine, 27 June 2021, https://frontline.thehindu.com/dispatches/indias-first-indigenous-aircraft-carrier-is-fast-getting-ready-at-the-cochin-shipyard/article34999085.ece

[8] Patrick Mills, Adam Grissom, Jennifer Kavanagh, Leila Mahnad, Stephen M. Worman, "A Cost Analysis of the U.S. Air Force Overseas Posture: Informing Strategic Choices", Santa Monica, CA: RAND Corporation, 2013. https://www.rand.org/content/dam/rand/pubs/research_reports/RR100/RR150/RAND_RR150.pdf

Moreover, in times short of armed conflict — that is, in times of peace or tension — mobile maritime forces centred upon an aircraft carrier are unsurpassed in their ability to provide a range of flexible and favourable geostrategic-options to the nation and its government. The ability of a naval battle-group centred upon an aircraft-carrier to shape perceptions (commonly known as 'shaping operations') in a manner that is advantageous to the nation fielding such a force in the areas of its maritime interest, is unmatched. These 'shaping operations' incorporate a series of persuasive, dissuasive, deterrent, and coercive missions, which are collectively defined as the 'diplomatic' role of the Navy. As the Carrier Battle Group (CBG) establishes presence in proximate as well as distant parts of the oceanic areas of interest to India, it also an invaluable source of 'Maritime Domain Awareness' (MDA) through direct as well as cooperative surveillance, the gathering and collation of intelligence on a regional basis, not only of goings-on on the sea surface, but below and above it, extending from abyssal ocean-depths all the way to outer space. These are functions that shore-based assets of an air force simply cannot perform.

The argument of cost-effectiveness is, however, most telling when subjected to the litmus test of armed conflict, which is, after all is said and done, the quintessential purpose of raising defence forces in the first place. Everything else is a spin-off. In times of State-on-State conflict, there is an inescapable need to routinely and efficiently mount and sustain operations-of-war at distances of the order of several hundred — if not thousand — kilometres from the Indian coast. At these distances, in times of conflict, the qualities of endurance and resilience that are inherent in warships enable them to 'poise-in-theatre' for protracted periods of time. Throughout this time, which can easily stretch over several weeks if not months, air-power critical to guard them against existential threats. This is why a group of frigates and destroyers cannot be deployed in the theatre of combat without an assurance of defensive and air offensive power. This air-power must be available both 'here' and 'now'. Thus, while there can be little argument over the fact that modern, technology-derived, shore-based airborne platforms such as airborne refueller-aircraft could overcome the 'here' component of this twin requirement for the sustenance of blue-water combat-operations, the 'now' component cannot be addressed merely by extending the range of shore-based aircraft — whether manned or unmanned. Aerospace power that is an 'embedded' or 'integral' component of fleet-capabilities at sea is a sine qua non for combat-effectiveness and, almost invariably, even for the most fundamental feat of plain survival.

Once combat is joined, the need for air power increases exponentially and it is no exaggeration to state that a force that is bereft of air-power but which faces an adversary that enjoys offensive and defensive air-cover is almost certain to be defeated and destroyed. This is why 'integral' air-power, as embodied by a CBG, remains such a central operational concept of major navies. There certainly are navies that do not have integral air power of their own. In all such cases, they are either part of an alliance in which some other alliance-partner will bring the requisite integral air-power to bear, or, they are restricted to the immediate proximity of their coast, or, they will be destroyed in combat by an adversary that can apply integral air power, once again both 'here' and 'now'.

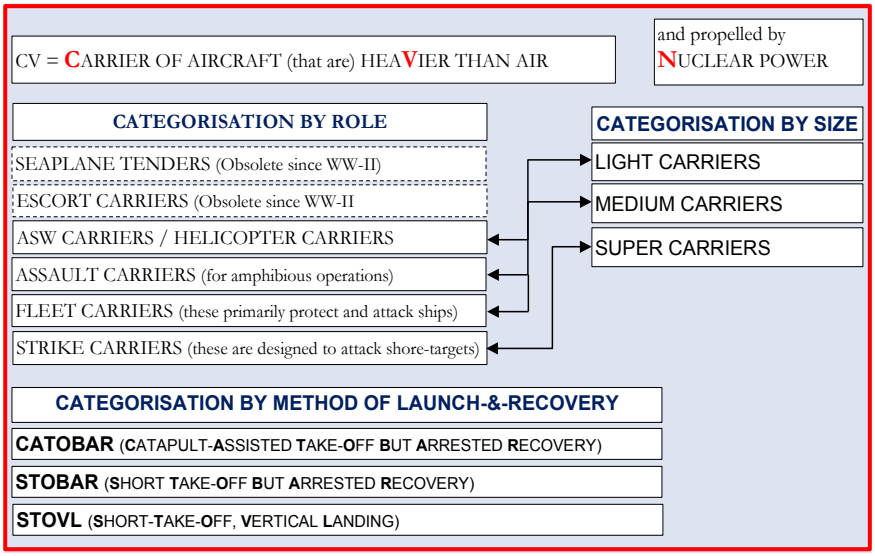
It is important to remember that an aircraft carrier cannot be considered to be the ship itself but is an integral part of an entire combat-system. This integrated combat system is what we refer-to as a Carrier Battle Group (CBG). Just as an army tank is a 'combat-system' comprising the chassis and the turret and the many connectivities between the two, and, just as it would be ridiculous to talk about the survivability of the tank's chassis separately and that of the turret separately, so too is a CBG a synergistic and mutually-supporting complete system and it is this system (i.e., the 'group') and not the aircraft carrier alone that must always remain the central point of reference. Many armchair analysts from the media, never having experienced the synergy that a CBG develops, are quite unable to appreciate this fact. Yet, all too often, their vanity compels them to talk or write about the aircraft carrier as a standalone ship. All too often, they end-up propounding a whole range of erudite and impressive-sounding arguments, but nevertheless ones

INS Vikrant (IAC-I). Photo: Indian Navy

that are quite simply erroneous (and often siloed), centred upon the several perceived vulnerabilities of the aircraft carrier alone.

Notwithstanding the acknowledged resilience of warships resulting from their very design (which, inter alia, incorporates a series of damage-control and enhanced-survivability features), some analysts highlight the threats to an Indian CBG emanating from the acquisition by the PLA Navy and the Pakistan Navy, too, of satellite imagery from surveillance-satellites such as those of the Yaogan series[9], coupled with the BeiDou satellite-navigation system[10]; anti-ship ballistic-missiles such as the Dong Feng 21D[11]; supersonic and hypersonic long-range cruise missiles[12]; nuclear-propelled attack-submarines (SSNs); very quiet diesel-electric submarines; and so on. These are, of course, grave threats and neither can nor should evoke either casual dismissal or responses that are driven more by machismo than by careful reflection. Surely, however, the mere fact that one's combat platforms face existential threats from one's adversary ought not cause one to give up on one's own combat capability altogether. Is the very existence of shore-based aircraft of an air force not threatened by the opposing aircraft and missile-systems of Pakistan and China? Is the existence of armoured regiments and artillery emplacements not threatened in combat by the opposing aircraft, missiles and artillery of the adversary? Is that, then a good enough reason for us to say that we ought not to invest in aircraft or tanks or artillery pieces of our own? This is a puerile argument that merits only disdainful dismissal.

It is important to recognise that there are several 'types' of aircraft carriers, which vary widely from one another in terms of their displacement-tonnage, their physical dimensions, their purpose or roles, their means of propulsion, the number of aircraft they carry in peace time as opposed to the number that can be carried in combat, the manner in which these aircraft are launched and recovered, the extent and depth of on-board logistics and repair capacity and capability, and so on. The following schematic (Source: Author) might help maintain some much-needed terminological exactitude:



As a consequence of the foregoing typologies, the difference between a carrier Battle Group (CBG) and a Carrier Strike Group (CSG) would be evident. A CBG is designed to attack enemy ships while protecting one's own fleet units. A CSG, on the other hand, is designed for land-attack — to attack heavily-defended targets on an enemy shore, while protecting its own fleet units.

In common with armed combat undertaken in other mediums, war at sea is undertaken via what is known as the 'engagement-cycle'. This involves the following eight activities, which are conducted sequentially: (1) 'Surveillance/ Search', (2) 'Detection', (3) Localisation, (4) 'Classification', (5) 'Identification', (6) 'Tracking', (7) 'Combat Decision-making' (whether to evade or to engage), and (8) 'Damage-Assessment'. The vulnerability of an Indian CBG in times of conflict needs to be assessed against these steps of the engagement cycle. Obviously, one needs to avoid the error of simplistically considering naval warfare as a game of 'Hide and Seek', where the 'Hiders' and the 'Seekers' are mutually exclusive entities with pre-defined roles. In truth, the hunter is also simultaneously the hunted and vice versa. This, along with the attendant fact that the hunter and the hunted may be operating in completely different mediums, each oblivious of the other, imposes limitations upon both protagonists.

The first challenge to be overcome by an enemy that seeks the destruction of an aircraft carrier of the size and type under discussion is one of combat-surveillance and resultant detection. Since any contemporary Indian CBG can easily traverse a distance of some 900-1,000 km in a 24-hour period, 'real-time' detection is needed. The magnitude of this problem needs to be appreciated. While the area of the Indian Ocean as a whole is a staggering 73.6 million square kilometres (km^2), the area to be kept under surveillance even within just the 'Arabian Sea' alone, is some 38,62,000 km^2.

[9] Stephen Clark, "China Launches Spy Satellite Triplet for Third Time This Year", Spaceflightnow website, https://spaceflightnow.com/2021/03/14/china-launches-spy-satellite-triplet-for-third-time-this-year/
See Also: Globalsecurity.org website, "Yaogan Naval Ocean Surveillance Satellites", https://www.globalsecurity.org/space/world/china/yaogan-noss.htm
Gunter's Space Page website, "Yaogan 9, 16, 17, 20, 25, 31 (JB-8 1, 2, 3, 4, 5, 6)", https://space.skyrocket.de/doc_sdat/yaogan-9.htm

[10] Jun Lu, Xia Guo, and, Chengeng Su, "Global Capabilities of BeiDou Navigation Satellite System", Satellite Navigation, 31 August 2020, DOI: https://doi.org/10.1186/s43020-020-00025-9

[11] David Webb, "Dong Feng-21D (CSS-5)", Missile Defense Advocacy Website, January 2017, https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/china/dong-feng-21d-df-21d/

[12] Richard Weitz, "China's Hypersonic Missiles: Methods and Motives", China Brief Volume: 21 Issue: 15, 30 July 30, 2021, The Jamestown Foundation, https://jamestown.org/program/chinas-hypersonic-missiles-methods-and-motives/

The proliferation of commercial light-weight satellites, such as those launched by US-based satellite companies like Planet Labs[13] and Spire Global,[14] have made it possible to provide global surveillance at 3-metre to 5-metre resolution. A well-known example is that of the 88-satellite 'flock' (constellation) of 'Dove' nanosatellites (CubeSats) from Planet Labs, that were, on 15 February 2017, launched into a morning crossing time, sun-synchronous orbit (SSO) via the Indian Space Research Organisation (ISRO)'s Polar Satellite Launch Vehicle (PSLV).[15] The vast bulk of commercial nanosatellites are focused on the land and do not image vast tracts of the open ocean.[16] That said, there is certainly substantial commercial satellite-based coverage of more restricted ocean-areas such as the South China Sea, the Mediterranean and the Persian Gulf.[17] However, persistent satellite-based surveillance of a large oceanic expanse such as the Indian Ocean or the Pacific Ocean remains a significant challenge. Moreover, satellite-based detection — including that by commercial nanosatellites (which are only a contemporary manifestation of what is generically called the 'space segment' of a satellite system) — calls for 'ground-stations'.[18] "The ground system is responsible for collecting and distributing the most valuable asset of the mission: the data".[19] Using the proper ground system is key to mission success. It is the 'footprint' of these ground stations that would enable 'real-time' downloads of imagery (electro-optical, radar, infra-red, or whatever) of medium/large objects detected at sea. An adversary seeking to make the Indian Ocean 'transparent', must, therefore, possess an adequate number of adequately located and technologically-sophisticated ground-stations. Multiple Low Earth Orbit (LEO) satellites would need to be simultaneously tracked and multiple communication bands employed by these ground stations. Although technology for ground stations for the larger Geosynchronous Earth Orbit (GEO) satellite classes is fairly well-developed and stable, the same cannot be said for ground stations for LEO satellites, especially since the tracking and correcting of LEO satellites generates far more demanding requirements for pointing and tracking than is the case with GEO ones.[20] Where nanosatellites are concerned, the sheer number of satellites in a constellation makes the problem even more challenging. LEO slots in space are getting increasingly crowded and collisions are increasingly likely, with the resultant space-debris causing cascading collisions. A key area of need for tactically relevant military nanosatellite systems is a robust, stationary, electronically-steered antenna that gives nanosatellite ground stations the ability to reliably transmit encrypted satellite commands as well as receive encrypted nanosatellite telemetry. It is obvious that 'ground-stations' — whether for GEO satellites or LEO ones — require 'ground'. An adversary of India must, therefore, possess adequate and suitably located 'territory' upon which 'ground-stations' can be positioned. This is true even if these 'ground-stations' are modern, small, and/or portable ones, such as the US/NATO 'RAPIDS' (Resource and Program Information Development System). All this is beyond the current or near-term capabilities of either of India's likely adversaries.

If, on the other hand, the adversary chooses to deploy airborne radar, this would typically be achieved through shore-based 'Long Range Maritime Patrol' (LRMP) aircraft such as Pakistan's P3C Orion and its replacement, the Embraer Lineage 1000 jetliner from Brazil. It is understood that once inducted, these will be known as 'Sea Sultans'.[21] However, only one aircraft seems to have been inducted thus far and another two having been contracted for conversion, even though the total order is reportedly for ten aircraft.[22] As things presently stand, Pakistan has some capability within the Arabian Sea, while China has some minimal/marginal capability at the eastern fringes of the Bay of Bengal. The effectiveness of these already-limited capabilities will inevitably be further constrained by the Indian Navy's deployment pattern in respect of the CBG. Since one never plans to place one's most valuable military-assets in a position of maximum disadvantage to oneself, it is realistic to expect that an Indian CBG would not be deployed where the enemy's shore-based air power poses the greatest threat to one's own forces. Thus, an Indian CBG would not be deployed within the unrefuelled combat radius of an intact enemy's shore-based Fighter Ground Attack (FGA) aircraft. Indeed, the 'deployment-pattern' of the CBG is an overarching factor that is germane right across the 'combat-engagement cycle' under consideration. All carrier-operating navies recognise the unacceptable risks involved in operating aircraft carriers singly, or keeping them in harbour, or deploying them in the close proximity of land. Consequently, CBGs routinely put to sea well before any crisis deteriorates into conflict. They then 'poise' in theatre at distances ranging from multiple hundreds or thousands of kilometres from the shore, that is, within distant and deep 'blue-waters'.

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[13] Planet Labs Website, https://www.planet.com/

[14] Spire: Global and Analytics Website, https://spire.com/

[15] AJ Vinayak, "How ISRO put 88 Doves and 2 Lemurs in Orbit", The Hindu Business Line, 15 February, 2017, https://www.thehindubusinessline.com/news/variety/how-isro-put-88-doves-and-2-lemurs-in-orbit/article9545260.ece

[16] HI Sutton, "The Realities of Tracking Aircraft Carriers with Civilian Satellites", Forbes, 07 May 2020, www.forbes.com/sites/hisutton/2020/05/07/the-realities-of-tracking-aircraft-carriers-with-civilian-satellites/?sh=6b741fcb4224

[17] Ibid

[18] National Aeronautics and Space Administration (NASA), "Ground Data Systems & Mission Operations", Small Spacecraft Technology State-of-the-Art Report 2020, NASA/TP—2020–5008734, https://www.nasa.gov/smallsat-institute/sst-soa-2020/ground-data-systems-and-mission-operations

[19] Ibid

[20] José Meseguer, Isabel Pérez-Grande and Angel Sanz-Andrés, "Keplerian Orbits", Chapter 3 in Spacecraft Thermal Control, Woodhead Publishing, 2012, https://doi.org/10.1533/9780857096081.39

[21] Usman Ansari, "Pakistan Hires Leonardo, Paramount Group for Aircraft Conversion Program", DefenseNews Website, 08 July 2021, https://www.defensenews.com/industry/2021/07/08/pakistan-hires-leonardo-paramount-group-for-aircraft-conversion-program/

[22] Ibid

Naval Group (France) Mistral class LPD

routinely mounted by modern, carrier-based fighter aircraft such as the MiG-29K that are already deployed on the INS Vikramaditya and would, additionally, be embarked on the future Vikrant. As such, every time the LRMP aircraft makes a detection of what it thinks might be an aircraft carrier — but might turn out to be a carrier-sized merchantman or a 'non-carrier' warship such as a fast LPD — it has no choice but to assume that every such contact is, indeed, the enemy aircraft-carrier. Consequently, it is forced to immediately adopt a series of gambit tactics designed to promote its own survival against interception by carrier-based aircraft. These departures from its mathematically-designed search-pattern seriously degrade the 'probability-of-detection'. This, as any experienced LRMP

Even once detection has been achieved, the next challenge that must be overcome is 'classification'. In terms of traffic-density, the Indian Ocean is the busiest of all the world's oceans, with over 145,000 ships transiting the International Shipping Lanes (ISLs) of this ocean every year.[23] On our western seaboard, the Strait of Bab-el-Mandeb (connecting the Gulf of Aden and the Red Sea) accounts for some 22,000 ships annually, while the Strait of Malacca on the country's eastern seaboard accounts for a staggering 90,000 ship-transits every year. Sailing on the ISLs are a number of large, fast ships — several of which are of a comparable size and speed to that of an aircraft carrier, but are not warships at all. Examples include a multitude of Very Large Crude Carriers (VLCCs), Maersk E-Class Container Carriers, a number of cruise-ferries and cruise-liners, several 'car-and-truck' carriers, and, a large variety of 'Roll-on-Roll-off' [Ro-Ro] ships. Moreover, heavy-lift warships as also those designed for amphibious operations (such as the French Navy's Mistral Class) and a number of Classes of LPDs [Landing Platforms Dock], can also be quite easily mistaken for aircraft carriers. Thus, the process of correct classification is by no means as simple as it might initially appear. Despite enjoying its reputation as a 'hunter', every LRMP aircraft is acutely aware that when facing a CBG, it is simultaneously the 'hunted' and is extremely vulnerable to attrition by the Combat Air Patrols (CAP) that are

Navantia (Spain) Juan-Carlos class LPD

[23] Indian Navy, Information Fusion Centre-Indian Ocean Region (IFC-IOR) Annual Report 2020, https://www.indiannavy.nic.in/ifc-ior/reports.html

IN MiG-29K inside the INS Vikramaditya. Note the arrestor hook. (Photos: Vayu)

crew knows, is a very serious limitation and plays havoc with the entire process of executing a planned 'Search'.

The foregoing challenges notwithstanding, let us assume that a contact that has been detected is classified as an aircraft carrier. The next problem is that of 'identification': whose aircraft carrier is it? This question is germane because extra-regional aircraft carriers (especially those of US and French navies) are regularly deployed in both, the Arabian Sea and the Bay of Bengal. Were one of these to be engaged by a trigger-happy LRMP Pakistani or Chinese aircraft searching for the Indian Navy's CBG, the consequences are likely to be catastrophic. Although it is possible for an LRMP aircraft to conduct a 'search mission' while using only passive means such as ESM (Electronic Support Measures), acoustic devices (sonobuoys, for example) and electro-optics, such a 'search' would yield a low 'Probability-of-Detection'. As such, more often than not, a 'search' mission seeking to confirm the presence or absence of a CBG in the area being searched, would be undertaken at least partially by active transmissions on the airborne radar of the LRMP aircraft. The constituent ships of the CBG, being far more capacious than an LRMP aircraft, carry a far greater variety of Electronic Warfare suites of far greater sophistication than an aircraft can. As such, an LRMP aircraft transmitting on its radar is very vulnerable — first to detection by any or all of the excellently data-linked constituents of the CBG and thereafter to interception by carrier-based aircraft data-linked to highly-qualified aircraft-direction teams and equipped with state-of-the-art Beyond Visual Range (BVR) missiles well before it can reach its own 'weapon-release-line' (WRL).

View from the deck of INS Vikramaditya (Photo: Vayu)

Next assume that the CBG has indeed been detected, correctly classified and correctly identified. The attacker must now make a series of command decisions leading to the launch of weapons, and these weapons must now transit the space between their point of origin and the carrier. While all this is occurring, the carrier is moving. If the CBG is not 'tracked' continuously — or at least continually, — positional errors could easily become very significant. For instance, during a 30-minute period, the Carrier could have manoeuvred anywhere within a circle measuring 700 square miles. Over 90 minutes, this area grows to 6,000 square miles! Consequently, the requirement of continual/continuous tracking increases the probability of destruction of even a missile-equipped LRMP aircraft by carrier-based interception manifold. LRMP aircraft-holdings in the inventories of our potential adversaries are severely limited and every loss of an LRMP aircraft imposes a very severe penalty on the adversary's overall capability in terms of maritime operations. This is because it is these very LRMP aircraft that are required to 'trigger' the launch of

shore-based aircraft of the enemy air force that have been earmarked for 'Maritime Air Operations' (MAO). Without this trigger, the MAO Commander does not know when exactly he should launch his Fighters Ground Attack (FGA) to attack the carrier. This is a critical input to him because in attacking the CBG at large distances from the coast, his aircraft will need to operate with a number of limitations. They will consume a significant amount of fuel in the transit to and from their weapon-release line. As a result, their time-on-target will be limited. If a tanker-aircraft is deployed near the seaward limit of the autonomous radius-of-action of the FGA, the refueller itself will become a strategically important (and hence hugely attractive) target for the carrier-borne aircraft and, as a further consequence, additional resources will have to be committed by way of air-defence fighter-aircraft so as to ensure its safety. The enemy's shore-based strike-aircraft would, perforce, be operating well outside the cover of their land-based radars and hence be bereft of direction by their Fighter Controllers. On the other hand, the Carrier's own fighters, operating in the 'interceptor' role, would have relatively more fuel and hence greater combat-time (time-on-task). They would be operating within the radar cover of the CBG as a whole and, with their contemporary armament of BVR air-to-air missiles, would have the advantage of being directed by ship-borne fighter-controllers (known in the Indian Navy as 'Direction Officers'). It is clear that the MAO Commander ashore cannot afford to fritter away the fuel-endurance of his aircraft by launching them too early and, yet, he certainly cannot afford to launch them too late. Consequently, the timeliness and accuracy of the 'launch-trigger' provided to him by his LRMP aircraft is a sine qua non for his operations.

Hence, as the CBG attains sequential or simultaneous destruction of the enemy's LRMP aircraft, it incrementally cripples the ability of the adversary to sensibly deploy either shore-based FGA or submarines against it. This then allows the CBG to close the enemy coast, should that be its operational intent. This brings us to the critically important question of whether closing the enemy coast to attack targets ashore (military power-projection) is what we want our CBG to do. If so, what we need is not merely a 'Fleet Aircraft Carrier' with a displacement of some 45,000 tonnes or so, but a larger one, of at least 65,000 tonnes displacement. That we will need a CATOBAR carrier is very likely, as this will enable it not only to embark Carrier On-board Delivery (COD) aircraft but, far more significantly, also AWACS aircraft such as modernised variants of the American 'E-2D Hawkeye'.

The next question that is frequently raised is that of the survivability of the Carrier (even here, the expression 'CBG' is generally missing) against sub-surface threats. This is, indeed, a more intricate and complicated operational challenge than that of the CBG's ability to deal with aircraft or missile threats. In several areas of the Indian Ocean, particularly the north-western segment (that is, the Arabian Sea) the acoustic profile almost always depicts a 'negative-gradient'. This makes it difficult for ships with hull-mounted sonars to achieve early detection of enemy submarines. The deployment of towed-array sonars could solve this problem, but brings another equally serious one in its

E-2D Hawkeye (Photo: US Navy)

wake. This is the penalty that has to be paid in terms of both, manoeuvrability and speed-of-advance. On the other hand, an adversary deploying conventionally-powered submarines must contend with challenges of his own. These are principally low speeds and very low endurance, the latter being an especially debilitating feature at high underwater speeds. Such submarines tend to be deployed in 'choke-points' — whether these are created 'geographically' or 'operationally'. For 'mid-ocean deployments of conventionally-propelled submarines to be even minimally effective, the adversary needs highly accurate and continually-updated tactical-intelligence with regard to the predicted direction (the 'Mean Line of Advance' [MLA]) of the CBG. Thus, a conventionally-propelled submarine can be effectively redeployed for a mid-ocean interception of the CBG only through one or another form of protracted tactical cooperation with a LRMP aircraft. The problems of maintaining instantaneous tactical communication with a deep-submerged submarine are not small by any stretch of imagination. They frequently involve the aircraft remotely 'keying' a distant 'Very Low Frequency' (VLF) or 'Extremely Low Frequency' (ELF) facility located a great distance and often deep in the hinterland of the country that is attempting such tactical cooperation between its conventionally-powered submarine and its LRMP aircraft. Since the LRMP aircraft is restricted in its own freedom of deployment, it becomes very vulnerable indeed to attrition or destruction from carrier-based fighter-interceptors. Thus, in dealing with a CBG, such cooperation between an LRMP aircraft and a submarine (often abbreviated to the expression, 'MR-Sub cooperation') is a non-starter. In any case, quite apart from its 'blue-water' positioning, the high speed-of-advance of the CBG is, in and of itself, an effective submarine-evasion measure, especially when it is overlaid by tactical manoeuvring involving violent and frequent course-variations.

However, once a nuclear-propelled attack submarine (what NATO refers to as an 'SSN') is introduced, the threat-equation changes sharply. On the one hand, SSNs are significantly noisier than contemporary diesel-electric submarines. On the other, their endurance limits are dictated by crew-fatigue and not by battery-life. As such, they have no 'indiscrete' periods dictated by the need to recharge batteries. Of course, this is also true (albeit to a limited extent) of diesel-electric submarines that are equipped with one or another form of 'Air-Independent Propulsion' (AIP). Where the SSN really scores over the AIP-equipped diesel-electric boat (submarines are traditionally referred to as 'boats') is in its high underwater speed. This, coupled with the fact that SSNs routinely carry a combination of torpedoes (both 'anti-ship' and 'anti-submarine') and anti-surface missiles, means that there are no 'Limiting Lines of Approach' (LLAs) for an SSN and the CBG faces an all-round threat, rather than solely one from the van as is the case with the threat posed by conventionally-propelled boats. Thus, on the one hand, the ability of the CBG to use high transit speeds as an effective submarine-evasion tactic is nullified. Unable to 'evade' the threat, the CBG is forced to address it through the adoption of anti-submarine attack methods. On the other hand, the threat has metamorphosed into an all-round one, involving both, torpedoes and subsurface-launched missiles. Of course, the submarine must still be able to obtain an accurate fire-control solution through Contact Motion Analysis (CMA) and reach its launch position without being detected and hence prosecuted. As in all forms of Anti-Submarine Warfare (ASW), earliest detection is vital. Although there certainly are technical means available to the CBG to achieve long-range detection, tactical means would invariably have to be superimposed upon technical ones. Yet, for all that, there is no gainsaying the fact that howsoever efficient, ASW measures taken by surface-ships against an SSN-threat are seldom going to be adequate. Airborne ASW, on the other hand, is much more promising and this is where rotary-wing ASW aircraft (helicopters) become ever so critical. The need to maximise the number of medium-range and long-range ASW-capable helicopters once again points to the IAC-2 displacing at least 65,000 tonnes. Almost every Indian frontline surface combatant that might form part of a CBG is capable of embarking and deploying two specialised medium/heavy ASW helicopters and the maximum utilisation of this deck-capacity is crucial. The deployment of one's own SSN — in an anti-submarine (hunter-killer) role against another SSN (or an SSBN) — as an intrinsic element within one's CBG is an option that has been extensively validated by the US Navy and, amongst several other advantages, holds out much promise in dealing with the enemy-SSN threat.

Irrespective of the launch-platform, the threat of the anti-ship cruise missile has been greatly diminished by the very-effective anti-missile capability provided by the various variants of the Barak missile, which is, today, fitted aboard every major surface combatant of the CBG, including the aircraft carrier itself. It is fair to say that an Indian CBG has a well-proven ability to 'take-on' incoming anti-ship sea-skimming

Indian Navy Ka-31 AEW helicopter (Photo: Vayu)

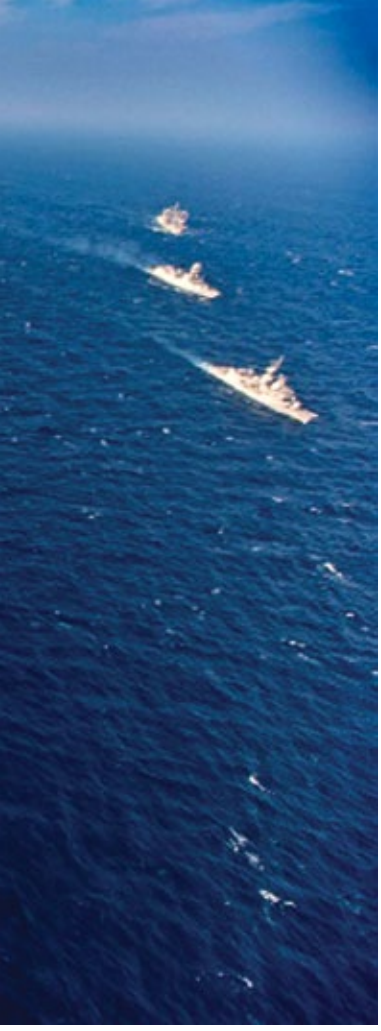
missile launched by the enemy and to thereafter 'take-out' the launch-platform (whether surface, sub-surface or airborne). This sense of self-assurance and the resultant rise in fleet morale is no mean thing. It has resulted in a marked resurgence of creative and even audacious operational deployment-patterns.

However, there is an increasingly shrill debate over the issue of what has come to be known as the 'anti-ship ballistic missile'. The Chinese-made 'Dong Feng 21-D' (DF-21D [CSS-5 Mod-4]) is widely touted by some as being a 'Carrier-Killer',[24] but, as the well-respected analyst, Commander Otto Kreisher (Ret), USNR, has succinctly pointed out, "…For a ballistic missile to hit a target at 1,000 miles or more, it has to know where that target is located, with a high degree of accuracy. That's complicated when the target — such as a carrier strike group — is moving at up to 34 miles per hour. For the weapon to be effective, such a geographic fix must be updated constantly. To locate a carrier initially, China could use its over-the-horizon radars, which can search out more than a thousand miles. But the geographic accuracy of OTH radars at long range can be off by scores of miles... in a time of conflict, a patrol airplane or submarine attempting to get close to a carrier — shielded by its E-2D early warning airplanes, F/A-18 interceptors, and an anti-submarine screen of subs and destroyers — might not succeed. If the Chinese could get an accurate fix on the carrier, the data would have to be processed, and the missile prepared, programmed, and launched — a complicated command and control procedure that has to be routinely tested and practiced to ensure it works. The missile, its homing sensors, and guidance system would also have to function properly to reach and hit the moving carrier."[25]

The fact that this sort of threat to a Vikramaditya-centric CBG is probably not an immediate one does not mean that it would not be so for a Vikrant-centric one. Any assessment of the lack of immediacy in materialisation of such a threat must not be taken as a signal for complacency but, rather, should be taken to mean that we have a little time in which to prepare ourselves

[24] Center for Strategic and International Studies (CSIS), "DF-21 (CSS-5)", Missiles of the World: China, CSIS Missile Defense Project, https://missilethreat.csis.org/missile/df-21/

[25] Otto Kreisher, "China's Carrier Killer: Threat and Theatrics", Air Force Magazine, December 2013, https://www.airforcemag.com/PDF/MagazineArchive/Documents/2013/December%202013/1213china.pdf



All four images above are from Exercise Malabar and the Quad 2020

for the inevitable enhancement of maritime military capabilities on the part of China and Pakistan. Consequently, shore-based as well as sea-based ballistic missile defence capability — whether the US Aegis system or some indigenous one — is a pressing requirement for India.

Finally, those who point to the military-strategic cooperation between China and Pakistan as translating into an existential threat to an Indian CBG would do well to note that India does not play the strategic game all alone, either. We, too, have competent, capable, and reliable partners, if not formal allies. The most recent edition of the MALABAR series of naval exercises provides compelling evidence of the development of intensive and operationally-relevant cooperation and interoperability between an Indian Naval CBG and a USN CSG, quite apart from the seamless incorporation of cooperating surface naval combatants of Australia and Japan. These are signals that are immediately received by China and Pakistan. Should they, then, fall upon deaf Indian ears?

UK's CSG and Exercise Konkan Shakti

UK Carrier Strike Group led by HMS Queen Elizabeth in the Bay of Bengal

(Photo: Royal Navy)

The UK's Carrier Strike Group (CSG), led by HMS Queen Elizabeth sailed into the Bay of Bengal mid-October 2021 in a powerful demonstration of the UK-India Comprehensive Strategic Partnership agreed by both Prime Ministers in May 2021. In its most substantial port visit to date, the CSG provided a platform for a wide range of cultural demonstrations and trade and investment initiatives. Subsequently, the CSG took part in the most demanding exercises ever between the UK and India, incorporating elements from all three military services.

British High Commissioner to India, Alex Ellis stated, "India is an essential partner for the UK in the Indo-Pacific region. The Carrier Strike Group's visit demonstrates the deepening of the UK and India's defence and security partnership. Prime Ministers Modi and Johnson agreed to work in lockstep for our shared security and prosperity. This visit will boost the cooperation of our armed forces and show the living bridge connecting our people."

First Sea Lord Adm Tony Radakin stated, "The CSG's engagement with India showcases the deepening comprehensive strategic partnership. Both the Indian and the Royal Navy are blue-water, multi-carrier navies, which places us in a very exclusive club. Our growing interactions are a testimony to the shared commitment to rules-based international system, a belief in the values of open trade, and in the importance of the freedom of the high seas – a right conveyed on all nations."

Royal Navy Air Engineers disconnect stores from a Merlin Mk 4 helicopter during vertical replenishment. (Photo: Royal Navy)

Maiden India–UK joint tri-service Exercise Konkan Shakti 2021

The maiden India–UK Joint Tri-Service exercise Ex Konkan Shakti took place from 21-27 October 2021. The maritime component of the exercise, conducted off the west coast of India, was held in two phases. The harbour phase was at Mumbai from 21-23 October, while at sea, the exercises were conducted from 24-27 October. The naval linkages between India and the United Kingdom is one of antiquity and, over a period, it has grown substantially in terms of interoperability and synergy. Over decades now, both navies have undertaken bilateral exercises, exchanges and enhanced their technical cooperation. Rightly so, this has formed the basis for the maiden tri-service bilateral exercise Konkan Shakti-21.

Royal Navy (RN) was represented by its aircraft carrier, HMS Queen Elizabeth, with her integral F35 fighter aircraft and helicopters, the Type 45 Daring Class air-defence destroyer HMS Defender, the Type 23 frigate HMS Richmond, a Royal Fleet Auxiliary (RFA) Fort Victoria, and a Royal Netherland Navy Frigate HNLMS Evertsen. The Indian Navy (IN) was represented by three of its indigenously built stealth guided missile destroyers INS Kolkata, INS Kochi and INS Chennai, two stealth frigates, INS Talwar and INS Teg as well as the tanker INS Aditya. The IN also participated with their integral Sea King 42B, Kamov-31 and Chetak helicopters, MiG-29K fighter aircraft, Dornier 228MPA and P8I (maritime patrol aircraft) and a submarine.

Sea phase of 'Konkan Shakti 2021'

The sea phase of maiden Tri-Service exercise 'Konkan Shakti 2021' between the Armed Forces of India and United Kingdom (UK) was held off the Konkan coast in the Arabian Sea. On completion of harbour planning phase, the sea phase of the exercise commenced on 24 October and continued till 27 October.

All participating units were split into two opposing forces with the aim of achieving sea control to land army ground-troops at a pre-designated site. One force was led by the Flag Officer Commanding Western Fleet and comprised the flag ship INS Chennai, other warships of the Indian Navy and HMS Richmond, the Royal Navy's Type 23 frigate. The other force operated under the UK Carrier Strike Group comprising aircraft carrier, HMS Queen Elizabeth, other UK and Netherland naval ships and Indian warships.

The two forces integrated within their groups with exercises such as replenishment at sea approaches, air direction and strike operations by fighter aircraft (MiG-29Ks and F35Bs), cross control of helicopters (Sea King, Chetak and Wildcat), transiting through war-at-sea scenarios and gun shoots on expendable air targets. The simulated induction of Army troops was also undertaken, followed by setting up of a joint command operations centre. Thereafter, the two forces effected a rendezvous at sea with advanced air and sub-surface exercises.

The air operations included strikes on the combined formation by Indian maritime patrol aircraft (MPA) Dorniers, fighters of the Indian Navy (MiG-29Ks), Royal Navy (F35Bs) and Indian Air Force (Su-30MKIs and Jaguars) as well as a composite fly past over the formation. Sub-surface exercises with an Indian Scorpene class submarine and underwater remote controlled vehicle EMATT, operated by the Royal Navy, were undertaken through the night. Indian Navy P8I's also participated in the exercise.

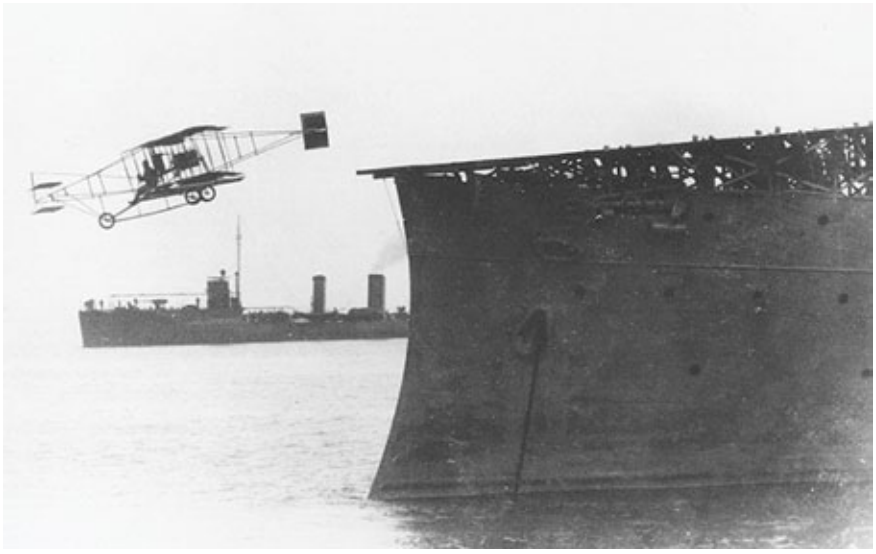
Rise of Asian naval might

The race for aircraft carrier-type platforms

On the deck of Indian Navy's INS Vikramaditya aircraft carrier (Photo: Vayu)

If one is asked to name the most fascinating warship of the twenty-first century, there is a big chance that one may name an aircraft carrier and that too most probably influenced by high definition aesthetic photos released over time by the US Navy. A 100,000 tonne floating behemoth is often considered a symbol of American diplomacy. Currently there are six navies around the world operating aircraft carriers and some more intend to join the club in near future. For almost eight decades the technology was limited to only US and Europe with India being the only example out of the NATO league to have the experience in operating carriers for more than six decades. But recently, many Asian nations have adopted high end modernisation programmes for their navies which will throw challenges against traditional carrier powers and may shift the balance of naval might.

14 November 1910 marked the beginning of a new era when a US Navy pilot Eugene Ely made a successful flight from the deck of US Navy cruiser USS Birmingham. Till then only hot air balloons were used to launch as an offensive weapon from a warship. The next year he became the first pilot also to land an aircraft, thus making a history in naval aviation history. Unfortunately, he didn't survive long to see fascinating and rapid progress of what he had pioneered.



Eugene Ely makes the first airplane takeoff from a warship in a Curtiss pusher airplane from the cruiser USS Birmingham at Hampton Roads, VA, USA. (Photo: airandspace.si.edu)

What was in infancy during the First World War saw rapid growth and rise of British, American, Japanese and Italian carrier battle groups during World War 2. Post WW-II, the US was the largest operator of aircraft carriers but now China is all set to challenge the Americans and Japan and South Korea are soon to join the club.

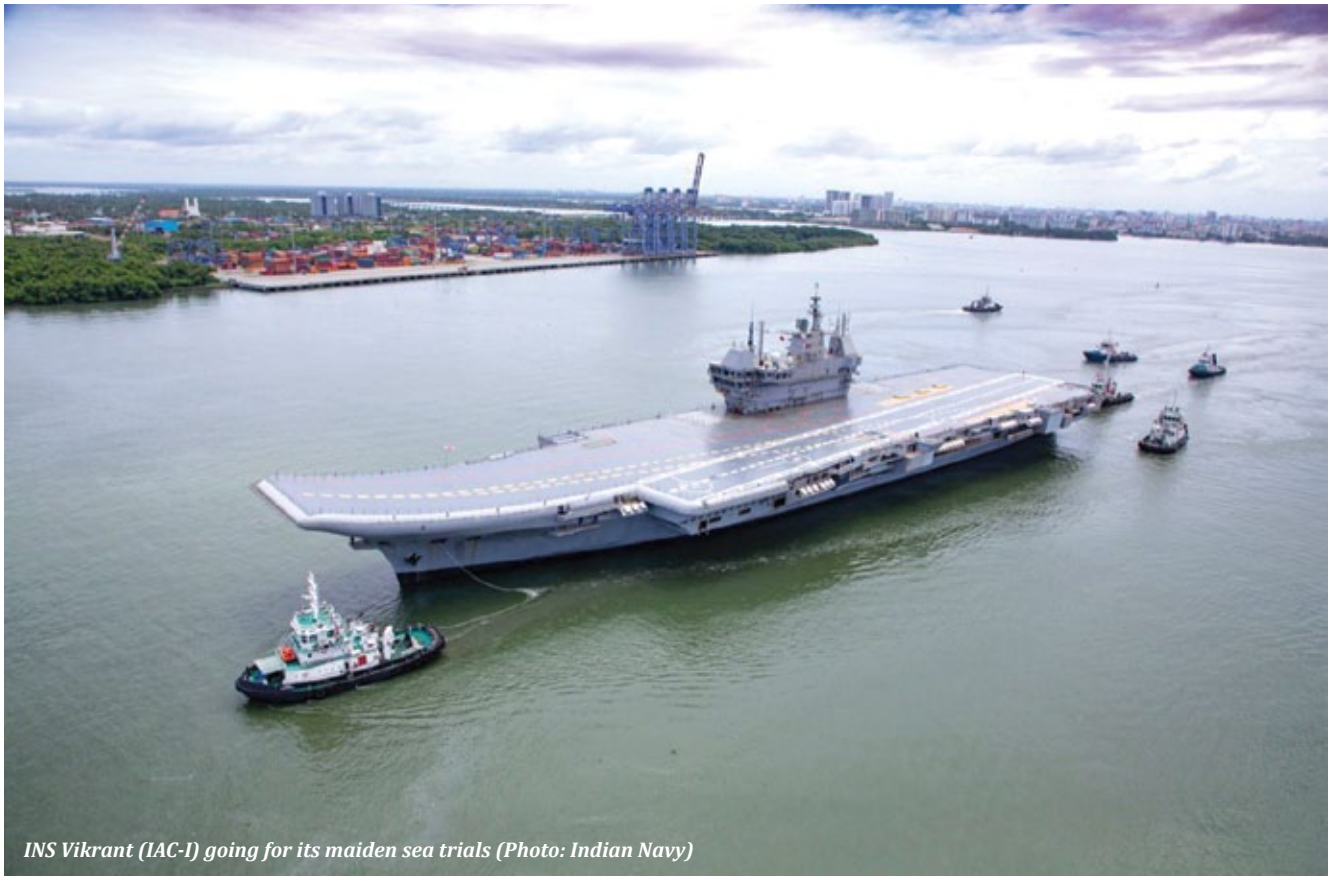
India

India became the first nation in Asia to operate an aircraft carrier when it acquired a Majestic class one; ex-Royal Navy HMS Defender was renamed INS Vikrant and later became a legend and symbol of 1971 Bangladesh Liberation War. India later procured another ex-Royal Navy aircraft carrier and Falkland War veteran to serve as INS Viraat. Currently the Indian Navy operates a single Russian origin Gorshkov class aircraft carrier INS Vikramaditya and at the same time has successfully constructed an indigenously new carrier, thus entering the selective club of countries that are capable of constructing their own aircraft carriers. The indigenous aircraft carrier, INS Vikrant is now (as on 24 October 2021) conducting its second sea trials and is expected to be commissioned by August 2022.

Like the INS Vikramaditya, INS Vikrant is also a Short Take-off But Arrested Recovery (STOBAR) platform and will carry MiG-29K fighters for a short time till they are replaced by indigenously developed advanced fourth generation platform the TEDBF (Twin Engine Deck Based Fighter). Besides, according to reports, procurement of a foreign platform (Boeing F/A-18 Super Hornet Block III and Dassault Rafale M) is also under consideration. However, experts are already concerned with the limited capability of a STOBAR platform and in favour of a bigger CATOBAR one. The Indian Navy too wishes for a conventionally powered 65,000 tonne super carrier with CATOBAR (Catapult Assisted Take-Off But Arrested Recovery) with EMALS (Electromagnetic Aircraft Launch System). In future the 'super carrier' will be able to house an indigenously developed fifth generation fighter jet (N-AMCA) as well. But till this is sanctioned, the Indian Navy will keep operating two aircraft carriers simultaneously equipped with indigenous fighter jets to protect Indian maritime interests.

China

China is a new player in the field and astonishingly catching up with the US Navy in terms of naval platforms. People's Liberation Army Navy (PLAN) got its first aircraft carrier in 1998 when it acquired Soviet era carrier Varyag from Ukraine. Infact how China brought Varyag is not less than a thrilling con artist movie. Even before Varyag, China had bought two more carriers for 'commercial purposes'. Varyag was renamed as Liaoning (CV-16) and it joined Chinese Navy in 2012. Later China built another aircraft carrier indigenously based on Liaoning design and named Shandong (CV-17). However Shandong got several modifications over earlier design which had several drawbacks. Both CV-16 and CV-17 have STOBAR technology to operate J-15, China's only carrier borne fighter aircraft for now. But the technology limit bars operating an AEW&CS (Airborne Early Warning and Control System) aircraft from either carrier. To overcome the drawback, China is now developing a new generation and its first 'super carrier' which will mark its entry into this sophisticated carrier technology era which was till now



INS Vikrant (IAC-I) going for its maiden sea trials (Photo: Indian Navy)

China's Type 002 aircraft carrier seen here in 2017 (Photo: Wikicommons)

China's fourth Type 055 destroyer is to enter service before the end of 2021; the Nanchang (in photo) was the first of the Type 055 destroyers to be commissioned in 2020. (Photo: Handout)

held only by the US . Several analysts have tried to assess the under construction (by the time you are reading this it will be almost completed) platform from recent satellite images.

It is believed once completed it will be a 100,000 tonne class carrier with a flat deck. From the possible design one can mistake it as Ford Class aircraft carrier which is the latest entry into US Navy. However, instead of nuclear propulsion it will be an oil fired one. The 320 meter long platform will feature two elevators and three catapults capable of launching the KJ-600 which is supposedly China's answer to the US E-2D.

Most fascinating feature of the platform is the catapult that will be powered by EMALS. The fixed wing fighter fleet will be formed with twin engine naval stealth fighter (a variant of FC-31) which recently has conducted the first flight and a CATOBAR variant of J-15. The rotorcraft fleet will possibly consist of Z-18F ASW, Z-20F ASW, Z-18J AEW and Z-9C. It is not confirmed yet how many aircraft carriers PLAN will acquire, but many reports suggest it might be six till 2035 including multiple nuclear powered ones. This will not only just throw a serious challenge to the US but will be a great danger to its neighboring countries including India.

Japan

On 3 October 2021, two F-35Bs from the United States Marine Corps (USMC) conducted launch and landing test on the JS Izumo of Japan Maritime Self-Defense Force (JMSDF), marking the first carrier operation by Japan since the end of World War Two. Facing increasing aggression by China, Japan is giving up its current pacifist approach and adopting a lot of measures to protect its territorial sovereignty.

Japan's JS Izumo (DDH-183). Photo: JMSDF

The Izumo Class as known as "Helicopter Destroyer" has a displacement of 27,000 tonnes and a length of 248 meters. Till now the aircraft facility consisted of SH-60K/J for anti-submarine warfare and UH-60J for Search and Rescue. But Izumo and Kaga are now being modified to support F-35B Short Take-off and Vertical Landing (STOVL) fighter jets. No doubt these two platforms each equipped with just 12 F-35B will not posses significant capability to thwart a major Chinese (or Russian) misadventure but definitely is enough to deliver a message and keep opposing forces in check.

There are lot of speculations regarding the modifications on these two platforms, but no ski-jump is planned for these instead the trapezoidal bow will be modified to a rectangular one. Besides F-35B, these platforms are reported to carry the V-22 Osprey as well. The Japan Ground Self-Defense Force (JGSDF) recently has become the first foreign customer with the acquisition of this advanced VTOL tiltrotor. Once the modernisation concludes, with the F-35B, SH-60 and likely V-22, Izumo and Kaga will provide extensive security in the Indo-Pacific Region.

South Korea

Eying the constant threat from North Korea and China, Republic of Korea is gearing up for a blue water navy. Under their CVX programme the nation intends to procure an aircraft carrier by 2030. MADEX 2021 surprised the world when not just one but two different concepts were showcased by two companies. The proposal from Hyundai Heavy Industries (HHI) has a displacement of 30,000 tonnes and a length of 270 meters enabling to carry 16-20 F-35B. It features

Models of DSME proposal for Korea's CVX project. (Photo: @Foxtrot19_RADAR)

twin-island similar to the British Queen Elizabeth class. HHI has brought significant changes from their previous concept to reduce radar signature significantly. The AESA radar is to be installed on the lower part of the islands enabling integration of a wide range of sensors to the upper part. Though developed to support STOVL F-35B, it can be modified as a STOBAR platform as well if needed.

Daewoo Shipbuilding and Marine Engineering Co. Ltd (DSME) on the other hand presented a much heavier 45,000 tonne flat-top concept. This 263 meter long platform can support a total of 28 F-35B's. Recently Fincantieri signed a contract with DSME to support the Conceptual Design. Currently, there is no clarification regarding the rotorcraft fleet for CVX, but both designs can support different helicopters as well as unmanned air and sea platforms. There are rumours of a possible naval variant of the KF-21, but it is yet to be confirmed officially.

Turkey

TCG Anadolu is a Turkish amphibious assault ship (LHD) being constructed by Sedef based on Navantia's Juan Carlos 1 which will be supported by a sister ship TCG Trakya later. Initially they were to carry 16 F-35B each, but after Turkey was removed from the F-35 programme following a US-Turkey rift, Turkey now plans to equip these with a new variant of TAI Hürjet. Hürjet is an Advanced Jet Trainer/Light Combat Aircraft which does not have STOVL capability and it is not clear what kind of modifications will be conducted for both the LHD and the aircraft. Even if a variant is successfully developed, the capability will be seriously restricted. The LHDs will carry helicopters such as T-129, S-70B, AW-149, CH-47 and several unmanned platforms as well.

The TCG Anadolu docked at the Sedef Shipyard in Tuzla, Istanbul, Turkey. (DHA Photo)

Christmas Bonus!

Singapore might look as the most surprising entry here but amidst growing threat from China the tiny nation does not want to lag behind. Singapore is located at the opening of Malacca Straits into the South China Sea and Malacca Straits witnesses roughly one-third of the world's commercial shipping annually which is now under constant threat from growing Chinese naval activity. So to protect its economic interest Singapore is gearing up with a quick but robust military modernisation. Recently the Foreign Military Sales Programme Office of US Defence Security Cooperation Agency approved four F-35Bs with the option to procure an additional eight platforms, up to 13 F135 engines and related equipment for an estimated US $2.75 billion. Delivery is expected to commence by 2026. F-35B will be able to take-off from comparatively short airstrips of Tengah and Changi. But it has a different and much important angle as well. Many experts believe this procurement is actually a cover-up for a future carrier acquisition following Japanese approach.

Singapore currently operates four Endurance Class 7000 tonne LPDs which can carry some rotorcraft. But these are likely to be replaced by unspecified numbers of "Joint Multi-Mission Ship" being proposed by ST Marine. One of the proposals, Endurance 170, is envisaged as a 19,000 tonne displacement flat deck platform with a length of 170 meters. The deck has five operational spots for helicopter take-off and landings. If modified, can operate F-35 STOVL. One must not forget at this moment officially there are is such requirement but can't be discarded either as future scenario.

Asia is experiencing rapid economic growth and naturally will invite a clash of interests. While some much more powerful nations will try to increase their sphere of influence and challenge previous maritime superpowers, some will try to protect own interests though a means of defensive offense. With change of strategic interests naturally strategic doctrines will be altered. This is the reason that though many nations are procuring aircraft carriers, each of them has different requirements and different approaches. But one thing is certain, Asia is growing powerful. And these beautiful giant ships are going to announce the "Asian Age" loudly to the world.

Sankalan Chattopadhyay
(Twitter @vinoddx9)

Roadmap to becoming an aerial superpower!

Drawing by Amartya Mitra

A look at Chinese aircraft industry

The rapidly increasing production rates of Chinese aircraft are always under debate, not because it happened all of sudden, but because it was a well drafted plan with excessive funds and that led to a unique development. The PRC is diverting humungous resources to boost the capabilities of PLAAF. The Chinese air force is already the third largest air force that is evolving as a complete 4th and 5th generation air force because of quantum leaps in industrial sector. The PLAAF is constituted of aircraft like J-10 series, J-11 series, J-16, J-20, H-6, JH-7, Su-30MKK, Su-35 and Su-27. It is remarkable that most of the aircraft like JH-7, J-10, J-11, J-16 and J-20 are the result of multiple aircraft design bureaus in China.

The Indian Air Force desires to become a dominant aerial power of South Asia, a title that PLAAF has already achieved because of quantum leaps in Chinese aerospace industry. The local aircraft manufacturing industry had always played a distinctive role to increase the capabilities of their air force. No nation has ever become a true aerial superpower without the efforts of indigenous aerospace industries, and no such industry has ever matured without the assistance of government and armed forces.

The modern day aerial powers like US, Russia and China had a common approach for extensive development of their defence aeronautical industry. It is because of such approach that today these airpowers enjoy numerical and technological superiority by extremely large margins. The Indian aerospace industry needs reform to withstand the massive requirement of combat aircraft for IAF and IN in near future, further there's a need to take inspirations from the model that was initially adopted by modern day airpowers to develop their combat aerospace industries.

PLAAF J-20 (Photo: Wikicommons)

It is interesting to note that Indian and Chinese aircraft industry had similar conditions till 1970s, in fact Indian aircraft industry was expected to leap ahead of its adversaries as quoted by the examples of HF-24 Marut, but today there is no comparison. The obvious factors like lack of funding and poor management did drastically show down the indigenous aircraft industry, but were these the only reasons for paralysing Indian aviation for decades?

Indian combat aviation industry

The successful development of LCA Tejas despite its longer duration has boosted the morale of Indian aviation. The inspiration from successful completion of LCA programme has energised Indian Aerospace to develop modern aircraft like Tejas MK-2 and AMCA for Indian air force and TEDBF for Indian Navy. Despite active updates on such programmes, it is expected that these aircraft would be operational only after 2030 as traced by the past experiences.

The delays have become an integral part of Indian aircraft manufacturing industry because of some inherited drawbacks that are not rectified even after multiple alarming threats. The Indian aircraft manufacturing industry can be remarkably bolstered through methods like competitive prototyping and coupling of design bureaus with manufacturing unit as done by rest of aerial powers.

The proposed LCA AF Mk.2/MWF (Photo: Vayu)

It is interesting to note that while India's aircraft manufacturing was exclusive to Hindustan Aeronautics Limited for decades; multiple nations including China focused on creating a competitive environment in aircraft industry and promoted several design bureaus with integral manufacturing unit to increase the competition. The United States have several active fighter aircraft manufacturers (4-5 to be exact), similarly Russian aerospace also have atleast two major combat aircraft manufactures and Chinese industry has three of them.

How competitiveness in combat aviation industry helped nations to establish aerial supremacy


USAF F-22 Raptor (Photo: Lockheed Martin)

American aerospace industry

The first next generation aircraft- The American F-22 raptor is often referred as the "worlds most advanced aircraft" ever built, however it is observed that the F-22 Raptor was possible because of direct competition between several American aircraft manufacturers. The United States Air Force in 1980s issued the requirement of an Advanced Tactical Fighter aircraft that incorporated emerging technologies like stealth, composite material and powerful propulsion methods to counter super-maneuverable Soviet threats primarily in air-air combat. Several American combat aircraft manufacturers like Boeing, Lockheed Martin, Northrop Grumman and General Dynamics responded to the requirement and proposed their designs. The American manufacturers were even ready to collaborate in development if only one design was selected. The shortlisted designs were of Lockheed Martin YF-22 and Northrop Grumman YF-23, the prototypes of both the aircraft were evaluated until YF-22 won and eventually became F-22 Raptor.

The focus of attention should be on the fact that how USAF benefited from availability of several designs that were presented by numerous aircraft manufacturers and the competitive environment in United States aerospace industry aligned with the interest of then planned massive orders by USAF for F-22 Raptor led to development of "Worlds first next generation aircraft".

The industrial marvel- The General Dynamic F-16 is often referred as 'industrial marvel' as it is one of the most produced aircraft in the history of aviation. Even the F-16 was the result of competition between designs of General Dynamics YF-16 and Northrop Grumman YF-17 during light weight fighter aircraft programme for USAF in 1970s. The YF-16 eventually won because of its lower operating cost, better agility and evolved as F-16 Falcons. The YF-17 on the other hand was accepted by US Navy

for Naval Air combat fighter programme and cooperation between Northrop and McDonnell introduced YF-17 as F/A-18 Hornets in modern time.

The competitive environment in American aerospace industry led to development of some of the most potent aircraft ever built. The F-16 is recognised as an extremely profitable aircraft for the US by General Dynamics, while the Northrop Grumman benefited with its YF-17 design in Naval Air Combat Fighter programme even after being declined by USAF.

Development during crisis– Russian aerospace industries

Quantum leap for Russia-The Russian Su-57 felon has always been in limelight, but it's extremely interesting to find that even Su-57 is a result of indirect competition between Sukhoi aviation and Mikoyan Corporation. The Soviet Union understood the importance of a next generation aircraft and assigned the design bureaus to develop an advanced aircraft in 1990s. The Mikoyan presented Mig-1.44 design while Sukhoi was initially hesitating to involve in competition because of its confidence in Su-27, however as Sukhoi gradually perceived Mig-1.44 a potent threat to business, they came into competition with Su-47 and PAK-FA designs. The Russian air force favoured the Mikoyan design, but as the design houses in Russia were funded by sales of successful designs, Sukhoi was a beneficial organisation and the Russian government forced the PAK-FA to Russian air force under a new programme. It is believed that the Russian next generation aircraft programme was adversely affected as a result of poor management with Mikoyan Mig-1.44 prototype.

However, it is noteworthy that today Russian aerospace is unexpectedly booming and Mikoyan is trying to retain its position after being defeated by Sukhoi in competition. The Mikoyan has already churned out modern aircraft like Mig-35 and is further planning to revive concepts of Mig 1.44, while Sukhoi's is no less with advanced aircraft like Su-57 and concept of Su-75. The Russian aerospace and defence has already being significantly benefited from the development of a 5th generation fighter aircraft despite economic crisis of 1990s and is further expected to grow because of heated competition between major aerospace manufacturers.

Lesson from adversary- Chinese aerospace industry

The Mighty Dragon- The Chengdu J-20 is the pride of PLAAF, it made China as the first nation (even before Russia) to develop a fifth generation fighter aircraft in Asia. Although the true potential of J-20 is still controversial, it is discovered that there was an intensive competition between two major design houses for development of J-20. The Chinese next generation programme started in 1990s under a tag of J-XX programme that made Chengdu and Shenyang aerospace to intensively compete between the designs of J-20 and FC-31. The J-20 won, but the reasons are not clearly defined. The Chinese Navy on the other hand has remarkably benefited from development of FC-31 and wants to utilise the aircraft as carrier based stealth aircraft. Chinese industries are also developing stealth bombers with help of other production houses like Xi'an Corporation that are significantly boosting the capabilities of PLAAF.

Developing a modern aircraft- The Chinese J-10 is the first step by China towards development of a modern aircraft, however as Chinese philosophy in manufacturing is based on taking extreme inspirations from foreign designs, the J-10 is also believed to be a result of competition between 'copied' foreign designs. The J-10 is often called as a result of competition between three design houses that had coupled manufacturing units- Chengdu, Shenyang and Hongdu -where Chengdu's design that was surprisingly similar to Israeli prototype aircraft Lavi was accepted.

Whatever it is, the Chinese aviation industry has benefited by availability of multiple design houses like Xi'an, Chengdu, Hongdu and Shenyang. The competition between these aircraft manufacturers are leading to development that can be currently observed in the Chinese Air force and Navy. Every design house is coupled with manufacturing unit to make the process of aircraft production and designing exceptionally quick.

Reforms required in Indian combat aviation

Majority of modern day aerial powers have multiple design bureaus with integrated manufacturing units to raise the competition in combat aviation industry. The competitive environment is seen to bring rapidness, accountability and

Sukhoi Su-57 (Photo: MAKS PR Team)

Drawing by Amartya Mitra

Proposed AMCA for the Indian Air Force (Photo: Vayu)

effectiveness in aircraft manufacturing. The coordination in aeronautical development may also be increased by availability of several aerospace companies as observed in case of American industry. However at the same time, the management of multiple aircraft industries is also a quite expensive process, it is because of the same reason why Russia is trying to consolidate its aerospace industry under state owned United Aircraft Corporation.

The Indian aviation industry should also try to incorporate the concept of "Competitive prototyping" to significantly bolster the condition of aeronautical development in nation. The competition in combat aviation industry between aircraft manufacturers can be remarkably enhanced with presence of even a pair of active design bureaus with integrated manufacturing houses, if economic conditions don't allow for numerous fighter aircraft industries.

India needs to work towards structural reforms as the requirement of combat aircraft for both Indian Air Force and Indian Navy is to surge in future. The Aeronautical Development Agency should be made more autonomous in aircraft production with an integrated manufacturing unit and HAL should focus on rapid expansion of one of its major design and development facility of ARDC (Aeronautical Research and Design Center), so that the competition between an autonomous ADA and a HAL with better design bureau benefit the forces and government. The private companies with government support should also collaborate with DPSUs to attain essential skills for complete development of aircraft and organisations with capability to manufacture in future should themselves approach to incorporate private manufacturers in co-development of aircraft, it shouldn't be enforced by government.

It should be noted that such models are majorly accepted by world and isn't the sole way for development of aerospace industries as illustrated by example of French aviation. The French combat aviation industry is majorly constituted of single privately owned Dassault Aviation that is globally recognised for its quality products, work ethics and next generation technologies. The aircraft that are rolled out by Dassault are not really a result of intensive heated competition between a series of manufactures desperately looking for orders. The French government had a huge role to play for the success of Dassault Aviation, it understood that the collaborations for development of a fighter aircraft between different European nations would not be really beneficial for French aerospace and showcased their trust and support to Dassault for its excellence in aircraft manufacturing.

The role of government in aeronautical development is supreme, the structural reforms will just promise a healthy system, but nothing can be achieved until government isn't interested in tracing development and providing adequate funds. All the modern day aerial powers may not have concept of competitive prototyping as common, but it was found that in all such nations, initially the government was playing a major role in providing funds, tracing development and sorting out any kind of disagreement between development agencies and forces.

The Indian government along with Indian armed forces needs to have constant policy for promotion of public and private aircraft manufacturing in nation. The IAF on their side should assure development agencies for a minimum number of orders and should issue formal letter of intents for critical indigenous projects like AMCA and Tejas MK-2. The procurement body also needs to be completely replaced with military professionals rather than bureaucrats and better negotiation should be done with foreign vendors so that even importing essential assets helps to attain better technologies. The pressure of import lobbies is also immense and need to be handled properly. The Indian diplomacy should also aggressively push for exports of aircraft to sustain the aerospace industry in future.

Pratisht Chaudhry

Safran's helicopter engine runs using 100% sustainable fuel

Safran Helicopter Engines performed a world first at its Bordes facility (Pyrénées-Atlantiques, France); a helicopter engine run on 100 percent sustainable aviation fuel (SAF). During the test, a Makila 2 ran on a biofuel produced by TotalEnergies from residues and waste from the circular economy, specifically used cooking oil.

Raytheon UK counter-drone laser technology for UK MoD

Raytheon UK has been awarded a demonstrator contract to provide a High-Energy Laser Weapon System, or HELWS, to the UK Ministry of Defence. Raytheon UK will deliver the MOD's high-energy laser demonstrator to show the application of directed energy weapons technology to help protect the UK armed forces from unmanned aerial vehicles (UAVs) in the battlefield.

Bell's 100th delivery of AH-1Z to US Marines

Bell Textron has successfully completed its 100th consecutive on-time delivery of the AH-1Z aircraft to the US Marine Corps, which began nearly four years ago. The H-1 series consists of the AH-1Z Viper and UH-1Y Venom, which provide light attack and utility helicopter support to the Marines while maintaining a small logistical footprint through the 85% commonality between the airframes.

Rolls-Royce selected to power the B-52

Rolls-Royce North America has been selected to provide the powerplant for the B-52 Stratofortress under the Commercial Engine Replacement Programme (CERP), further extending a long history of powering the United States Air Force. The decision means the American-made Rolls-Royce F-130 engine will power the B-52 for the next 30 years. The Air Force made the announcement after a vigorous multi-year competition.

CAES RF assemblies for L3Harris F-16 Viper Shield EW Suite

CAES, a leading provider of mission-critical electronic solutions, has been selected by L3Harris Technologies to develop RF assemblies for its new Viper Shield all-digital electronic warfare (EW) suite. The AN/ALQ-254(V)1 Viper Shield is a custom virtual electronic shield for the next generation F-16 Block 70/72 multirole aircraft and is designed to provide protection and offensive EW capabilities to warfighters in increasingly complex battle scenarios.

NGC's AARGM-ER transitions into LRIP

The US Navy has awarded Northrop Grumman the contract to proceed with low rate initial production (LRIP) for the AGM-88G Advanced Anti-Radiation Guided Missile Extended Range (AARGM-ER). As the AARGM-ER prime contractor, Northrop Grumman has worked with a team of U.S. Navy and industry partners to develop an effective, production missile design, successfully achieving Milestone C in just 28 months following engineering and manufacturing development contract award.

Australia for MH-60R multi-mission helicopters

The Government of Australia has requested to buy twelve (12) MH-60R Multi-Mission helicopters; thirty (30) T-700-GE-401C engines (24 installed, 6 spares); twelve (12) APS-153(V) Multi-Mode Radars (installed); twelve (12) AN/AAS-44C(V) Multi-Spectral Targeting Systems (installed); thirty-four (34) Embedded Global Positioning System/Precise Positioning Service (GPS/PPS)/Inertial Navigation Systems (EGI) with Selective Availability/Anti-Spoofing Module (SAASM) (24 installed, 10 spares), etc.

USAF awards Exosonic contract for supersonic UAV concept

Low boom supersonic transport company Exosonic announced a Direct to Phase II Small Business Innovation Research (SBIR) contract award from the US Air Force (USAF). The contract will fund the development of a low boom supersonic uncrewed aerial vehicle (UAV) demonstrator. Awarded by the Air Force Life Cycle Management Center's AFWERX, the contract is in partnership with Air Combat Command and the Air Force Research Laboratory, and the Presidential and Executive Airlift Directorate.

Safran begins assembly of Arriel 2E in the US

Safran Helicopter Engines has opened a second assembly line at their facility in Grand Prairie, Texas for the Arriel 2E engine. The first assembled and tested Arriel 2E engines have been delivered to Airbus. These engines power the UH-72B delivered to the US Army as part of the newest Lakota helicopter. Also installed in the H145, the Arriel 2E was until now produced in France.

LM's PrSM completes record-setting flight

Lockheed Martin's Precision Strike Missile (PrSM) completed its longest flight to date, exceeding maximum threshold, with the US Army at Vandenberg Space Force Base (VSFB), California. This marks the fifth consecutive successful flight test for the missile. Firing from a High Mobility Artillery Rocket Systems (HIMARS) launcher, the PrSM flew an extended range mission over the Pacific Ocean.

Saab order to modernise German Navy's F123 frigates

Saab has signed a contract with the German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw), and has received an order to deliver and integrate new naval radars and fire control directors for and in the German Navy's Frigates of the Brandenburg-Class (F123). The contract includes a new combat management system in order to completely overhaul the system currently in use on the F123, allowing a low risk integration of the new naval radars and fire control capabilities.

Kongsberg awarded contracts valued at 8.2 BNOK

Kongsberg Defence & Aerospace has entered into contracts with Norway and Germany to deliver ORCCA combat system elements to the six new 212CD submarines, and the Naval Strike

Missile to the two nations' navies. The contract for NSM is a joint procurement by Norway and Germany valued at 4,404 MNOK. Germany is the 6th nation to select NSM. For Norway the contract will serve to replenish and update the current inventory.

Indonesian Navy commissions new landing ship

Indonesian Navy (TNI-AL) has commissioned a new tank transporter ship KRI Teluk Youtefa (522) at Tanjung Priok, North Jakarta. Also known as Landing Ship Tank or LST, the ship is the fifth Teluk Bintuni-class LST built by PT Daya Radar Utama (PT DRU). Launched in May 2019, KRI Teluk Youtefa (522) is also one of twelve Teluk Bintuni-class LSTs that TNI-AL has ordered from local shipyards, with the ninth ship having been launched earlier this year.

Austal Australia delivers 12th Guardian class patrol boat

Austal Limited (Austal) has delivered the 12th Guardian-class Patrol Boat (GCPB) to the Australian Department of Defence. The vessel, the RVS Takuare, was then gifted by the Australian Government to the Government of the Republic of Vanuatu at a certificate signing ceremony held at the Australian Marine Complex, in Henderson, Western Australia.

Japan for AEGIS class destroyer support

The Government of Japan has requested to buy Follow-On Technical Support (FOTS) of AEGIS Class Destroyers, to include sustainment support and services; AEGIS computer software updates, system integration and testing, in-country and on-site engineering support etc. The total estimated programme cost is $134 million.

UK CSG 21 and USS AMA ESG in LSGE 21 operations

United Kingdom Carrier Strike Group (CSG 21) and USS America Expeditionary Strike Group (AMA ESG) with embarked 31st Marine Expeditionary Unit, began multinational advanced aviation operations in support of Large Scale Global Exercise (LSGE) 21. LSGE 21 is global command and control exercise, with a regional focus, to enhance integration of the US and its allies and partners in the Indo-Pacific. HMS Queen Elizabeth led the UK's Carrier Strike Group and is operating a mixed air group of F-35Bs, with a squadron of UK jets and a squadron from the US Marine Corps. Additionally, USS The Sullivans from the US Navy as well as several other Royal Navy ships comprised the UK's Carrier Strike Group.

Greece signs MoU with Naval Group and MBDA

Nikólaos Panayotópoulos, the Greek Minister of Defence, Pierre Eric Pommellet, CEO of Naval Group, and Eric Béranger, CEO of MBDA, signed a Memorandum of Understanding to open negotiations to provide the Hellenic Navy (HN) with three Defence and Intervention frigates (FDI HN) and their equipment as well as an optional additional frigate. The FDI HN frigates will be built in the Naval Group shipyard in Lorient, where the second in the series for the French Navy has just entered production. As a first-rank frigate, the FDI HN is a compendium of the best technologies of Naval Group, Thales and MBDA, which will notably supply the ASTER 30 B1 and Exocet MM40 Block 3C missiles.

Saudi Arabia for 280 AIM-120C AMRAAM's

Saudi Arabia has requested to buy two hundred eighty (280) AIM-120C-7/C-8 Advanced Medium Range Air-to-Air Missiles (AMRAAM) and five hundred ninety-six (596) LAU-128 Missile Rail Launchers (MRL). Also included are containers; weapon support and support equipment; spare and repair parts; US Government and contractor engineering, technical and logistical support services; and other related elements of logistical and programme support. The total estimated cost is $650 million.

Lockheed Martin in F-22 modernisation deal

Lockheed Martin has been awarded a US$10.9 billion contract by the US Air Force to modernise its F-22 Raptor fighter jet. The indefinite-delivery, indefinite-quantity contract for Advanced Raptor Enhancement & Sustainment (ARES) for the F-22 Programme Office will help sustain and modernise the F-22 Raptor, and will include modernisation hardware kit procurement and services such as upgrades, enhancements and fixes, as well as performance-based logistics services.

Royal Thai Army reveals domestically developed UAS

The Royal Thai Army (RTA) has published pictures and information of the first prototype of the D-eyes 04 Unmanned Aircraft System (UAS), locally developed by Thailand's Defence Technology Institute (DTI) and the RTA's Research and Development Office (ARDO). The DTI/ARDO D-eyes 04 is a medium-sized UAS with a length of 6.5 meters, 13.4 meters wingspan, and 2.5 meters height. It has an operating radius of about 200 km with a 20 hours endurance, a 24,000 ft (about 7,300 meters) service ceiling, and a maximum speed of around 180 km/hour. Equipped with a day/night and all-weather electro-optical/IR system, it has a maximum take-off weight of 750 kg with a maximum payload weight of about 150 kg.

The world of Airbus

Spain for three Airbus A330 MRTT's

The Spanish Ministry of Defence has signed the formal order for the acquisition of three Airbus A330 Multi-Role Tanker Transport aircraft (MRTT). Under the agreement, the handover of the first aircraft in transport configuration was decided recently followed by its conversion to MRTT in 2024. The handover of the first fully converted aircraft is scheduled in 2023 and the third and final unit in 2025.

The aircraft, acquired from Iberia, will be converted into military tanker transport at Airbus' Spanish headquarters in Getafe, Spain. It will be equipped with a state-of-the-art hose & drogue refuelling system and a specific Medical Evacuation (MEDEVAC) kit. The A330 MRTT fleet will be operated by the Spanish Air Force 45 Wing, based in Torrejón Air Base (Madrid).

1st UH-72B Lakota to the US ANG

Airbus Helicopters has delivered the first UH-72B, the latest variant of its Lakota helicopter, to the US Army National Guard from its production facility in Columbus, Mississippi. This delivery is the first of 18 UH-72B Lakota helicopters currently on order to support the National Guard's critical missions.

Airbus reveals the next generation of CityAirbus

Airbus has announced plans for a new CityAirbus at the Company's first summit on "Pioneering Sustainable Aerospace" as the emerging Urban Air Mobility (UAM) market begins to firm up. Ushering in the next generation of CityAirbus, the fully electric vehicle is equipped with fixed wings, a V-shaped tail, and eight electrically powered propellers as part of its designed distributed propulsion system. It is designed to carry up to four passengers in a zero emissions flight in multiple applications.

First of 60 A220s for Air France

Air France has received its first A220-300 from an order for 60 aircraft of the type, the largest A220 order from an European carrier. The aircraft was delivered from Airbus' final assembly line in Mirabel, Quebec, Canada and officially unveiled to the public during a ceremony held at Paris Charles-De-Gaulle Airport.

First A320neo family aircraft to enter service in Pakistan

Airblue Limited's (airblue) latest fleet addition, A321-200NX MSN 10162 departed Hamburg destined for Karachi and the aircraft from GECAS' skyline is the first A320neo family aircraft to enter service with a Pakistani airline.

BAE Systems successfully completes planned overseas support of Carrier Strike Group

BAE Systems has successfully completed the management and delivery of planned overseas support for the UK's Carrier Strike Group 21 (CSG21). The carrier group sailed from the UK in May 2021 and has been supported by BAE Systems throughout its deployment.

BAE Systems engineers and technicians have overseen the maintenance of aircraft carrier HMS Queen Elizabeth, Type 45 destroyers HMS Defender and HMS Diamond, and Type 23 frigates HMS Kent and HMS Richmond, in a number of countries along the route of CSG21.

As well as delivering maintenance support to the Royal Navy's ships, BAE Systems also delivered specialised support to the ships' combat systems and the fleet of F-35 aircraft on board HMS Queen Elizabeth.

Almost 100 engineers and technicians from BAE Systems and its partners have deployed across the world and on board the ships in order to deliver the support needed to keep CSG21 at sea.

A group effort

Supporting a large and varied group of complex warships so far from their home port has required the close and careful coordination of multiple industry, Ministry of Defence (MOD), military and foreign government organisations, as well as expertise from across BAE Systems.

BAE Systems has managed one of the most critical elements of the operation: the virtual Class Output Management (COM) function, the cross-industry team responsible for overseeing and coordinating support for the entire strike group.

As well as managing support efforts across five different classes of vessel, the COM team has co-ordinated organisations including the Royal Navy, Royal Air Force, Royal Fleet Auxiliary, Defence Equipment and Support (DE&S), Defence Munitions and several equipment manufacturers and support providers to deliver high quality and effective support across CSG21.

Experts from BAE Systems' air division also worked closely with the F-35 pilots and aircraft on board HMS Queen Elizabeth to prepare them for the deployment and delivered a synthetic training environment on the ship to allow UK Lightning Force and US Marine Corps pilots to quickly and easily refresh emergency procedure training and conduct mission rehearsals while at sea.

BAE Systems engineers have also supported the combat management systems, air traffic control system, and communications systems of all the Royal Navy ships throughout their deployment. Integration services have been provided at the Maritime Integration and Support Centre (MISC) in Portsmouth, allowing systems to be tested together prior to, and during, deployment.

Proud to serve

"Delivering deployed support to CSG21 has been a complex and exciting project and one that we've been proud to lead," commented Jon Pearson, Warship Support Director, BAE Systems. "We have spent months planning and forward-deploying resource and materials for CSG21 and have been responsible for liaising with everyone from suppliers to industry partners, the MOD and foreign base personnel. We've been flexible and agile in the face of shifting requirements, with the added complexity of the global pandemic. Our teams responded to these challenges admirably, drawing on our extensive subject matter expertise, partner network and global reach. We extend our thanks to our numerous industry partners and to the MOD and the foreign governments that made this project such a success."

Courtesy: BAE Systems

First 'Sea Sultan' Maritime Patrol Aircraft Joins Pakistan Navy

Induction ceremony of Pakistan Navy's first modern Long Range Maritime Patrol twin engine jet aircraft was held at PNS Mehran, Karachi on 2 September 2021. Chief of the Naval Staff Admiral Muhammad Amjad Khan Niazi graced the occasion as chief guest. Upon arrival at Mehran base, the Chief Guest was received by Commander Pakistan Fleet Rear Admiral Naveed Ashraf.

The Sea Sultan is based on Embraer's Lineage 1000E business jet, which is a variant of the Embraer 190 regional airliner. Two more aircraft of the series have also been contracted by Pakistan Navy. These aircraft will be equipped with latest weapons and sensors to undertake Maritime Air Operations.

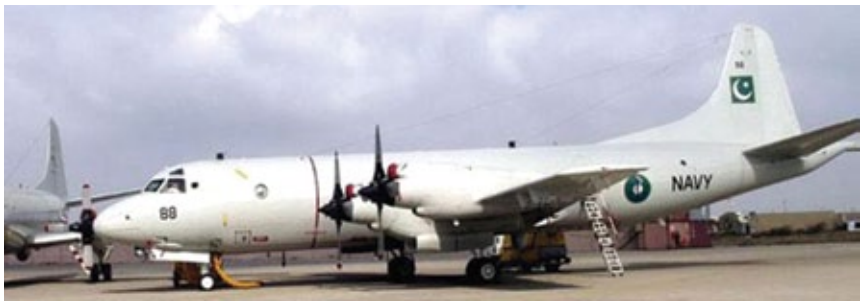
Later the Naval Chief commended remarkable transition of Pakistan Navy Air Arm from prop to jet age of Long Range Maritime Patrol Operations. He reassured the nation that Pakistan Navy is fully cognizant of prevailing challenges and is committed to upgrade its combat inventory to generate swift response. He also highlighted that Pakistan Navy is effectively contributing towards Government's policy of promoting peace and stability in the region as a responsible maritime nation. He further underscored that Pakistan Navy is committed to safeguard its sea fronts while ensuring conducive maritime environment in the region.

Earlier during his welcome address, Commander Pakistan Fleet Rear Admiral Naveed Ashraf highlighted capabilities of the new aircraft and expressed hope that addition of this potent aircraft will enhance PN capabilities to protect maritime interests of Pakistan.

Later, Chief of the Naval Staff, Admiral Muhammad Amjad khan Niazi handed over aircraft documents to Commanding Officer of the concerned squadron. The ceremony was attended by senior serving and retired PN officers and CPOs/Sailors.

Pakistan selected the Embraer jet to replace its fleet of 9 US-built P-3 Orion turboprop aircraft, which first entered service in the mid-1990s.

(*Pakistan Navy press release*)



Pakistan Navy is expected to replace the P-3 Orion with a total of 10 converted commercial aircraft

Rubin Design Bureau's Magadan commissioned by the Russian Navy

The ceremony of raising the Russian naval ensign and commissioning by the Russian Navy the Magadan submarine took place 12 October 2021 at the Admiralty shipyards. Magadan is the third boat in a batch of submarines developed by Rubin Design Bureau and together with her sister boats is destined for the Pacific Fleet.

Rubin's specialists, in cooperation with the shipyard and the State Acceptance Commission, ensured the successful completion of the trials. The submarine has confirmed all declared parameters.

The keel-laying ceremony for Magadan took place 1 November 2019 and the ship was launched 26 March 2021. The first two submarines of the batch, Petropavlovsk-Kamchatsky and Volkhov, were delivered to the Russian Navy in 2019 and 2020 respectively (their keels were laid in 2017).

Fast-paced construction has been ensured by well-coordinated work of

the designer, the shipyard and carefully orchestrated team of suppliers. Rubin's specialists provide supervision and in-service support for the ships of the Navy.

Magadan is the 72nd submarine of the Kilo class, which includes Pr. 877, Pr.636 and their modifications. All ships of the class have been delivered to customers on contract schedule, due to prompt and effective responses to all challenges.

The design is inherently future-proof and have margins for gradual modernisation, increasing submarine's stealth, detection capabilities, operating safety and overall combat effectiveness. The construction period of a Pr. 636 submarine, including trials, is about 3 years.

Rubin Design Bureau is among world leaders in the design of nuclear and conventional submarines and the largest marine engineering company offering design services in Russia. 1064 submarines in 120 years of our work have been built to Rubin designs, including 948 submarines commissioned by the Russian Navy. Totally 116 submarines designed by Rubin have been exported to 16 countries.

Updates from IAI, Israel

IAI/ST/Estonia for Blue Spear (5G SSM) missile systems

ECDI has reached an agreement for developing Estonian coastal defence capabilities and arming the defence forces with the Blue Spear (5G SSM) land-to-sea missile system. Proteus Advanced Systems Pte. Ltd., 'is proud to be selected', following a tender process, to provide the Estonian Defence Forces with advanced anti-ship missile systems. The project, with tight timescales and encompassing a complex set of requirements, is one of the biggest projects in Estonian defence procurement and definitely the most complex.

IAI and future AFV Carmel

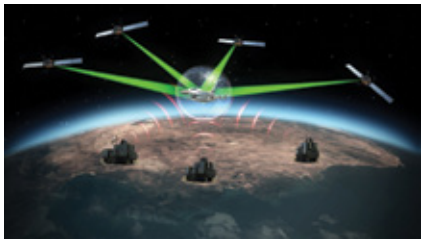
Israel Aerospace Industries (IAI) has been selected by Israel's Ministry of Defense (IMoD) as the prime contractor and integrator for developing the concept and technologies for the future Armoured Fighting Vehicle for the IDF – the Carmel – following IAI winning a demonstration of the technologies between Israel's defence companies. At the conclusion of a successful live demonstration of a two-man, closed hatches armoured fighting vehicle (AFV), IAI was selected by the IMoD to develop the next phase of the Carmel: development and demonstration of technologies for a multidimensional combat team, which will enable significant improvement in the system maneuverability.

IAI and KAI MOU on loitering munition

Israel Aerospace Industries (IAI) has signed a Memorandum of Understanding (MOU) with Korea Aerospace Industries (KAI) on a Loitering Munitions Programme, to secure a new concept weapons system that will maximise the effectiveness of Suppression and Destruction of Enemy Air Defenses (SEAD & DEAD) missions. The expanded cooperation between IAI and KAI will offer the South Korean military with new technologies, and will establish concrete cooperation plans through joint feasibility studies between the two companies.

IAI's ADA System Integrated into IsAF airborne platforms

Israel Aerospace Industries' ADA Anti-Jam GPS System, designed to protect GPS/GNSS navigation from jamming, has been integrated into advanced platforms used by the Israeli Air Force (IsAF), including into F-16 fighter jets and various types of UAS. The ADA System has demonstrated operational maturity and is in use by a number of international customers on various airborne, land, and marine platforms.



ADA is combat proven in providing immunity against GPS jammers, most recently demonstrating its effectiveness in 'Operation Guardian of the Walls' last May.

IAI and SixAI Partner

Israel Aerospace Industries (IAI) and SixAI have announced a partnership to leverage IAI's technological expertise into developing dual-use technologies. The partnership will focus on commercialising IAI's military technologies and their adaptation to current civilian market needs. IAI and SixAI will jointly own the partnership and manage it, leveraging the experienced IAI management and R&D teams and SixAI's commercialisation capabilities.

Hensoldt and IAI radars to equip German F124 frigates

Sensor solutions provider Hensoldt, together with Israel Aerospace Industries (IAI), is supplying new radars to the German Navy to modernise the sensor technology of the F124 air defence frigates. To this end, Hensoldt has entered into a strategic cooperation in the field of BMD-capable wide-range radars in S-band with IAI subsidiary Elta Systems Ltd. This supplies the German customer with a combination of a national partner for certification and long-term support, as well as market-available systems that have been tried and tested in the field. Previously, the contract for the modernisation of land-based air surveillance in the HADR NF programme, also based on a cooperation with IAI's Elta, was awarded to Hensoldt.

IAI unveils REX MK II

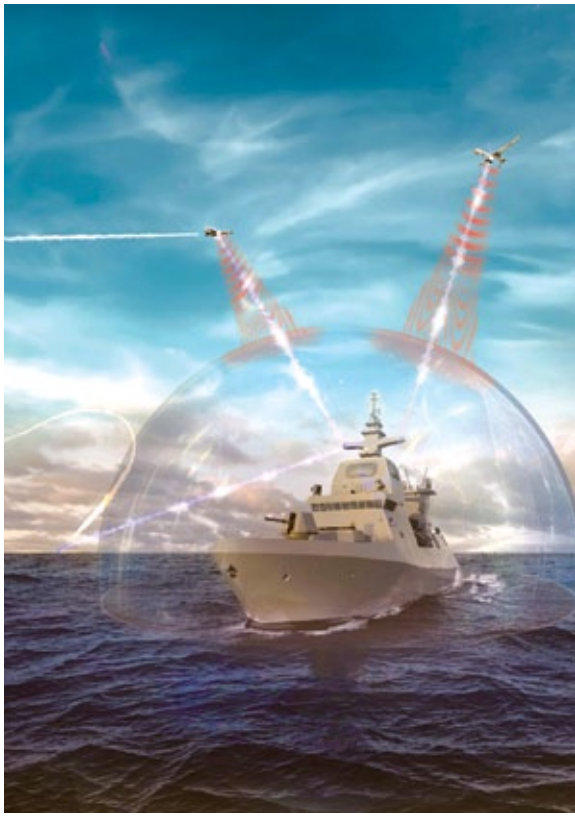
Israel Aerospace Industries (IAI) has unveiled the REX MK II, the newest unmanned land platform, intended to keep troops out of harms way in complex circumstances. The REX MK II, already sold to customers worldwide, is an unmanned land vehicle adapted to a range of ground missions with advanced maneuverability and ability to carry a load of 1.3 tons. The new hybrid electric platform, all-wheel drive, supports combat forces in gathering intelligence, providing logistical support and helps execute remote attacks. The vehicle is land-based, autonomous with command-and-control capabilities, or by a single operator through wireless communication.

The multi-mission REX MK II is intended to support infantry ground forces in various stages of fighting. This includes providing logistical assistance to troops by carrying munition supplies, critical medical equipment, water and food, as well as evacuating injured personnel on stretchers. The system can also gather intelligence through a situation-awareness-system that incorporates electro-optical sensors and radar.

IAI and Scorpius Electronic Warfare System

Israel Aerospace Industries (IAI) recently unveiled the Scorpius family of Electronic Warfare (EW) systems. Scorpius is the first electronic warfare (EW) system in the world capable of simultaneously targeting multiple threats, across frequencies and in different directions. Scorpius is based on the Active Electronically Scanned Array (AESA) technology which provides a breakthrough in EW performance and enabling a new generation of electronic warfare capabilities.

With AESA's multi-beam capability, Scorpius can simultaneously scan the entire surrounding region for targets, and deploy narrowly focused beams to interfere with multiple threats across the electromagnetic spectrum. The system is able to target a range of threats, including UAVs, ships, missiles, communication links, low probability of interception (LPOI) radars and more. Scorpius effectively disrupts the operation of their electromagnetic systems including radar and electronic sensors, navigation and data communications.



IAI to convert ten B737-800 airliners to cargo configuration

Israel Aerospace Industries' (IAI) Aviation Group signed an agreement with World Star Aviation to convert ten B737-800 passenger aircraft to cargo configuration, with an option for an additional ten conversions. The cargo conversions will take place at IAI's partially-owned subsidiary, Bedek Lingyun (Yichang) Aircraft Maintenance Engineering Co., Ltd (Belinco) in Yichang, Hubei Province, China and in other locations.

News from Dassault

Dassault unveils full-scale cabin mockup for Falcon 10X

Dassault Aviation displayed a full-scale cabin mockup for the new Falcon 10X ultra-long-range twinjet at the NBAA-BACE convention in Las Vegas and after the show, the mockup remained in the US for individual customer tours.

Detailed design for the 7,500 nm, Mach 0.925 jet will be completed before year-end, with parts production beginning in 2022. Many components and structures will come from Dassault's new Factory 4.0 smart manufacturing facility in Seclin, France. A redesigned building at Dassault's plant in Biarritz will manufacturer the advanced all-composite wing.

Rolls-Royce meanwhile is developing the latest and most powerful variant of its ultra-efficient Pearl engine series to power the new aircraft. The modules for the first Pearl 10X test engines are currently being assembled at Rolls-Royce's center of excellence for business aviation engines in Dahlewitz near Berlin, Germany. The first engine test run is scheduled for next year. The Pearl 10X will be rated at more than 18,000 pounds of thrust and be 100% SAF capable.

Falcon 6X proceeding smoothly through flight test campaign

Dassault Aviation's new extra widebody Falcon 6X continues to march through key certification milestones one after another. The first flight of the Falcon 6X was on 10 March of this year. Three test aircraft are now flying. Pratt & Whitney Canada is in the final stages of the certification process for the 6X's PW812D engine, with all required certification testing complete. Final reviews are currently underway with Transport Canada, and certification is expected to follow shortly.

Each test aircraft is currently flying two to three times a week, several hours per flight. Test points beyond Mmo and Vmo have been completed and every aspect of flight testing, from system development, aircraft performance and envelope expansion, is proceeding flawlessly.

First announced in 2018, the Falcon 6X will create a new benchmark in the long-range, large aircraft segment. At the time, the 6X had the largest cabin cross section in business aviation, 6 feet 6 inches (1.98 m) tall and 8 feet, 6 inches (2.58 m) wide. It is now surpassed only by Dassault's own ultra-long-range Falcon 10X, which will have the largest cabin of any purpose-built business jet.

The 6X has end-of-mission approach speeds as low 109 knots and can routinely fly out of small airports with runways of 4,000 feet or less. The aircraft has the 'most advanced digital flight control system in the industry', with digital control not only of primary flight controls such as ailerons, elevators and rudder but also, for the first time, secondary flight controls like flaps, flaperons, and nose wheel steering. In addition to ultra-low noise levels, the 6X will feature a cabin altitude as low as 3,900 feet at a cruise level of 41,000 feet.

F21 Artémis torpedo from the Naval Group

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) 6-m long 1.5-t F21 Artémis Torpedo programme is projected to replace the existing F17 Mod.2 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 by sea bottom but also and especially in the very noisy and very dense coastal/littoral areas in maritime traffic with normal operating depth ranging from 10-m to 500-m. 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 torpedo defence systems. Whatever the operational sequence (search/pursuit/attack), the F21 benefits from a high level of target 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 emerged as a strong candidate for Indian Navy (IN) Scorpène/Kalvari Class diesel-electric hunter-killer submarines (SSK).

Initially 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 silver oxide-aluminium (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 (93-km/h) and endurance 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 PBX B2211D insensitive explosive warhead and a fully electronic fuse which fulfils 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, 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 (with dual propeller), wake homing and fibre-optic wire guidance widen significantly 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 pre-sets, 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 smoothly from one torpedo type to another. Today more than 40 MIGAL systems equip six navies.

Sayan Majumdar

Updates from Saab

Combat training solutions to Poland

Saab has signed a contract for the delivery of several live training systems and services to the Polish Armed Forces. The total order value is approximately 1 billion SEK and comprises the supply of a complete live training solution for a reinforced mechanised battalion and four training centres for company size units. The contract period is 2021 to 2026 including support over a period of three years.

Saab Giraffe radar and C2 proven at Multinational Air Power Exercise

Saab's Giraffe 1X radar and a Command and Control (C2) system successfully participated in the multinational Arctic Challenge Exercise 2021 (ACE 21). They were operating alongside more than 70 military aircraft from eight different countries, which gathered in Norway, Finland and Sweden to develop air combat tactics, techniques and procedures.

Giraffe 1X together with a packaged, scalable C2 system was used to securely plan, monitor and evaluate flights, as well as participating in the exercise as a whole. ACE 21 was an opportunity to test both systems in conditions close to a real air defence operational environment, both with and against the participating aircraft. Giraffe 1X's advanced detection capabilities were proven against the many participating aircraft, while its ability to rapidly redeploy across many kilometres demonstrated how survivability

is maximised. Representatives from the Swedish Armed Forces had the opportunity to gain operational exposure to the two systems during ACE 21.

Giraffe 1X is a small, lightweight, high performing, multi-mission, 3D radar that enables unique flexibility and redundancy in GBAD solutions, and provides commanders with engagement quality target data, drone detection and Counter-Artillery, Rocket and Mortar (C-RAM) sense and warn within a single solution.

Orders for Carl-Gustaf M4 and ammunition

Saab has received orders for the recoilless rifle Carl-Gustaf M4 with included ammunition. The combined order value is approximately 900 million SEK and deliveries will take place in 2022. Lightweight and multi-role, the Carl-Gustaf M4 increases tactical flexibility, enabling soldiers to deal with any situation. Built to satisfy future requirements, it is compatible with advanced fire control devices and prepared for specialised ammunition, putting advanced technology at forces' fingertips. Since the launch in 2014, Saab has signed contracts with fourteen different nations for Carl-Gustaf M4. The wide range of ammunition provides extreme tactical flexibility ready for any combat situation, delivering faster engagement, increased hit probability and greater effectiveness.

News from Navantia, Spain

Navantia launches fourth corvette for the Saudi Navy

Navantia shipyard in San Fernando (Cadiz) hosted the launching ceremony of construction 549, the Jazan corvette for the Royal Navy of Saudi Arabia. The President of Navantia, Ricardo Domínguez García-Baquero and Commander of the Saudi Navy, Vice Admiral Fahad Bin Abdullah Al-Ghofaily, presided over the event. Jazan corvette is the fourth of the series of five included in the Avante 2200 programme.

Royal Australian Navy commissions HMAS Supply

Navantia and Navantia Australia congratulated the Royal Australian Navy on the commissioning of HMAS Supply (II), lead ship for the Supply Class Auxiliary Oiler Replenishment (AOR) vessels. HMAS Supply was built at Navantia's shipyard in Ferrol, Spain, with her final fit-out performed at Garden Island, Western Australia in late 2020. Defence's Capability Acquisition and Sustainment Group AOR Systems Programme Office (SPO) and Navantia Australia formed the AORSPO Enterprise to deliver industry-leading asset management to support the AOR capability through life. Navantia Australia will act as Prime Contractor and manage the through life support for these vessels for their first five years of service. As the design authority for the Supply class, Navantia Australia is also providing configuration and baseline management as an integral component of the through life support for these vessels.

Launch of first S80 submarine for Spanish Navy

His Majesty King Felipe VI, accompanied by Her Majesty the Queen, Her Royal Highness the Princess of Asturias and Her Royal Highness Infanta Sofia presided over the launching ceremony of S-81, the first submarine of S-80 class, in Navantia shipyard in Cartagena (Murcia, Spain). The S-81, which will be named 'Isaac Peral', is the first submarine designed and built in Spain. This represents a strong commitment with national technological development, and thus, with national defence as well as with the international positioning of Spanish industrial sector.

With S-80 programme, Spain becomes one of the few countries that can design and build submarines, an extremely complex task because these vessels must operate autonomously in a hostile environment. The S-80 programme is the greatest industrial and technological challenge ever faced by the national defence industry. Navantia is taking a huge technological step forward, as it is taking the role of Technical Design Authority for the first time. In addition, Navantia is completing the cycle of technological evolution: from building in Spain with a foreign design to building in Spain with Spanish design.

The submarines will have an overall length of 80.8 metres, a diameter of 7.3 metres, and a submerged displacement of around 3,000 tonnes. They include the integrated combat system and platform control system developed by Navantia Sistemas the integrated platform control system developed by Navantia Sistemas. They will have BEST-AIP, an atmosphere-independent propulsion system, which supplies the ship with electrical power at any depth so that it can remain underwater for longer periods.

The next phases will be harbour tests and sea tests, which include sailing up to the maximum operating depth. The first sailing is scheduled for early 2022 and delivery to the Navy in early 2023.

NUSHIP Stalwart arrives at HMAS Stirling

After a 30 day transit across the world's oceans, NUSHIP Stalwart arrived safely at Fleet Base West in Western Australia in June 2021. NUSHIP Stalwart is the second of two Supply Class Auxiliary Oiler Replenishment (AOR) ships built for the Royal Australian Navy by Navantia, S.A., S.M.E. The Australian Supply Class ships are based on the Spanish Navy's Cantabria Class design. Navantia Australia is supporting NUSHIP Stalwart and sister ship, HMAS Supply, through life as the Prime Contractor under the AORSPO Enterprise for the first five years' of service. Navantia Australia established its Sustainment Support Centre in 2020 at the AMC Jakovich Centre, Henderson, Western Australia specifically to provide first class asset management for NUSHIP Stalwart. NUSHIP Stalwart will commence final fit-out and testing activities at HMAS Stirling after clearing custom and quarantine, and will commission into service with the Royal Australian Navy later this year.

Navantia Training Centre (NTC) in San Fernando

Navantia has opened in the city of San Fernando (Cádiz) its Navantia Training Centre (NTC), which will be a key asset for the company in its pursuit of excellence and a leading training centre in the naval industry. The NTC will host both internal and external activities. Three main lines of in-house activities are planned for the NTC: training programmes for ship crews; training and coaching for Navantia personnel; and exclusive events such as conferences, seminars, technological events, exhibitions, team boosters, internal communication events, marketing 4.0 and commercial intelligence activities, Corporate Social Responsibility activities, etc.

Successful tropicalisation of F-311 frigate

The Norwegian Defence Material Agency (NDMA) has congratulated Navantia and its subcontractors for the successful completion of the tropicalisation of HNoMS F-311 Roald Amundsen, second of the Fridjof Nansen Class (F310) that Navantia designed and built for the Norwegian Navy between 2000 and 2011. These works, for which the contract was signed on July 2020, has significantly improved the cooling capacity of the F311 frigate, which will allow it to navigate in conditions of much warmer ambient and water temperatures than the traditional operational scenarios of the Royal Norwegian Navy.

Navantia shortlisted for Poland ToT frigate programme

The offer submitted by Navantia to the Polish Ministry of Defence to build three frigates in a Technology Transfer (ToT) programme has been selected in a 'short list' along with two other finalists. Now, Navantia will participate in the Viability Phase in order to propose a design that further adjusts to the requirements of the Armaments Inspectorate of the Polish Ministry of Defence. The final decision on the contractor is expected in 2022. The offer presented by Navantia is based on the design of the F-100, in service for the Spanish Navy, which has been the starting point for successful export contracts to Norway and Australia. The Miecznik programme for the construction of frigates is part of an ambitious plan launched by the Polish Government to modernise its armed forces with an investment of 115 billion euros until 2035.

The IAF at Dubai Airshow

An all out performance!

The Indian Air Force (IAF) Contingent participated at the biennial Dubai Air Show held at the Al Maktoum International Airport from 14-18 November 2021. The IAF had been invited by the Government of UAE to participate with the Sarang and Suryakiran Aerobatics Teams. These teams performed along with some of the best aerobatics and display teams in the world including the Saudi Hawks, Russian Knights and the UAE's Al Fursan. In addition, the IAF's Light Combat Aircraft (LCA) Tejas was part of the aerobatics and static displays during the show.

The induction of five Advanced Light Helicopters (ALH) Dhruvs of the Sarang Team, 10 BAE Hawk 132s of the Suryakiran

Team and the three LCA Tejas was completed a few days before the event and were supported by the IAF's C-17 Globemaster IIIs and C-130J Super Hercules. On arrival, the contingent received a warm welcome by H. E. Staff Maj Gen Staff Pilot Ishaq Saleh Mohammed al-Balushi of the UAE Armed Forces and other officers of the UAE Air Force.

While the Sarang Team has previously participated in the Al Ain Grand Prix in UAE in 2005, the Dubai Air Show was the first occasion for the Suryakirans and the Tejas to show off their 'swashbuckling aerial manoeuvres' at the event.

IAF at Dubai Air Show's last day

17 November 2021, the penultimate day of the Dubai Air Show 2021 commenced with a fascinating combined flypast by the IAF's Suryakiran Aerobatics Team and UAE's Al Fursan Display Team. Nine Hawk-132 of Suryakiran Team flew in sync with seven Aermacchi MB-339 of Al Fursan over important landmarks of Dubai like Burj Khalifa, Palm Jumeirah and Burj Al Arab, in a display which signified the deep camaraderie and bonhomie between the two Air Forces. The Suryakirans also participated in a late afternoon aerobatics display which was highly appreciated by the crowd.

The ever increasing popularity of the Tejas was reinforced by the superb demonstration flights flown everyday. The aircraft manoeuvred effortlessly, showing off its agility and versatility; a testament to the rapid strides that the platform has achieved in recent times.

(All photos: IAF PR cell)

Airbus at the Dubai Airshow 2021

408 aircraft including the first A350F ordered

In the first major airshow since the COVID-19 pandemic struck two years ago, customers demonstrated confidence in the recovery of the aviation sector and also in Airbus by placing orders and commitments totalling 408 aircraft (269 firm orders and 139 commitments). The agreements covered the full range of commercial aircraft families including a first commitment for the A350F freighter derivative.

At a pre-show event, Airbus launched its latest global market forecast outlining progressively shifting demand from fleet growth to accelerated retirement of older, less fuel-efficient aircraft resulting in a need for some 39,000 new-build passenger and freighter aircraft. Of these,15,250 aircraft (around 40%) are for replacements.

With the UAE Universal expo showcasing themes on Mobility, Sustainability and Opportunity, on the eve of the airshow Airbus lit up the Burj Khalifa, the tallest building in the world, by displaying its Company purpose, "Pioneering sustainable aerospace for a safe and united world", on the façade of this iconic Dubai landmark at a time when connecting with people and cultures has never been more important.

On the opening day of the show, Indigo Partners portfolio airlines placed a firm order for 255 A321neo Family aircraft, including 29 XLR. The order breakdown was as follows: Wizz Air 102 aircraft (75 A321neo + 27 A321XLR); Frontier 91 aircraft (A321neo); Volaris 39 aircraft (A321neo); JetSMART 23 aircraft (21 A321neo + 2 A321XLR).

The second day saw Air Lease Corporation sign a commitment for 111 aircraft covering the full range of aircraft families including the new A350 Freighter (25 A220-300s, 55 A321neos, 20 A321XLRs, four A330neos, seven A350Fs). Along with the orders, ALC and Airbus announced the first ever joint ESG scheme in aircraft procurement, a joint Sustainability Fund, to foster industry decarbonisation solutions.

On the third day, Jazeera Airways committed to 28 A321neos and Nigeria's Ibom Air became a new Airbus customer with a firm order for 10 A220s.

On the defence side, Airbus sold two additional Airbus A330 Multi Role Tanker Transport (MRTT) to the United Arab Emirates Air Force and Air Defence, and secured a new export order for two A400M new generation airlifters from the Indonesian Ministry of Defence.

At the show, Airbus also highlighted its ambition to play a leading role in developing innovative and sustainable solutions for urban air mobility, leveraging partnerships and technologies to bring a product to the market by 2025.

Courtesy: Airbus

Rolls-Royce and the IAF


Netra AEW&C

A proud partner of the Indian Air Force (IAF) since 1933 when the Rolls-Royce Bristol Jupiter Engine powered the first flight of the IAF, Rolls-Royce congratulated India's brave air soldiers on occasion of the 89th Indian Air Force Day. Over 750 Rolls-Royce engines of 10 engine types are powering different aircraft of the Indian military including combat and strike aircrafts, trainers, strategic airlift, VVIP and surveillance aircraft. Over the years, Rolls-Royce has established a strong ecosystem in India to support these engines. A dedicated Defence Service Centre in Bangalore supports all Rolls-Royce engines in operation with the armed forces, with a dedicated team ensuring optimum availability of engines and time on wing, while reducing maintenance and overhaul times.

Kishore Jayaraman, President–India and South Asia, Rolls-Royce stated, "It has been both our privilege and honour to serve the Indian Air Force for the last eight decades, and we salute the brave officers of the IAF on the occasion of Air Force Day. As India envisions the fleet of the future, our commitment to support the country's defence indigenisation and self-reliance goals remains as strong as ever."

Through its growing partnership with Hindustan Aeronautics Limited, Rolls-Royce has further reinforced its commitment to serve the Indian Air Force and enable the mission capability of the fleet. Rolls-Royce engines have been 'made in India' and supported by HAL for over 60 years. The partnership has evolved to include an authorised maintenance centre at HAL for Adour Mk871 engine and a supply chain agreement that enables Adour engine parts to be made in India to support IAF and Rolls-Royce's global customers.

Abhishek Singh, Senior Vice President– Defence, India and South East Asia, Rolls-Royce stated, "We are honoured to have been supporting the Indian Armed Forces to fulfil critical training, transport and combat roles. We will continue to support the mission readiness of our engines powering the IAF fleet and enable the 'power to protect' through our technologically advanced product and service offerings."

Prominent Rolls-Royce engine types powering various military aircraft in India include combat and strike aircraft Jaguar powered by the Adour Mk811, Hawk Advanced Jet Trainer powered by Adour Mk871, strategic airlift aircraft C-130J Hercules powered by AE2100, VVIP and Surveillance aircraft ERJ145 powered by AE3007.


Adour maintenance in progress


C-130J


Jaguar


Hawk AJT

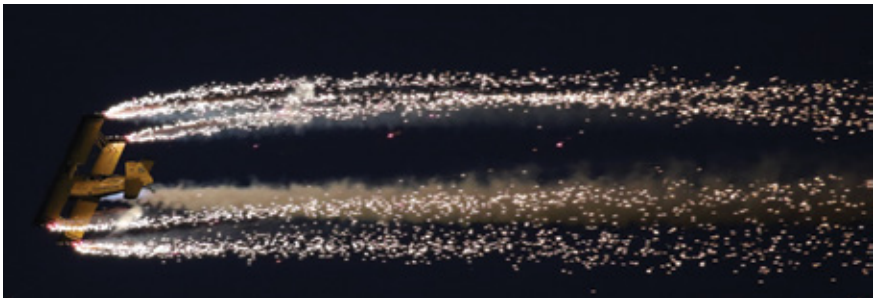
Sanicole 2021

Every year, the Sanicole Airshow at Leopoldsburg Airport is a treat for the visitors. In the year 2020, the show was canceled due to the outbreak of COVID-19. However, the show was restrcutured in 2021 with organisers aligning the event with Corona protocols.

Simultaneously and in collaboration with the Tiger squadron at vlb Kleine-Brogel, the participants of the Mini Tiger Meet also flew during the Sanicole show. The highlight for many visitors was the spectacular evening show on 10 September 2021 with aircraft giving a demonstration from the small Sanicole runway and

from the nearby runway of Kleine-Brogel Air Base.

Participants that excited the viewers with their evening flying display incuded the F-16, Agusta A109, an Airbus A400M from Belgium, Patrouille Suisse demo team from Switzerland, Red Arrows demo team from UK, Saab Gripen from Hungary and Equipe de Voltige in the Extra 330 from France.



In the civilian part, the participants included aircraft such as a biplane from Sweeden flown Jacob Hollander, the two gliders of Airborne Pyrotechnics and the Consolidated Catalina from UK, the SA-300 Trescal Starduster from France and Hawker Sea Fury flown by Kris van Den Bergh from Belgium.

Mini Tiger Meet

During the event, a spotter day took place at Kleine-Brogel. After a year of absence due to Covid, this time thousands of aircraft enthusiasts were present at the Belgian base. The highlight for spotters was the presence of a French Navy Hawkeye. The E-2C Hawkeye plays an important role on board the Charles de Gaulle (CdG). The aircraft, which is equipped with two turboprop engines, is a flying radar station for the crew of the ship and its aircraft.

A Mini Tiger Meet brought many participants from the Tiger squadrons in Europe to Kleine Brogel.

Photos and text: Joris van Boven and Alex van Noije

Jedi ops over Sicily

Fast and flexible military Search and Rescue units who can respond quickly to emergencies, are essential for defence operations. Italy, with a majority of its borders connected with sea, is no exception and has a firm force in place at various locations with a complete coverage of the country. We took a closer look at one of the units, 82nd Combat Search & Rescue (CSAR) squadron at Italian Air Force (AMI) base Trapani, Sicily, where we spoke with Captain (Capt) Filippo Conforti, one of the units helicopter pilots, gave an inside view of the specialised rotary work out of Sicily.

"We provide regional military search and rescue capacity 24/7 throughout the year", stated Capt Conforti giving a short overview of units' mission. He further added, "For that reason, we have a flight crew and a ground team at Trapani air base on a permanent alert, essential to take off with our helicopter within 30 minutes after an emergency call to deploy". Once airborne, the units HH-139 operates under

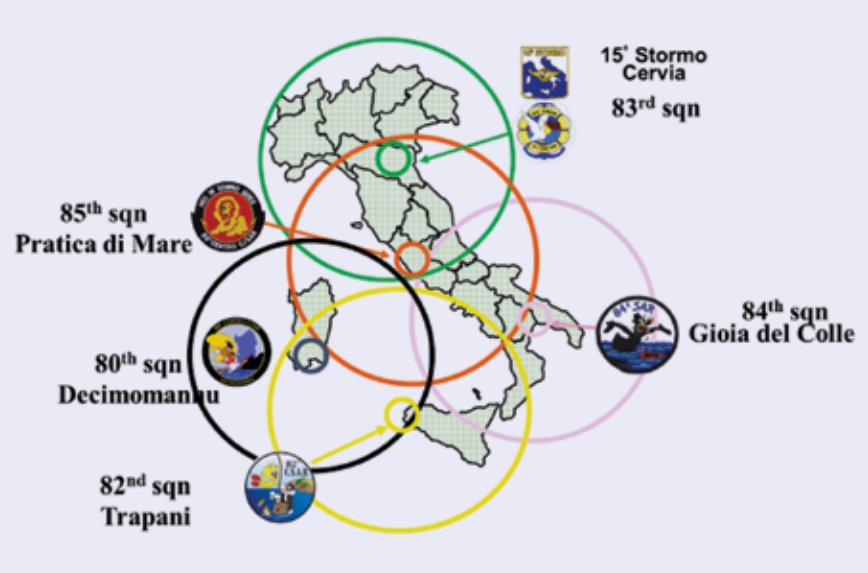
their "Jedi" callsign. It was in 2016 that the unit transitioned from the characteristic HH-3 "Pelican" to the Leonardo built HH-139. The new helicopter is the military version of the popular AW-139 and is powered by two Pratt & Whitney PT6C-67C turboshaft engines each providing more than 1500 hp and specified to carry a maximum of 15 passengers. Capt Conforti continued, "With a maximum flight time of approximately 3 to 5 hours, we can fly to destinations up to 120 nautical miles, spend some time on scene and can return safely to base".

Unit structure

The CSAR flight operations at Trapani are carried out under the command of 37 Stormo (wing), which is also in command of the Eurofighters of 18 Gruppo. Formal hierarchy places all the Italian CSAR squadron under command of 15 Stormo having its home base at Cervia. The other CSAR squadrons includes 80th squadron at Decimomanu air base, 83rd squadron at Cervia air base, 84th squadron at Gioia del Colle air base and 85th squadron at Pratica di Mare air base. The strong bond between all the CSAR squadrons is underlined by the use of Warner Brothers cartoon figures in all their individual unit badges. This counts also for the Trapani based 82nd squadron insigna, with Tweety bird offering a helping hand to Sylvester cat, symbolising that they are there with SAR capacity for everyone in distress.

SAR or CSAR

We walked with Capt Conforti to one of their HH-139 helicopters where he explained the crew composition of 4, being a commanding pilot and a co-pilot. In the cabin, you have the onboard operator, who manages the equipment such as the hoist. The last crew member is the rescue men/swimmer who also provides medical aid on nurse level. When an emergency call indicates a medical emergency, the 82 CSAR helicopter will pick up a doctor at the nearby hospital of Trapani or Marsala. The HH-139 cabin can contain 4 stretchers



to transport casualties. The military-civilian SAR duties of 82nd squadron includes regular cooperation with the mountain rescue unit CNSAS, the police and the firefighting forces of Vigili del Fuoco. Since 2018, the unit is also equipped with water-bambi buckets to assist with forest fires. During Combat SAR missions, a swimmer is not required and cabin space is used by Special Operation Forces (SOF) with their equipment for their work in a hostile environment. For CSAR missions, the HH-139 can be additionally equipped with a "Minimi" machine gun, mounted in the right door entry. Further Combat provisions are obtained with both sides supported by sniper rifles and an Integrated Self-Protection System (ISSYS) to detect attacking guided weapons and immediately deploy automatic initiated protective measures. "To maintain our Full Operational Capable (FOC) status and combat readiness for any requested deployment, we train vigorously. The region around Trapani air base is an ideal for these purposes, not only for sea ops training, but also the rough Sicilian mountainous landscape is perfect to practice in a wide variety of circumstances", Capt Conforti informed us.

With the outbreak of pandemic Covid-19, 82nd CSAR squadron also obtained an additional task. When needed the HH-139 can be made available to transfer patients between hospitals, with a supplementary bio-containment cradle, the patient was isolated to secure a safe working area for the crew. Although the Covid-19 flights are relatively small in number, 82nd CSAR squadron has meanwhile logged more than 42,000 flight hours in its existence, of which 7500 in rescue missions, saving about 750 persons.

Text and photos by Peter ten Berg

Search and Rescue Meet 2021

From 27 September till 1 October, the Galileo Search-And-Rescue (SAR) Meet 2021 was conducted at Koksijde Air Base (ICAO code EBFN), home base of 40 Squadron, which is responsible for helicopter rescue operations off the Belgian coast. With the participation of six helicopters and more than 100 crew members from multiple European countries, this exercise was marked as one of the larger versions of the meeting ever held. This year's edition was organised in close cooperation with Galileo, the Global Positioning System of the European Union.

The International Search and Rescue Meet is an exercise where search and rescue teams demonstrate their missions, assets, skills and procedures to one another. The aim of the exercise is to share experiences in order to learn lessons to make rescue operations even more efficient, safer and faster. The event circulates around three main pillars. A symposium in which each nation presents its assets and procedures. A flight of a challenging nature where skills such as precision, speed and agility of the entire crew are put to the test. Finally, a sports event that tests the cohesion of the crew, an important factor in rescue operations. At the end of the exercise, the best team receives the prestigious SAR Meet Trophy.

The Belgian 40 Squadron has a tradition of organising this SAR event. Nevertheless, the last edition dates back to October 2016. The transition of the Sea King rescue helicopter to the high-performance and ultra-modern NH90 NFH, as well as the Covid-19 pandemic, were the reasons for this break. The 2021 edition counted on a very diversified and significant international presence of rescue squads. For example, the "40th" welcomed teams from Belgium, the Netherlands, Germany, Italy, Norway, Finland, Great Britain, Cyprus, the Czech Republic, Greece, Sweden, France and Slovenia. The Belgian Air Force 40th SAR squadron worked very hard to organise a unique international search-and-rescue meeting. Koksijde Airbase hosted 13 lifesaving teams and 9 rescue helicopters out of 12 European countries making the event the largest SAR meet in history.

Report by Joris van Boven and Alex van Noije.

Ocean Sky meets EART

A lineup of 2 Hornets and 1 Typhoon behind the tanker, waiting for fuel

The skies around the Canary Islands were once again filled with a variety of planes from 15 to 29 October 2021. This year for the very first time two major exercises combined their forces to meet their goals together. Ocean Sky 2021 and EART (European Air Refueling Training) 2021 joined up at the Canary Islands to get the most out of both exercises. Ocean Sky had their home at Gando Air Base on Gran Canaria, while EART operated from Arrecife Airport on Lanzarote. The large airspace surrounding the islands makes it an ideal place for large scale exercises. The possibility for supersonic flights combined with large fighter formations give unique training opportunities for pilots as well as all others involved in the exercises.

Ocean Sky 2021

Fighter jets gathered at Gando Air Base for the air combat exercise which is organised every year and hosted by the Ejército del Aire (Spanish Air Force). Started as a DACT (Dissimilar Air Combat Training) exercise in 2004, the Spanish Air Force uses the exercise as the most important workout in its annual programme. However, the exercise was renamed in 2019 with a new title called Ocean Sky. Originally, Ocean Sky was born to test the combat level of the Spanish combat squadrons through their chain of command. Today, it has become a primarily air-to-air exercise, based on three missions modelled on NATO tactics: the protection of the area, the escort of major aircraft and the entry force. OS21 is the biggest international air combat exercise organised by Spanish Air Force Air Combat Command (MACOM) and is part of the advanced training of the Spanish Air Force Fighter pilots and air combat controllers.

During OS21, both pilots and air combat controllers have to face complex scenarios with dissimilar aircraft from Spain and other NATO nations. The underlying purpose of the exercise is to train the capabilities of the Command and Control structure of the Air Combat Command in an air superiority campaign, which allows to increase the level of preparation for air-to-air combat of the fighter units of the Air Force and the invited foreign units. The exercise is carried out in four phases:

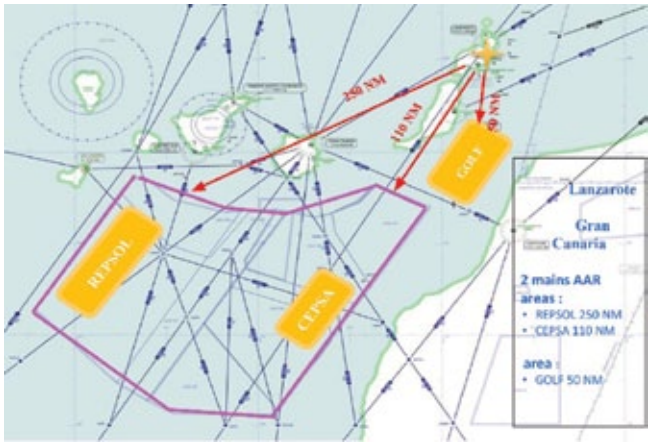
1. A first phase of 'Generation and deployment of forces' with the aim of carrying out all personnel and force preparation tasks, as well as the deployment of participating units.
2. A theoretical phase, which includes a series of 'force integration conferences' aims at learning about the aircraft participating in the exercise, Flight Safety, Combat Tactics, etc., in order to complement the flight training.

3. A practical phase with DACT and Mixed Fighter Forces Operation (MFFO) type missions, in a wide variety of scenarios and with a large number of aircraft, that allow increasing interoperability between the different participating units, as well as evaluating and improving the tactics, techniques and procedures used in this type of missions.
4. A final phase of 'withdrawal' or redeployment.

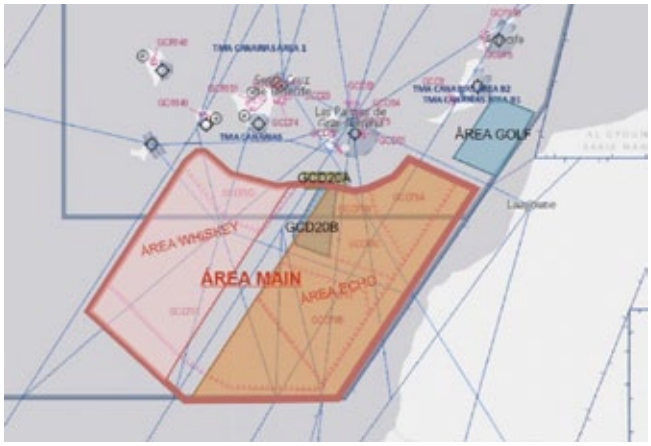
Missions during OS21 focused on the use of multiple media, simultaneously and in demanding scenarios, appropriate to the geostrategic reality. In total, the exercise included around 700 personnel, 40 fighter aircraft and 3 support aircraft. This combined force completed 27 flight missions and more than 500 departures from both bases with an average of 44 departures per day. The daily missions flown by the participants were split in morning and late afternoon missions. To reach the goals of all involved the main missions that were planned for this year's edition were:

Three periods of visual combat (one against one - 1vs1). There were 9 main missions (Main Wave) and upto 30 fighters involved. Varied scenarios included Defence of a No-Fly Zone; Recovery of downed personnel; Air defence and air control and Defence of High Value Air Resources.

Eighteen missions of minor entity (Shadow Wave) and upto 14 aircraft



AAR-AREAS



Area of operation OS21

A full flightline of Hornets and Typhoons before an afternoon mission

Countermeasures like flares are highly effective in air combat manoeuvres on a 1v1 basis and larger force missions

Gando Air Base is connected to the east by the Atlantic Ocean. Resident Ala 46 uses the shelters to the south side of the base.

The A400M of the Spanish Air Force participated for the first time in an EART exercise. The cooperation between different A400 users is invaluable

The French A330 MRTT participated for the first time in EART. An all round way to train planners, aircrews and technicians

EART 2021

Already in 2012, Air-to-Air Refueling (AAR) was identified as a capability shortfall in Europe and a plan to further develop this capability was set up by the European Defence Agency (EDA). Lessons learnt from operations led to an assessment, that more training dedicated to tanker crews was needed. Therefore, the European Air Transport Command (EATC), supported by EDA, developed the sole European training event for tanker aircraft, the European Air Refueling Training (EART) exercise. EART is organised yearly in conjunction with a large fighter exercise like the Dutch Frisian Flag exercise and aims at training tanker air and ground crews and increasing their know-how in complex multinational scenarios. The event is also a unique opportunity for exchanging information and procedures and building interoperability within the European AAR community. EART is also used as a testbed by EATC experts to develop and refine common procedures and receive immediate feedback from all actors. The 2021 edition was the first time the exercise was not flown from Eindhoven Air Base in the Netherlands, but instead the exercise used the Canary Islands to join up with Ocean Sky.

During EART 2021, EATC spearheaded various cross-national maintenance activities as Colonel Salvatore Melillo, Italian Air Force, EART 2021 Exercise Director explained; "Inside air mobility, air-to-air refueling is one of our topics in EATC. This exercise has a link to a fighter exercise, Ocean Sky, and born to give support to

involved in two different simultaneous missions. Scenarios remained the same.

The participants made use of the expansive 110,000 square kilometres "Delta 79" operating areas adjacent to the islands. The area is located 46 miles (74km) from Gando Air Base and is one of the largest air combat training areas in Europe – stretching for 186 miles (300km) by 230 miles (370km) – that allows for unrestricted air combat training without speed or height limitations. Air superiority is a necessary condition for the joint action of land, naval and air forces to enjoy freedom of movement, enabling them to achieve their objectives, making the area south of the Islands ideal for such a large-scale exercise.

The Hellenic Air Force participated with four F-16's based at Larissa. The participation of different foreign units helps the pilots to prepare for future deployments

The principle aim of the Ocean Sky exercise is to increase interoperability between different types of aircraft

The NATO AWACS was not flying due to technical issues for most of the exercise.

this fighter exercise in terms of air-to-air refueling assets, and at the same time, it's a good opportunity to share training and to standardise operational procedures inside the air-to-air refueling community. The aim is to test and train current and future processes".

These activities also helped in bringing in EATC experts for the technical and logistic branch, A400M maintenance teams from Spain, Germany and France as well as A330MRTT maintenance teams from France and the Multinational Multirole Tanker Transport Unit (MMU) members together. One focus area was to test A400M draft processes based on EATC's "A400M Cross-Exchange of Technicians Manual" (AXET Manual) and on scenarios ("what if" cases) including an exchange of technicians, one-off certification authorisation, sharing of spare parts, tasking a military approved maintenance organisation from another nations. They also exchanged lessons learned, information and expectations.

The vast airspace south of the Canary Islands provides the ideal place for large force missions. Hornets and Typhoons flew in close cooperation during the exercise

Two Eurofighter Typhoons fly with gear down over the Atlantic Ocean. Ready to go to work!

As for the A330MRTT, EATC's aim is to present the opportunities and benefits of cross-national maintenance to the MMU and French teams. Together they explored A330MRTT and national maintenance specificities linked to IT or specific French/MMU procedures. Col Melillo added, "The benefit of EATC is the pooling and sharing concept, so sharing information, sharing assets and having this information in between the mission, in order to create a unique organisation for the standardisation of all the manuals and operational procedures".

Text and photos: Erik Bruijns, Mark de Greeuw and Lex de Kort

EBAP Malbork airbase 2021

For the NATO Enhanced Baltic Air Policing (EBAP), four Turkish Air Force (Türk Hava Kuvvetleri, THK) Lockheed Martin F-16s (Fighting Falcons) were deployed to Malbork airbase in Poland (ICAO code: EPMB). From July 2021 until mid September 2021, the Turkish F-16s were based in Poland. The four F-16s (three single seat and one double seat) from the 161 Filo (squadron), named 'Yarasa' (Bat) are normally based at 6th Main Jet Base Bandirma airbase (ICAO code:LTBG) in the northwestern Turkish province of Balikesir.

Malbork airbase (22 Baza Lotnictwa Taktycznego) is the homebase of the 41 squadron (41 Eskadra Lotnictwa Taktycznego, 41.ELT) flying with the Mikoyan MiG-29 (NATO name: 'Fulcrum') fighter. The MiG-29s at Malbork airbase, were transferred in 2004 from the German Air Force to Poland.

The Turkish F-16s were fully armed with the internal M61 gatling gun (Vulcan) and two kinds of external air-to-air missiles: AIM-120 (Advanced Medium-Range Air-to-Air Missile AMRAAM) and AIM-9X (Sidewinder). Together with the Polish Mig-29s from Malbork and the Polish F-16s from Łask airbase (32. Baza Lotnicza Taktycznego) (ICAO: EPLK), Enhanced Baltic Air Policing missions were flown.

This is the second time the Turkish Air Force contributed fighter jets to NATO Air Policing in the Baltic region; and it is the first Turkish deployment to Malbork, Poland.

Baltic Air Policing (BAP and EBAP)

The Baltic Air Policing (BAP) is a rotational air defence role taken up by the North Atlantic Treaty Organisation (NATO) countries as the Baltic countries (Estonia, Lithuania and Lettonia) do not have the means to maintain their own air defence fighters on a 24/7 basis. For three to four months, NATO partners deploy their

fighters to Amari airbase (Estonia) or Šiauliai airbase (Lithuania). And in times of higher tensions, the eastern airbase of Malbork in Poland is also used by NATO partners on rotational duty to protect the eastern NATO flank. The Malbork deployments are called Extended Baltic Air Policing (EBAP). The Baltic Air Policing missions are controlled by Combined Air Operations Centre (CAOC) Uedem, near the city of Kalkar (Germany).

Southern support for the northern NATO flank

In the summer of 2021, there were three southern NATO countries (Spain, Italy and Turkey) protecting the northern region of the NATO airspace. They were supporting NATO's Baltic Air Policing in the north, demonstrating Alliance cohesion and solidarity. Deployed in the Baltic region, they worked with each other and hosted air forces to enhance cooperation and interoperability. Spanish Eurofighter Typhoons were based at Šiauliai airbase (Lithuania) (ICAO: EYSA) , Italian Lockheed F-35s were based at Ämari airbase (Estonia) (ICAO: EEEI) and Turkish F-16s were based at Malbork (Poland) (ICAO: EPMB).

Media Flight

On 26 August 2021, a media flight was organised by NATO Allied Air Command and the Polish Air Force. From Malbork airbase, a Polish Air Force EADS CASA-295M transport aircraft flew towards the laguna enclosed by the Hel peninsula near Gdynia. Onboard were twelve aviation reporters, securely attached to the floor of the CASA-295M. Initially, a mixed formation photo session was planned with Polish and Turkish F-16s. But due to bad weather in the assigned photo area, the Polish F-16s were cancelled and eventually two Turkish F-16s flew for an hour behind the CASA-295M.

The F-16s, the CASA-295M crew and the photographers were briefed before the flight, to allow good photo opportunities in a safe environment. This briefing was done by Sławek 'Hesja' Krajniewski, who organises similar commercial air-to-air photo opportunities in Poland.

Text and photos: Alex van Noye & Joris van Boven

Tiger Meet turns 60 !

The X Tiger of hosting unit 23 smaldeel taking off

No doubt most colourful participant: EF.2000 from JG 74

In July 1961, three NATO squadrons brandishing their tiger emblem got together at RAF Woodbridge in the United Kingdom and conducted the first 'Tiger Meet'. This turned into an annual event which is still going strong year after year. This year, the Tiger Meet completed its 60 glorious years and this benchmark was celebrated by conducting various events at Kleine Brogel which is a Belgian Air Force airbase.

The Tiger Meet is intended to promote solidarity between NATO members and to learn from each other. This is done by conducting full-scale exercise scenarios along with all kinds of social happenings. In the beginning years, emphasis was on the social part, but later on full COMAO (Combined Air Operations), CAS (Close Air Support) and DACT (Dissimilar Air Combat Training) missions were integrated in the Tiger Meet. As Major General Karsten Stoye, Chief of Staff of the NATO Allied Air Command assessed, "NATO is very glad to have an exercise in Europe such as the NATO Tiger Meet. It underlines its high level of operational readiness and shows its flag with different weapon platforms from many partner states".

Starting with three participating units in 1961, the Tiger Meet Association nowadays has no less than 23 full members and two probationary members, all from Europe, plus nine honorary members from the USA, Canada and India. This exercise has witnessed participations of famous aircraft such as the F-4 Phantom, F-104 Starfighter and MiG-23 'Flogger'. Currently, aircraft range from fighters such as the F-16 and JAS-39 Gripen to 'heavies' like the B-2 Spirit bomber and E-3 AWACS have been actively participating in the exercise along with the helicopter fleet that includes Puma, AB.212 and Mi-24 Hind.

French Navy Rafale with full afterburner climb

Czech Mi-35 Hind with colourful markings

French Air Force twin seater Rafale with modest tiger markings

All participating squadrons have a tiger in their emblem, or at least a similar kind of cat. Only exception is 11 Flotille of the French navy, flying the Rafale M, whose squadron badge displays a seahorse! When they were admitted to the Tiger Meet Association they operated from the aircraft carrier 'Clemenceau' which carried a tiger crest. Although 'Clemenceau' has retired years ago, the squadron was allowed to keep their tiger-status as they had shown true tiger spirit in the past years!

As the 2020 edition of the Tiger Meet had to be postponed to 2021, the scheduled edition of 2021 was called the Extra Tiger Meet or XTM21. This meeting was also meant to celebrate the 60th birthday of the Tiger Meet. Unfortunately, this had to be celebrated under less than ideal

Greek F-16 of next year's hosting 335 Mira

German Tiger Spirit Tornado with full afterburner

Polish F-16 with a toned down tiger camouflage

Hungarian 'Puma squadron' JAS-39 taxiing out

circumstances. Due to Covid-19, the exercise part of XTM21 had to be cancelled in the end. What was left was a long weekend with lots of social activities, including a formal dinner and of course the famous Tiger Games. German participant TLG 74 were the winners of this year's edition.

As always, many squadrons painted up at least one aircraft in very colourful tiger schemes. Most colourful no doubt was the 'Bavarian Tiger', an EF.2000 from TLG 74 based in Southern Germany. Hosting unit 23 smaldeel also had a fully painted jet, their F-16 was named 'The X Tiger' based on the eXtra Tiger Meet theme. Also pilots and ground crew did their best to show the Tiger spirit, and tiger colours and markings could be seen everywhere during the weekend. On Monday morning, some participants used the opportunity to fly one operational mission together with F-16s of hosting 23 smaldeel. And that was the end of a short but intense celebration weekend. Next year, hopefully a full Tiger Meet can be conducted again in Araxos, Greece.

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

French Rafale flyby

Hungarian 'Puma squadron' crew starting up

Farewell flight of McDonnel Douglas KDC-10

On 7 October 2021, the last McDonnel Douglas KDC-10 tanker and transport aircraft (with registration T-235) of the Royal Netherlands Air Force flew a farewell round past Dutch airports.

The aircraft departed from Eindhoven Air Base (ICAO: EHEH) and flew at a low altitude over the military air bases of Leeuwarden, Den Helder, Woensdrecht and Gilze-Rijen. Due to the low clouds, the KDC-10 subsequently flew on to Volkel Air Base. The airports at Texel, Amsterdam and Rotterdam were also visited along with the headquarters of the Royal Netherlands Air Force in Breda. After landing, the aircraft received a water shower from the fire brigade.

On 25 October 2021, this aircraft left the Netherlands and flew to its new owner in the United States, who also took delivery of the first aircraft at the end of 2019, with registration T-264. The new owner, OMEGA, will use the aircraft to refuel US Air Force aircraft on a commercial basis.

Both KDC-10s were acquired from airline Martinair in 1992 and were converted into tanker and transport aircraft, before entering service in mid- 1995. With the arrival of the KDC-10, the Royal Netherlands Air Force got the ability to transport large amounts of cargo and personnel quickly and over long distances. The KDC-10 also served as a flying gas station by providing midair refueling facilities to the fighter jets.

The tasks of the KDC-10 will be taken over by the new Airbus A330 MRTT aircraft.

Report by: Joris van Boven and Alex van Noije

Falcon Leap 2021

The Dutch 11th Airmobile Brigade of the Royal Netherlands Army organised the international exercise Falcon Leap. The unit specialises in the rapid deployment of troops by air and for this, it practices the so-called cargo droppings. With tactical C-130 Hercules transport aircraft of the 336 Squadron of the Royal Netherlands Air Force and international partners, loads were dropped over the Marnewaard (Netherlands) and Schaffen training areas (Belgium) and Deelen Air Base (Netherlands).

In total, about 80 container delivery systems and 1 heavy load were dropped. This was done in collaboration with American (C-130 Hercules), Polish (Casa C295M) and Italian (C-130 Hercules) colleagues. Falcon Leap provided the opportunity to train together and become familiar with each other's equipment and procedures. A possible airborne operation nowadays always takes place in collaboration with coalition troops. Interoperability, using the same procedures and working methods, is then essential. The hermetically sealed 'delivery container' is very suitable for providing poorly accessible troops with vulnerable items such as food or ammunition. This also applies to relief supplies to people in a disaster area.

During Falcon Leap, a so-called cross-loading was done for the first time. Dutch payloads were ejected from a Polish C-295M transport aircraft. A heavy load (more than 1,000 kilogrammes) was also been dropped for the first time, led by American soldiers. Being able to drop such loads broadens the deployability of the unit. In the future, the Airmobile Brigade wants to add form to this deployment to the operational 'toolbox'. The second week of the exercise revolved around parachute drops by soldiers on Ginkelse Heide, Heteren, Houtdorperveld, Renkum, Marnewaard (all in the Netherlands) and Hechtelse Heide (Belgium). Soldiers also practiced airdrops from a helicopter for the first time (2 American CH-47 Chinooks and 1 Czech Mi-17 Hip). Falcon Leap is organised by 11 Airmobile Brigade. The participating parachute units came from Belgium, Germany, France, Greece, Great Britain, Italy, Poland, Portugal, Czech Republic and the USA.

Falcon Leap coincides with the annual commemoration of Operation Market Garden in Ede. The 11th Airmobile Brigade and the 336 Squadron and the international partners supported the commemoration with a paratrooper drop on 18 September. This paradrop was executed at the same locations near the Arnhem bridge as in 1944 ('A bridge too far').

Text: Alex van Noije & Joris van Boven
Photos: Alex van Noije

Attack by MiG-21s on 'Spooky Runway' foil escape of East Pakistan leadership: 1971 Indo-Pak War

Air Marshal Ajit Bhavnani (Retd) Former VCAS recounts

It was 11 December 1971. I was a Flt Lt posted in 4 Squadron, the Fighting OORIALS, flying Mig-21 FL aircraft. The squadron along with 28 and 30 Squadrons was based at Tezpur in Eastern Air Command (EAC).

In November that year, with war clouds looming, 4 and 28 Squadrons moved to Gauhati and began honing their operational skills.

The Indo-Pak war began on 3 December and both squadrons roared into action against enemy targets in East Pakistan. Counter Air operations began with air strikes on Tezgaon airfield, the primary PAF Sabre base, followed by strikes on Kurmitola, the main stand-by airfield. By 8 'December, both airfields were neutralised by IAF, thus grounding the entire PAF Sabre fleet in East Pakistan. The Indian Army which was rapidly advancing towards Dacca, could now move forward at greater speed, unhindered by enemy air threat. The fall of Dacca was imminent.

On 11 December 1971, I learnt later, HQ EAC was informed of a secret message from the Pakistan Army in Dacca which had been intercepted by Mukti Bahini, the resistance group fighting for liberation of Bangladesh. The message talked of an escape plan for top civil and military leadership of East Pakistan, to flee to Rangoon in a United Nations Twin Otter aircraft. As the IAF had gained total air supremacy and rendered enemy airfields unusable, the plan was to take off from a makeshift grass strip away from Dacca city.

Gp Capt MSD "Mally" Wollen, then Base Cdr at Tezpur, had moved to Gauhati and was in charge of all Mig 21 combat operations in EAC. On the same day intel inputs had been received stating that the escape plan was expected to take place in complete darkness sometime during that night. The report had made mention of a grass field located approximately 35 km North East of a specific pin point on the outskirts of Dacca city. This grass strip was dubbed by HQ EAC as the "Spooky Runway".

Late afternoon on 11 December, I had flown a 3 aircraft mission with "Dopey"

Rao, Sukrutraj and self, providing top air cover to the Indian Army's largest ever para drop mission into enemy territory over Tangail. Around 40 IAF transport aircraft- An12s, Caribous, Packets and Dakotas flew into the designated area in perfect VIC formations. While looking out clearing the airspace for any possible air threat, it was a unique and fascinating sight to watch over 800 parachutes deployed, dropping troops and their combat equipment.

For me however, this interesting mission was soon to follow with some more excitement that night.

After landing from the CAP mission over Tangail, I was detailed for night ORP (Operational Readiness Post) duty to undertake any night missions that may be required.

Around 11 pm, I was called into the Ops Room where Stn Cdr Gp Capt Wollen

and my CO, Wg Cdr JV Gole informed me of the Spooky Runway and that I was to get airborne ASAP and fly to the target area, as Intelligence reports had ascertained that the escape plan was to be implemented very soon.

Stn Cdr briefed me of the specific location of Spooky Runway and due to time constraints, I was to get airborne in the Air Defence configuration of 2 x K13 air to air missiles. He briefed me that if I spotted the Spooky Runway, I should not hesitate to fire both missiles on to the ground target.

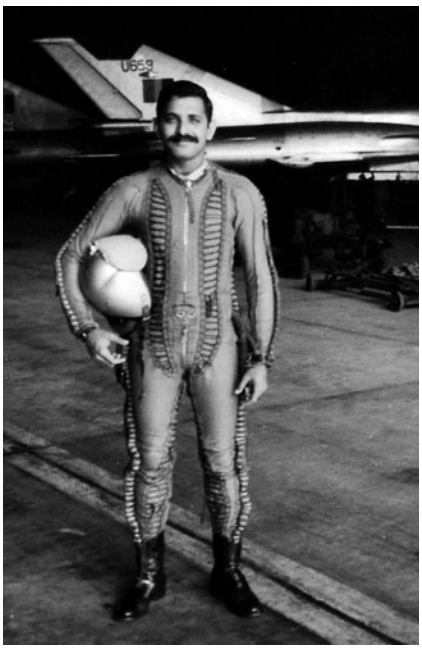
Pre-war preparations. L-R : Flt Lts G Bala, Ajit Bhavnani, Suren Tyagi and Sqn Ldr Lawrie Menezes (photo: author)

I made a quick calculation of the navigation to target and got airborne.

I recall it was a dark night and all lights off on ground. With no inertial systems or GPS in those days, I went strictly by compass and clock to ascertain my arrival over target area. Overhead, I began circling the area looking for any signs of the Spooky Runway. Descending to a height of 2-2.5 km/7-8000 ft, yet I did not spot any signs or get any indications of what may be the the Spooky Runway. Orbiting over the general area for 15 odd minutes with no luck and with fuel running low, I turned and began to set course back to base.

Prior to settling down on the return leg, fortuitously, I decided to have a last look and loosely turned in the direction of the target area. And lo and behold, that was when I saw a few lights appearing on ground in a straight line. In hindsight it appears, the enemy would have assessed my aircraft had departed the area and it was safe to place lights perhaps kerosene lamps, to assist the Twin Otter for its take off in darkness.

Without a second thought, instinctively I put my MiG in a dive towards the lights, waited a few second and pressed the weapons trigger. It then appeared to me, "all hell had broken loose"! Both K13 missiles fired. The fireball of bright flames from two rocket motors igniting and firing in the still of the pitch dark night, with rocking of wings and the sound which followed, blinded me totally and shook me up for several seconds. And then what followed was the bigger shock and surprise! I found the RPM gauge winding down. I had lost my only engine. The disturbance of airflow into the engine due to firing of both missiles simultaneously, had led to engine failure.



Getting set for a high altitude sortie

When the hard reality of my desperate situation struck me, thoughts ran through my mind of night ejection over enemy territory, with the uncertain consequences. My thoughts also went back to my ejection from a MiG 21 in April that year. At low level, due to a bird hit, I had lost engine and had tried to relight unsuccessfully. I ejected at very low level, with parachute deploying a few seconds before I touched down on mother earth!

Training to cope with such emergency situations is part of a military pilot's regular regime. I then took stock of the situation and thanks to the reliable relight system of the MiG-21, was able to restart the engine and with a 'skip of few heartbeats', returned to base with fuel level at an edge.

On landing, I debriefed the Stn Cdr and my CO on the entire sequence of events as they had transpired. I recall words of the Stn Cdr, this was indeed the very first firing of K 13 AAMs on to a ground target!!

Next morning, two additional MiG 21s, this time loaded with 2 x 500 kg bombs flown by Hemu Sardesai and then G Balasubramaniam, successfully dropped their bombs in the same area of the Spooky Runway.

The next day, our CO informed us that HQ EAC had commended him for the high effectiveness of the night strike and day bombing missions of 4 Squadron. He complimented us as he had been informed, the escape plan of the top brass of East Pakistan had been totally abandoned due to the air action by 4 Squadron.

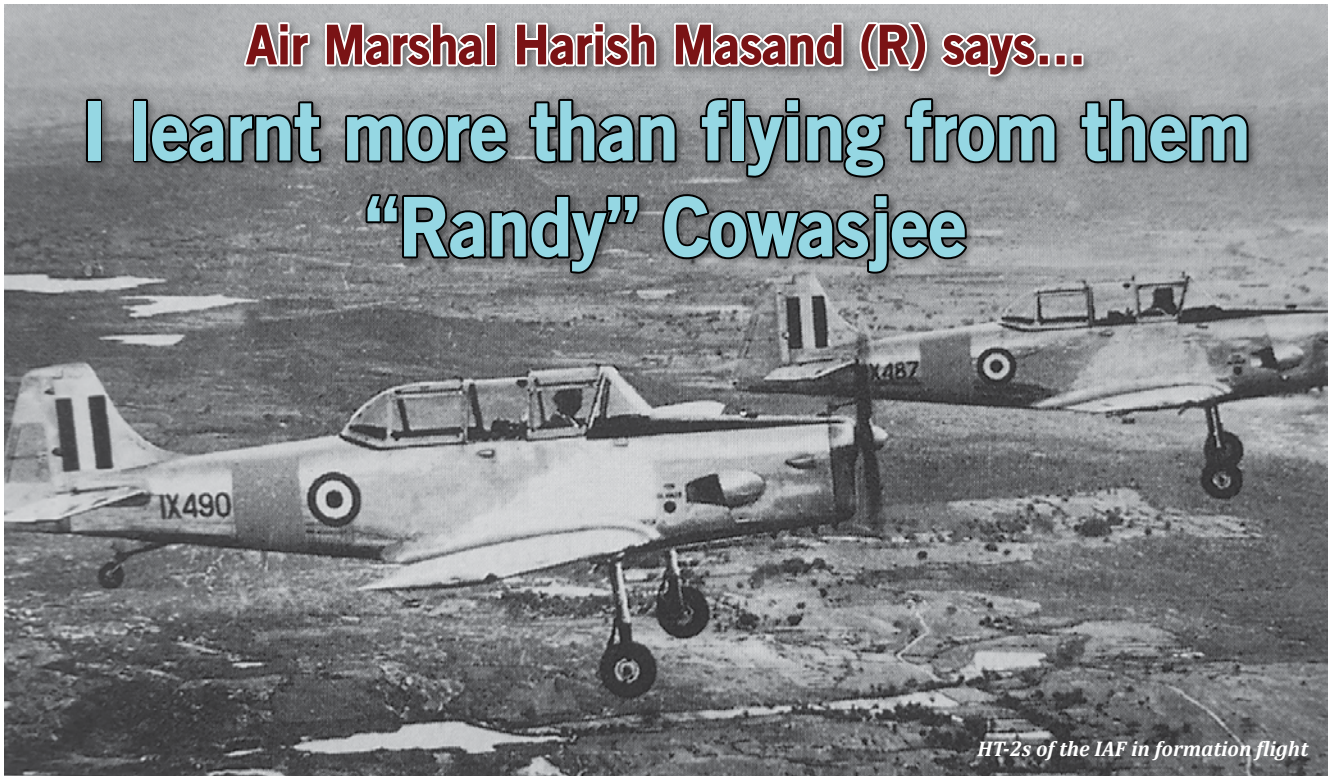
The top military leaders including Lt Gen Niazi and his senior staff surrendered to Indian forces and were taken POWs at the end of the war on 16 December 1971.

Indian military had scored an unprecedented and decisive victory over Pakistan. 90,000 Pakistani troops had surrendered to the Indian Army and had been taken as POWs. India's victory has gone down in the annals of history as one of the finest and most decisive ever military victories.

Article by Air Marshal Ajit Bhavnani (Retd) & Former Vice Chief of Air Staff, Indian Air Force

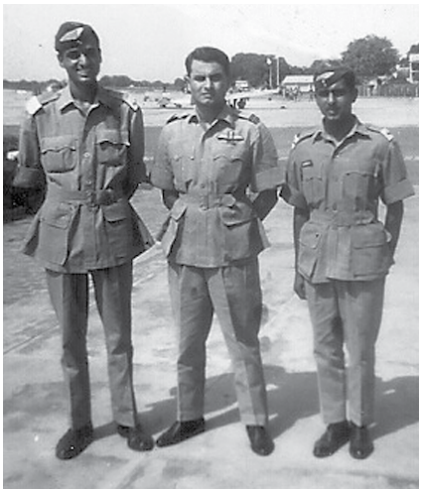
Air Marshal Harish Masand (R) says...

I learnt more than flying from them "Randy" Cowasjee



HT-2s of the IAF in formation flight

A little background of how I joined the Air Force and the environment I came from is essential to understanding how Flight Lieutenant Ransford "Randy" Cowasjee had a positive effect on my career in the Air Force and my life. In early September 1965, while the Indo-Pak War was in full swing, I appeared for selection for the Air Force as a pilot at the No. 1 Air Force Selection Board, Dehradun having applied for the 99th GD (P) Course through the NCC Air Wing. At that time, I was pursuing my third year in the Engineering College in Indore. While I was doing well in academics, I imagined myself as becoming a nerd in the future with thick glasses, good in academics but nothing much else. Due to this fear, I was grabbing every opportunity to do something more adventurous through the NCC as well as other venues. Becoming a fighter pilot seemed a natural choice, in the absence of huge funding required for car racing those days. Having been selected, as one of two candidates from an all-India NCC Air Wing competition, and having just returned from the NCC Commonwealth Camp in Singapore in August 1965, I was supremely confident of getting through the Air Force selection particularly with some Tiger-Moth flying under my belt. I still recall the question posed by the President of the Selection Board, Group Captain George if my memory serves me right after all these years, after all the tests were over when he asked me why I wanted to join the Air Force and what I would do if I was not selected. The first was easy to answer since I had dreamt of flying fighters for a long time. However, for the second, I replied with a straight face that while I would be disappointed, I would continue with my engineering course to become an aeronautical engineer and try get into NASA. I don't really know if that answer convinced the Board but I was sent on for medicals at CME and which also I fortunately cleared.



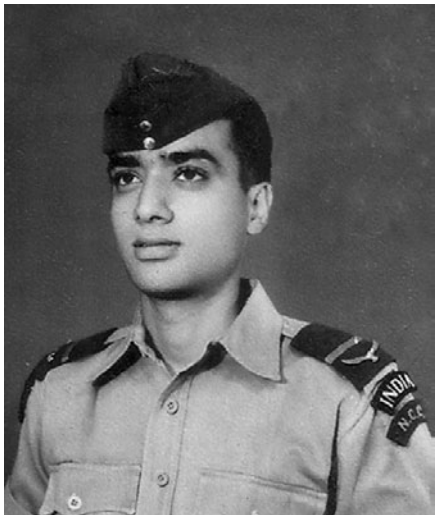
(L-R) Self, "Randy" Cowasjee and Flt Cdt "Rocky" Bhatia in 1966 (Photo: Author)

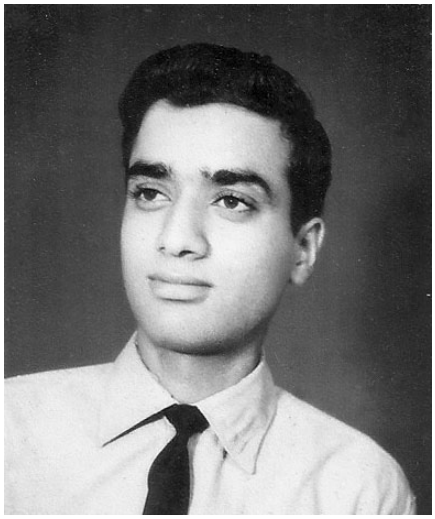
Unfortunately, thereafter nothing was heard from the Air Force for months and I thought that my opportunity had slipped by. Of course, my father was very happy with this long silence from the Air Force since he never wanted me to leave my engineering career and I continued with my college. Suddenly, in early March 1966, I was asked to report to Pilot Training Establishment (PTE) at Bamrauli, Allahabad for training with the 98th GD (P) Course at short notice. Excited as I was at finally getting an opportunity to realise my dreams, I hadn't really bargained for what I initially got on the way. We reported for training at PTE Bamrauli around the 21st of March, 1966. The course trainees comprised of almost 200 direct entry cadets who had already done over a year of training at Air Force Administrative College (AFAC) in Coimbatore and various Elementary Flying Training Units (EFTUs) which were essentially based on civil Flying Clubs at various places to give some flying to the Air Force Flight Cadets. The other lot were about 50 ex-NDA cadets who had done three whole years of rigorous training at Kharagvasla. I was in the minuscule remaining lot of eight, four of which

were ex-NCC and four ex-airmen. Quite obviously, these 250 odd cadets were very upset that eight of us joined them directly at PTE through a shortcut which made many of them pick on us whenever they could.

For ease of administration, the eight of us were put along with the ex-NDA cadets who on the very first day defied the air force Sergeant, who was our drill instructor, perhaps because he was not as imposing or commandeering like the NDA drill Havildars/Saabs. For such misbehaviour, we were all immediately put on three days of CC or confinement to camp which meant a lot of punitive drills and parades along with reporting to the guard room every one hour after working hours. I still recall that this was the hottest March in the history of Allahabad for about 50 years and we were front-rolling on the hot tarmac for hours at end at a temperature of around 48 degrees Celsius on 23 March 1966. At the same time, exhausted as I was, I was also picked on by the ex-NDA and some direct entry cadets in the evening hours leading to a lot of fisticuffs and bruised faces. Concurrently, we also had to go through the technical lessons on the HT-2, the aircraft we had to start flying on soon. Later, when we started flying, the same heat also restricted our flying to early morning hours giving us a lot of time later in the day to do our studies, sometimes disrupted by such confrontations.

I think my instructor, "Randy" Cowasjee, watched all this unobtrusively and developed a soft corner for me perhaps sympathising with what I was going through without ever talking about it. His attitude towards me was further reinforced when I started flying with him towards the end of March and all that Homi Mistry had taught me on the Tiger-Moth earlier in Indore came to the fore. I guess I did not do too badly since Randy was pretty rough on my other co-pupils, like "Rocky" Bhatia and Chhatwal, but never laid a hand on me or even yelled at me during flying. Remember this was the time when we had surplus pilots in the Air Force and the instructors had the luxury of throwing out anybody who showed the slightest sign of inability to cope or did not progress as expected in flying during training. The HT-2 was also a different animal compared to the docile and pleasurable Tiger-Moth, very demanding and with a vicious tendency to swing or ground loop during take-off and even more so during the landing run. I closely watched Randy's use of rudders and ailerons in the initial sorties and demos and quickly imitated his technique and control movements in these two critical phases of flight due to which I was able to do my entire flying on the HT-2 in PTE, Allahabad without ever swinging or ground-looping the aircraft. Though we only did about 45 hours on the HT-2 in this initial training at PTE, what I had learnt through Randy came in very handy even eight years later during the Flying Instructors' Course in Tambaram. For some minor reason not important enough to be mentioned here, I had to do my flying trophy check in FIS, Tambaram with then Group Captain PD Dogra on the HT-2, a propeller aircraft





NCC and Singapore 1965 (Photo: Author)

The clean, and unpretentious, lines of the HT-2 are clearly seen

that I hadn't flown since our training days, having moved on to jets and fighters.

Perhaps realising that I was doing alright in flying, as well as ground subjects, and would make an acceptable pilot in the Air Force, after a couple of months, Randy also took care of my isolation and lack of friends during the course by inviting me and taking me along for jam sessions and socials in town on weekends where I could make civilian friends and get introduced to the civil society. Generally, Randy Cowasjee was accompanied by Squadron Leaders M Sadanand, HM "Herbie" David and Flight Lieutenant "Ronnie" Mitra accompanied with their spouses and all of them were very friendly and hospitable without ever treating me like a cadet in such outings. This exposure did a lot to boost my self-confidence while polishing up a village/small town boy like me apart from taking care of my initial loneliness and lack of friends. With this renewed self-confidence, I could focus on my training better and started doing pretty well and soon, even my course-mates, who earlier used to gang up on me, pick fights with me and sometimes plastered me pretty badly, started making friends with me. On my part, I forgot about all the initial ragging and animosity displayed by my course-mates and developed lasting friendships with a large number of such course-mates which have stood the test of times, as experienced by me in the course reunion during the Golden Jubilee of our commissioning in 2017/2018 despite not having met many of them for decades and even recently during my travels.

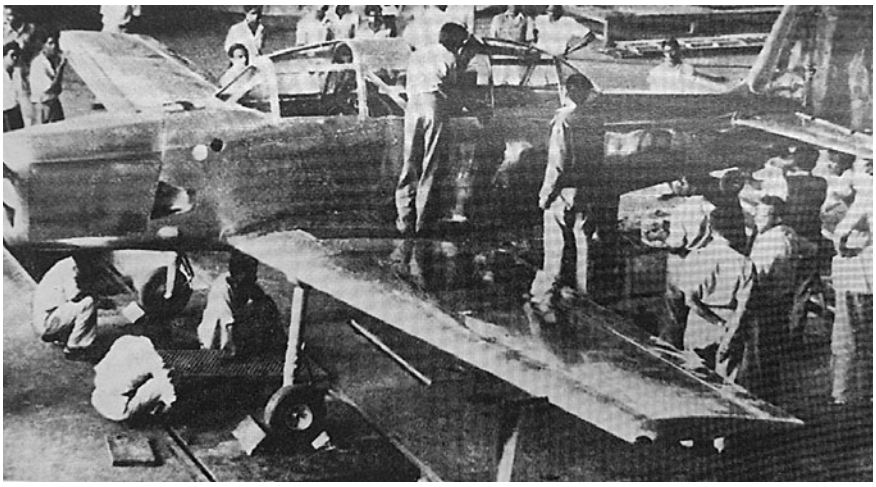
Randy showed me and taught me how to treat pupils differently based on their abilities, temperament and individual needs. In the circumstances that I did my initial training, having come from an academic background from a small town, not truly confident of making the cut as a fighter pilot and being picked on and ragged by my own course-mates, if Randy had behaved aggressively or had been abusive with me, I think I would have just not been able to survive and make a confident pilot later.

Sohrab Choksey and me with RM Y.B. Chavan just before departure for Singapore in August 1965 (Photo: Author)

Randy seems to have seamlessly taken over from my first flying instructor, Homi Mistry in Indore, who had taught me flying in an easy friendly manner while also permitting all of us to socialise with the Mistrys in after hours, as described in my previous article. His quiet guidance and grooming also held me in good stead later in my early years in the Air Force by accepting the hardships with equanimity and also responding correctly to the demands placed on me by my seniors. I still recall some similar occasions later in OTU, Jamnagar when I was converting on the Hunter, "Herbie" David was there too and asked me if I could drive them for a night outing in a 3-tonner since he had arranged the vehicle but had not been able to get hold of a service driver or an MTD, as they were called in the Air Force, or perhaps because he did not want an MTD around in such personal and private outings. Though I did not have a driving licence for heavy vehicles, I was somewhat familiar with the requirements with a little exposure to the truck drivers who used to work for my father. I not only drove them around in the 3-tonner but also knew my place in the outing and the socialising those evenings. Herbie later asked for me whenever he needed a driver for such outings earning me the sobriquet of "Corporal Masand".

The example set by Randy also helped me treat my own pupils and subordinates later in the correct manner which helped me create the right environment for them to develop to their full potential as pilots and officers without breeding contempt through familiarity. Some of my own pupils still remind me of those times that I look back on with great fondness. Thank you Randy Sir for all that you taught me.

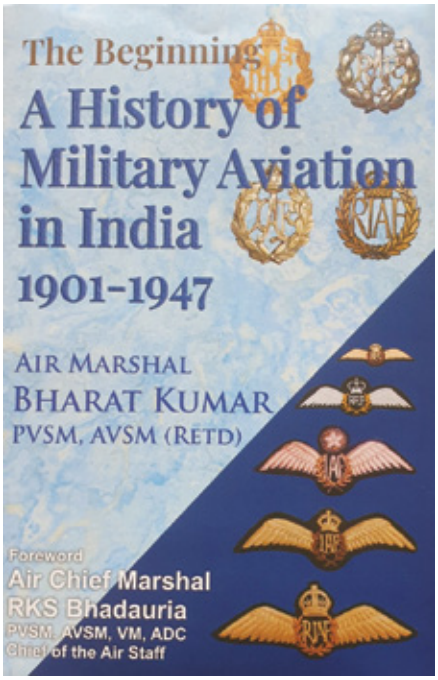
(Photos of the HT-2 from the Vayu Aerospace Review archives)



Building of first HT-2 at Bangalore

A History of Military Aviation in India 1901-1947

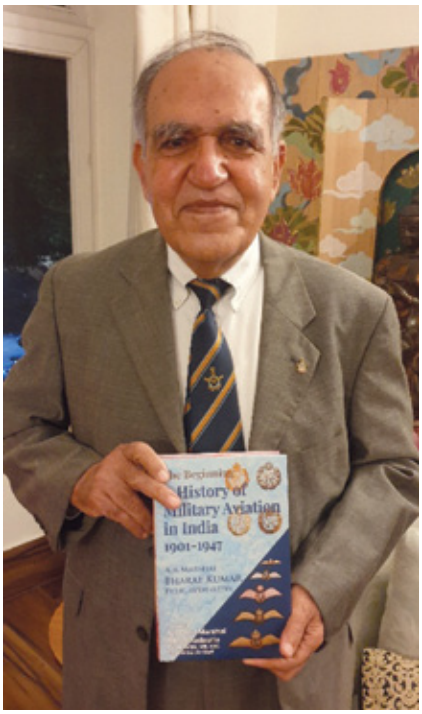
by Air Marshal Bharat Kumar PVSM, AVSM (Retd)



The front and back cover

Some words from the author

The history of the Indian Air Force is rich and is very closely associated with military aviation in India. Unfortunately, very little has been written about the origin of the Indian Air Force, various obstacles and prejudices to its creation. The early pioneers faced discrimination and were not treated the way they should have. Despite all these difficulties, the Indian Air Force emerged as a mature, viable and vibrant fighting force. When was the Indian Air Force formed in India? There have been two accepted dates. Till 1978, it was taken to be 1 April 1933, the day on which `A' Flight of No. 1 Squadron, IAF was raised and now, 8 October 1932, the date on which the formation of the Indian Air Force was notified in the Gazette of India. But, as we shall see in this book, the origins of an air force in India can be traced to even before the First World War. There are other little known facts about the Indian Air Force, as well as the evolution of military aviation in India, that needs to be brought to the attention of the military aviation enthusiasts and especially those associated, in one capacity or the other, with the Indian Air Force.



Air Marshal Bharat Kumar with his labour of love that took over four years to write and put together. He very kindly dedicated his book to the late Pushpindar Singh Chopra, his friend and Founder Editor of the Vayu Aerospace and Defence Review journal.

After having served for nearly four decades and hanging up my uniform, I realised that I did not know fully about the Service and especially about the wars that the Indian Air Force had been involved in. I tried to redress this shortfall by researching the subject of wars starting from the Indo-Pak war in Kashmir in 1947-48, the Sino-Indian War of 1962, the Indo-Pakistan War of 1965, and the role played by the Indian Air Force during Operation Pawan in Sri Lanka during 1987-1989. A few years ago, I came across two articles by Clive Richard in the `RAF Air Power Review' on the origins of the Indian Air Force. It was then that I realised that the history of the Indian Air Force and military aviation in India dates back to an even earlier era about which I was ignorant. This nudged me to commence my research. Some of the questions that came to my mind and for which I needed answers were: how the idea of the formation of an air force for India was mooted? What problems were encountered in its formation? Why did it take such a long time for the first squadron to come up to its full strength? And finally, the reasons for the delays in the build-up of the IAF and formation of additional

squadrons. During my study, I realised that the history of the Royal Air Force in India was closely interlinked with that of the Indian Air Force. I concluded that I need to expand the area of my study from the history of the Indian Air Force to the history of military aviation in India. This work is the culmination of that study.

Chapter 1 covers the evolution of military aviation in India from 1901 when the first and the only balloon unit was inducted for purposes of reconnaissance work in the North West Frontier — it was never utilised there as the balloons were unsuitable for operations in the area. The first lot of manned aircraft arrived in India for demonstration purposes in 1910. The Commander-in-Chief, India, was so impressed by the results of a reconnaissance flight that he wanted to have an air force for India immediately. But, as always, the lack of funds did not see an air force in India being formed even before the Royal Flying Corps in England. However, a Central Flying School was established in India as far back as 1913 and the 'Indian Flying Corps' saw action in Egypt and Mesopotamia (Iraq) in 1915 before its merger into the Royal Flying Corps. The necessity of air reconnaissance assets to assist the Indian Army in the North West Frontier was duly recognised and the first RAF squadron was inducted into India in 1915.

A small number of daring young Indians served in the Royal Flying Corps during the First World War. This, notwithstanding the rules that only persons of European descent could join the armed forces. They left their indelible mark on the Indian military history and the stories of these young pioneers have been covered in Chapter 2.

The RAF was in India right through from 1915 till India achieved her independence in 1947 — some units did leave in 1948. The history of the RAF in India during this period has been covered in Chapter 3. Another little-known fact is that the RAF in India, as also the Royal Indian Navy, was part of the Indian Army and faced many difficulties in their development. The expansion of the RAF in India and the budgetary constraints etc. are some of the issues that are normally not pursued by those involved in operational aspects of the Service. The RAF's role in the Third Afghan War, as well as in the Jalianwala Bagh massacre — the RAF was used against unarmed civilians during the tragic events — have also been covered in this Chapter.

The British had problems with the tribesmen in the North West Frontier and had been militarily engaged with them from the middle of the nineteenth century. They had to deploy at least two divisions on a near permanent basis in the North West Frontier. The RAF was inducted into India mainly to assist the Indian Army in countering the problems posed by various tribes in the region and, to a lesser extent, the threat from Russia and Afghanistan. These operations were extremely costly both in terms of money and casualties — they were time consuming too. The British were never able to establish a durable peace against these tribesmen. The RAF was deployed to assist the Indian Army in the North West Frontier and engaged the tribesmen right from 1916 till the opening stages of the Second World War when the responsibility was handed over to the Indian Air Force squadrons. It was a different kind of conflict with its own challenges, both for the air and ground crew. Chapter 4 describes these operations in some detail.

Two of No. 60 Squadron's Wapitis over the Bay of Bengal nearing Sunderbans on 22 February 1938. (Courtesy: Squadron Leader DW Joe Warne thru Pushpindar Singh)

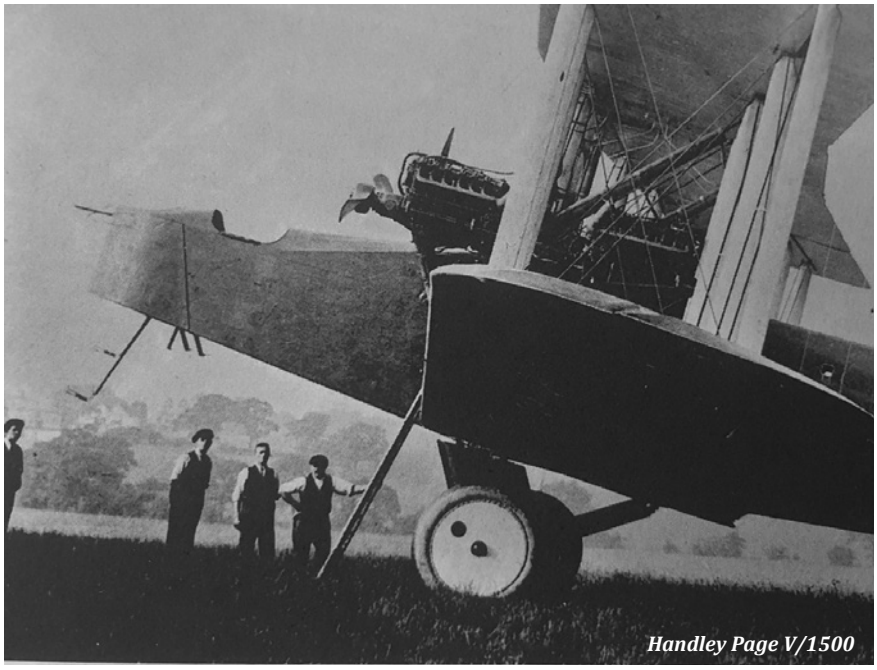
With the Royal Air Force already in India, there was naturally fierce opposition to the creation of an Indian Air Force. The political pressures in India forced the British, and they had to relent in the end. It was a long-drawn battle, but the Indian politicians stuck to their cause. The 'skirmishes' at the highest levels of the British bureaucracy and military hierarchy in the debate on the creation of the Indian Air Force have been covered in the Chapter "Birth Pangs of the Indian Air Force".

One expected that once the decision to form the Indian Air Force had been taken, it would be smooth going for the personnel of the Squadrons. Unfortunately, it was not to be. The discriminations, and the British prejudices are not well known, but those who had opted to join the Service kept their chins up. How the Indians overcame these prejudices with grit and determination has been covered in the Chapter "The First Innings of the Tigers of No. 1 Squadron, Indian Air Force".

India was faced with a maritime threat during the initial years of the Second World War. The onus for the defence of the Indian seashores fell on the IAF and the RAF squadrons in India. Five Coast Defence Flights were raised for this purpose. Various steps to secure India from seaward attacks have been covered in the Chapter "India's Coastal Defence".

No. 1 Squadron, IAF came into being on 1 April 1933 but it took another nine years before the second and subsequent squadrons were formed. This expansion took place under the compulsions of the Second World War. The short histories of these squadrons, from their raisings till 1947, have been covered in the Chapter "Expansion of the Indian Air Force from 1 to 10 Squadrons".

Against all expectations and military appreciations, the war was at India's doorsteps when Japan invaded Burma in December 1941, and the British had to retreat to the Indo-Burma border. Thereafter, the Allies fought back and managed to inflict a humiliating defeat on



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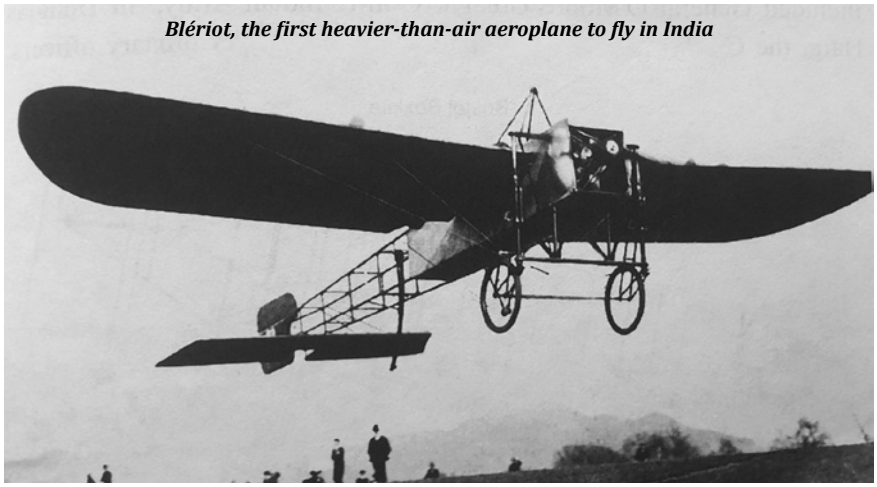


Blériot, the first heavier-than-air aeroplane to fly in India

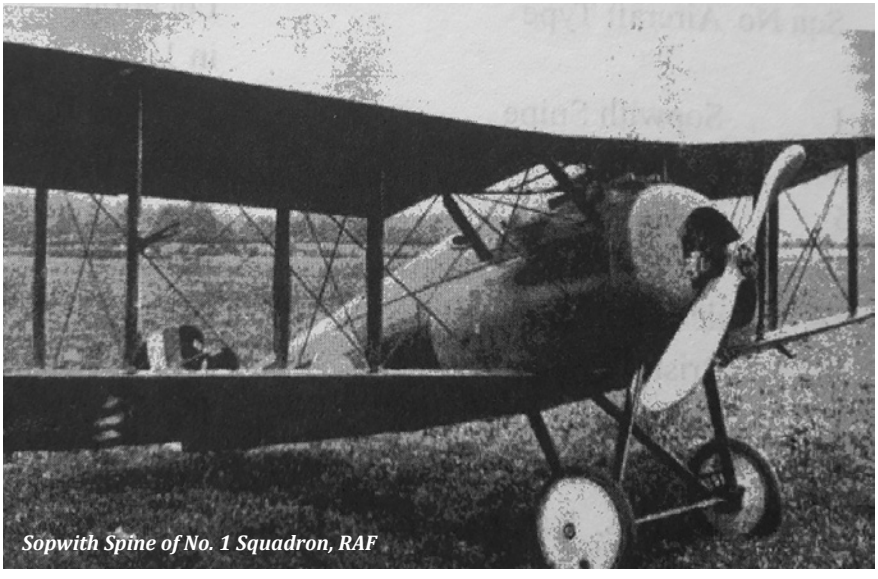
This work would have not been possible but for the assistance of various friends and colleagues. I am especially thankful to Shri Jagan Pillarisetti for getting me the Operational Record Books of IAF squadrons from the British Museum, finding answers to numerous queries and letting me use the photographs in his web portal bharat-rakshak.com. My thanks to Shri Pushpindar Singh for the "Tedder Papers" and other assistance, Air Commodore Prashant Mohan, Air Advisor in London for getting me material from the British Library, London and Dr. Narendra Yadav, Deputy Director, History Division, Ministry of Defence for letting me access various historical records. Shri Vijay Seth was kind enough to permit me to use some of his collection of postal marks. I would be failing in my duty if I did not acknowledge the contributions of Mrs. Ushi Kak and Shri KS Nair for going through the manuscript and making some extremely relevant suggestions. There are far too many more friends who assisted me and found answers to my queries; I would just say "Thank you" to each of them —the list is just too long to pen their names here.

I am sure that the readers will find many new and hitherto not so well-known details about the growth of military aviation in India and that of the Indian Air Force. I know that a lot more ground needs to be covered in this field, and I am hopeful that other researchers would take up the thread from here onwards.

Air Marshal (Retd) Bharat Kumar

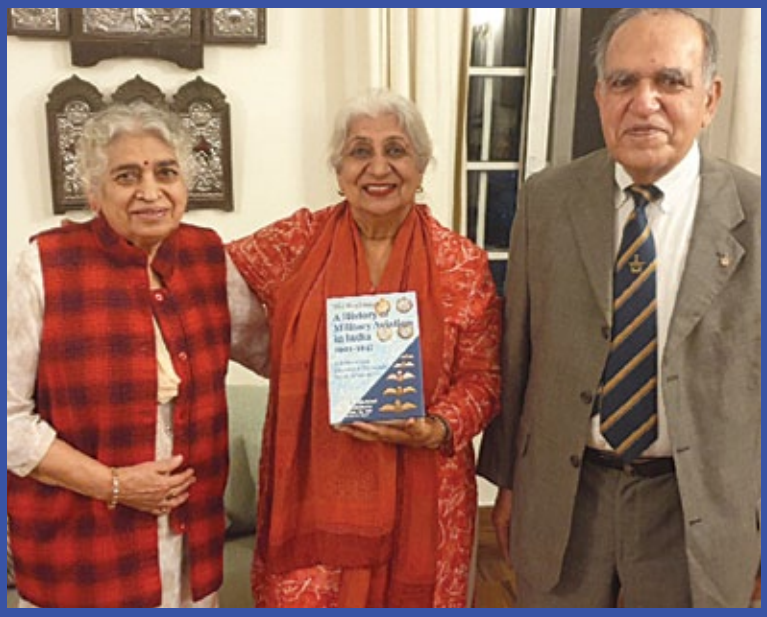
the Japanese. Air power played a decisive role in the Allied victory over Japan in Burma. The Indian Air Force's contribution in this victory, and the stellar and significant roles played by the Indian Air Force, form an integral part of the Chapter "Japanese invasion of Burma and the Role Played by the Indian Air Force".

When India got its independence on 15 August 1947, the assets of the Indian Air Force had to be divided between India and Pakistan. Pakistan wanted to have the bulk of the Indian Air Force assets, ostensibly for the needs of the North West Frontier. The procedure and the discussions resulting in this division, though well-recorded, are not well known. These have been described in the last chapter, "The Reconstitution of the Indian Air Force".

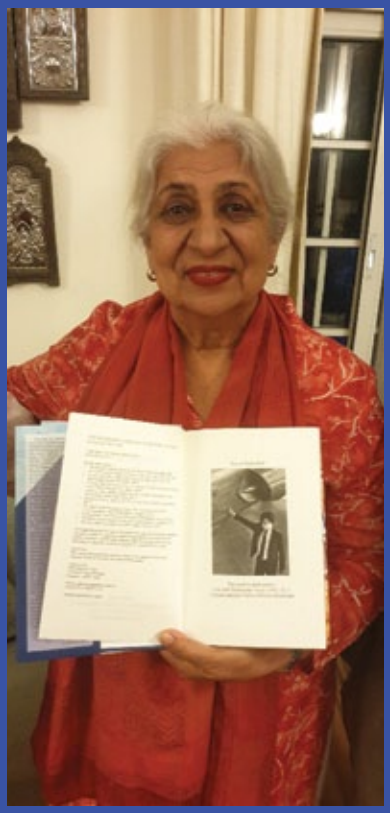


Sopwith Spine of No. 1 Squadron, RAF

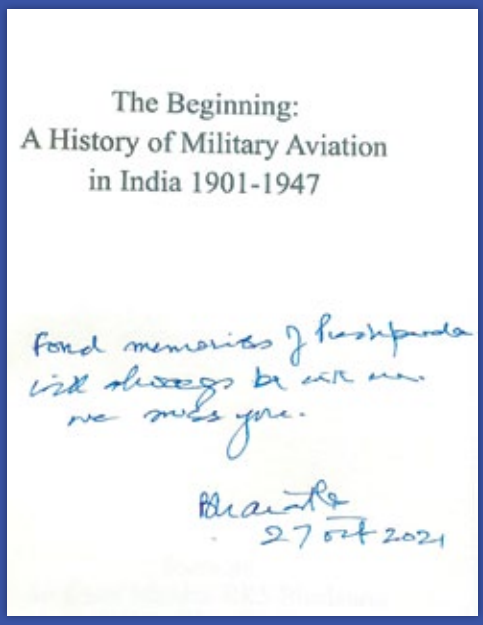
An evening to remember!



An evening with the wonderful Air Marshal and Mrs. Bharat Kumar at Mrs. Deepak Chopra's (wife of late Mr. Pushpindar Singh Chopra) residence at New Delhi on 27 October 2021.



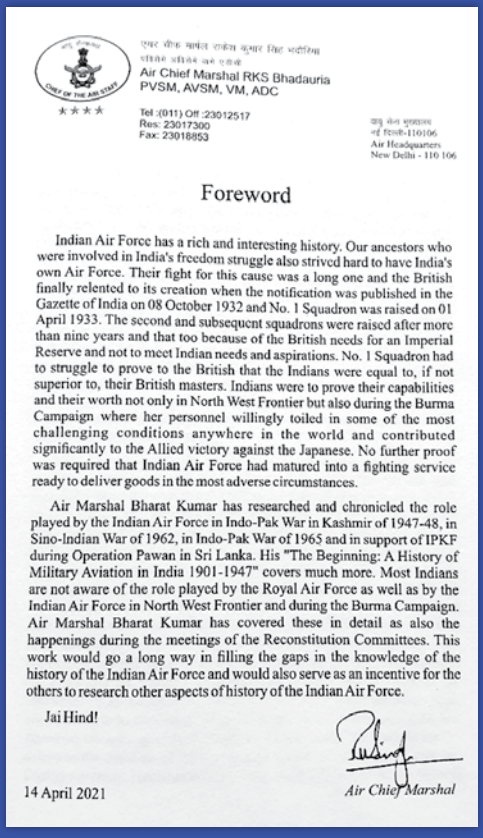
Mrs. Deepak Chopra with the page dedicating the book to her late husband Mr. Pushpindar Singh Chopra. Air Marshal (Retd) Bharat Kumar very kindly wrote a note for the family.



The Beginning:
A History of Military Aviation
in India 1901-1947

Fond memories of Pushpinda
with thanks to Air Mrs.
we miss you.

Bharat
27 Oct 2021



Air Chief Marshal RKS Bhadauria
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Air Headquarters
New Delhi - 110 106

Foreword

Indian Air Force has a rich and interesting history. Our ancestors who were involved in India's freedom struggle also strived hard to have India's own Air Force. Their fight for this cause was a long one and the British finally relented to its creation when the notification was published in the Gazette of India on 08 October 1932 and No. 1 Squadron was raised on 01 April 1933. The second and subsequent squadrons were raised after more than nine years and that too because of the British needs for an Imperial Reserve and not to meet Indian needs and aspirations. No. 1 Squadron had to struggle to prove to the British that the Indians were equal to, if not superior to, their British masters. Indians were to prove their capabilities and their worth not only in North West Frontier but also during the Burma Campaign where her personnel willingly toiled in some of the most challenging conditions anywhere in the world and contributed significantly to the Allied victory against the Japanese. No further proof was required that Indian Air Force had matured into a fighting service ready to deliver goods in the most adverse circumstances.

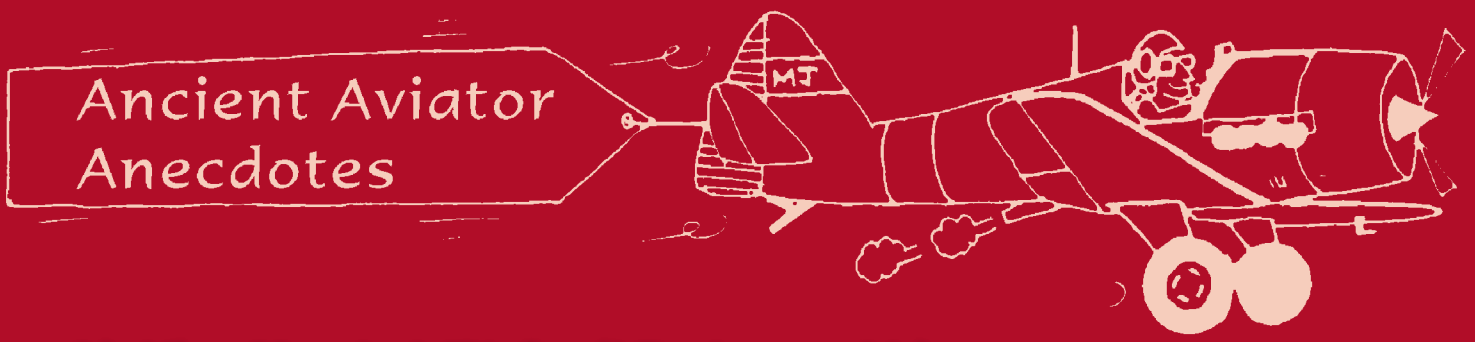
Air Marshal Bharat Kumar has researched and chronicled the role played by the Indian Air Force in Indo-Pak War in Kashmir of 1947-48, in Sino-Indian War of 1962, in Indo-Pak War of 1965 and in support of IPKF during Operation Pawan in Sri Lanka. His "The Beginning: A History of Military Aviation in India 1901-1947" covers much more. Most Indians are not aware of the role played by the Royal Air Force as well as by the Indian Air Force in North West Frontier and during the Burma Campaign. Air Marshal Bharat Kumar has covered these in detail as also the happenings during the meetings of the Reconstitution Committees. This work would go a long way in filling the gaps in the knowledge of the history of the Indian Air Force and would also serve as an incentive for the others to research other aspects of history of the Indian Air Force.

Jai Hind!

14 April 2021

Air Chief Marshal

Top: Beautiful message from the Air Marshal to the Chopra family and (Bottom): foreword by Air Chief Marshal RKS Bhadauria, CAS, Indian Air Force. This detailed, rich and very informative book was released by ACM RKS Bhadauria just a few days before he retired end-September 2021.



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

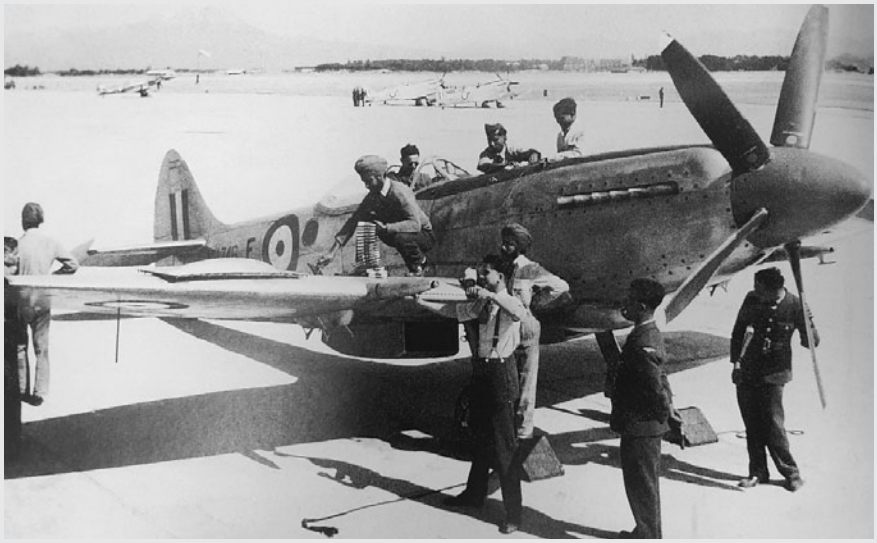
HAKIMPET HIGHLIGHTED

The ongoing Swarnim Vijay Varsh celebrations brought the Vijay Mashaal to Air Force Station Hakimpet on 11 September 2021. Gallantry awardees of the 1971 Indo-Pak war, along with air veterans and guests from all three Services, were invited to attend the function. Two gallantry awardees from the air force, resident in Hyderabad, were felicitated; one, an 89 year old recipient of the MVC and the other an NOK widow of a VrC awardee.

In 1952, as a young, newly commissioned pilot officer, I did my fighter conversion at CTU Hakimpet on Spitfire and Tempest aircraft. My most enduring memory of that period was having to bale out of a blazing Tempest on fire. In 1959 as a QFI I was attached to FTW Hakimpet for instructional duties on Vampires. In 1975 I returned to command Hakimpet which now had 84 aircraft on base comprising 50 new Polish Iskra trainers (which were required to be commissioned and inducted into our air force) plus 24 Kiran trainers and 10 Chetak helicopters of HTS. At peak we were flying well over 100 hours per day which made for a very busy but productive tenure. However I did find time to buy a plot of land and build a house in AFOCHS Ltd Vayupuri, just 5 km from Hakimpet, and in which we continue to live 45 years on.

Having retired from the air force in 1986, we feel privileged to still receive an invitation from AFS Hakimpet every year to attend the Air Force Day function held in the Officers Mess built in my tenure; the advent of Covid 19 has of course curtailed such gatherings. In 2005 I was invited to the decommissioning ceremony of the Iskra after its 30 years of service at Hakimpet. I wonder if there is any other air veteran from the IAF who has been present at both, commissioning and decommissioning, of the same aircraft? In 2019 AFS Hakimpet very deservedly received the Presidents Colours. We were once again privileged to be invited but were unfortunately unable to attend as the function was held at Sulur.

For me therefore, any visit to Hakimpet is like a homecoming. As we drove into the station to attend the function on 11 Sep'21 we passed the VISTAK auditorium; the name is an acronym I had created from the six aircraft types that had been based at Hakimpet: Vampire, Iskra, Spitfire, Tempest, Alouette (Chetak) and Kiran. My wife and I, now both in our sunset years, received a warm welcome from the AOC and his staff. The programme commenced with the arrival and reception of the Victory Torch by the AOC and this writer and went on to include speeches, audio – visual presentations of citations of both gallantry awardees, vocal renditions and spirited dramatic depictions from children of the local KV. The icing on the cake was the sunset flypast by three Kiran



and three Chetaks. It was an emotional mixture of pride, humility and gratitude to be remembered and honoured.

2021 marks 70 years since the IAF gave life to a deserted WW II airfield by relocating CTU from Ambala to Hakimpet in 1951. In turn, Hakimpet has produced generations of fighter and helicopter pilots who have gone on to do the Armed Forces and the Nation proud both in peace and in war.

JAPAN: EXPO 70

The recent news coverage of the Olympics brought back memories of our only visit to Japan 51 years ago on. On 1 April 1970 I was awarded the Vayu Sena Medal (VM) for my performance as the founding CO and CI of the IAF's first Hunter equipped Operational Training Unit (OTU). When he learnt of the award, my delighted father (who 20 years earlier had opposed my joining the air force) offered to gift us a holiday trip to the East. I might explain that, as an engineer with the GOI, in the mid-1950s he had been the Head of our Supply Mission in Tokyo. He soon alerted his many friends and contacts in Japan to our visit to Expo 70.

In late 1969 I had taken over command of No 20 Squadron and left immediately for the UK to lead a ferry of updated Hunter aircraft back to India. My unit was equipped with this type and we had many commitments before I could apply for and be granted leave to proceed abroad. Our two children aged 12 and 10 years were in boarding school and hence could not join my wife and self as we boarded our Thai Airways flight via Dhaka (then in East Pakistan) with sight-seeing stopovers in Bangkok, Hongkong, Taiwan and on to Osaka. The next few days were full of unforgettable sights, sounds and events. Expo 70 was an eye-popping display of Japan's technological progress 25 years after its devastation in World War II. Equally admirable was the amazing display of courtesy, punctuality, cleanliness and hospitality observed and experienced throughout our stay.

The Award: ACM PC Lal, CAS presents the VM to Wg Cdr CV Parker, CO No. 20 Squadron on 1-04-1970

We resided in both hotels and homes and, thanks to our hosts, saw a great deal more than the exposition itself. Our first ride in a bullet train was a revelation. One of our hosts drove us to see Hiroshima from a distant authorised viewpoint; the sight of the silent dead city has a deep emotional impact. On one occasion my wife left her handbag containing passports and money in a restaurant. On our (panicked) return a half hour later, it was found exactly where she had left it guarded by a smiling manager. Language was not a major barrier; for the benefit of tourists nearly all restaurants had model replicas of dishes on offer in window display with adequate content - information to indicate choice. We must admit that Japanese cuisine was somewhat bland for Indian palates and we periodically returned to the Indian pavilion of the Expo which had an Indian restaurant.

Like most ladies my wife's primary interest was in the shopping arcades located conveniently right above major railway stations. A very persuasive and friendly Japanese sales lady, who knew no English, even 'talked' her into purchasing a rather glamorous half wig! In those days there were not too many Indians in Japan and on more than one occasion my sari-clad wife was politely requested to pose for a photograph; 'selfies' were still in the future. When we were dangerously close to exceeding our airline baggage, we bid our new friends farewell, proffered our *'arigato guzai masu'* (profound thanks) and extended invitations to visit us in India, which two of them did. Five minutes after entering our home in Hindan the phone rang; it was our good friend and neighbour welcoming us back and letting us know that breakfast was on its way; *paratha* and *aloo* never tasted better!

On 1 October 2021 the OTU (renamed OCU) will be 55 years old; it now operates from two air bases and is equipped with the Hawk AJTs. The only surviving souvenir of our trip to Japan (the half-wig), having earned its share of 'oohs and aahs' from admiring ladies, now lies buried in my wife's wardrobe awaiting resurrection by a feminine progeny in time for a possible India Expo 70!

The Reward: Standing, Shirley and Cecil Parker, 2nd & 3rd from left

25 Years Back

From Vayu Aerospace Review Issue VI/1996

Indo-Russian Defence Cooperation Renewed

General Igor Rodionov, Russia's Defence Minister visited India for three days from 21 to 23 October 1996. In view of the large holding of weapons systems and equipment of Russian-origin by India's Defence Forces (and requirements for the future) his visit at this critical juncture assumes much importance. For the past many years, modernisation of India's defence forces has been severely affected by the severe resource crunch.

Formal Approval For Su-30 Induction

The Cabinet Committee for Political Affairs (CCPA), in a late evening meeting at New Delhi on 13 November 1996, has accorded formal approval for the procurement of Sukhoi Su-30MK multi-role combat aircraft for the Indian Air Force. The CCPA, chaired by the Prime Minister of India, and including the Union Ministers for Defence, Finance and External Affairs (in this case), is the apex executive body of the Government of India.

India's National Security-The Defence Report 1995-1996

The breakup of the Soviet Union and collapse of the Soviet economy has put an end to the cold war confrontation between the USA and Russia, the two super powers. With its economic and most modern military power, the USA stands along as the world's only super power. Laying down its own agenda, it plays a pivotal role in evolving the security environments obtaining in different parts of the world. The annual report of the Ministry of Defence (MoD) for the year 1995-96 released in August 1996 needs to be viewed against this backdrop.

Air-India Improved On-Time Performance

Aviation sources have indicated that in the first six months of 1996-97, Air-India (A-l) improved its on-time performance and load factor to as high as 85 per cent and 71 per cent respectively, as against 67 per cent and 64 per cent in 1995-96. As a result, its financial performance has improved. According to VK Verma, Director, Delhi Region, Air India, A-I is inducting two new aircraft into its fleet, which will increase its capacity by 13 per cent.

DGCA Issues Show Cause Notice

The Directorate General of Civil Aviation (DGCA) has taken a serious note of some of the private scheduled airlines not adhering to the commitments to operate scheduled services to the remote and backward areas, particularly the North East, Jammu and Kashmir and Lakshadweep islands. According to Civil Aviation Ministry sources, the DGCA recently issued a show cause notice to one of the private airlines. It also demanded why action should not be taken against them for suspending services on many occasions to Lakshadweep unilaterally.

HAL To Supply Spares To Boeing

According to aviation sources in Seattle, Boeing Commercial Airplane group has qualified the public sector Hindustan Aeronautics Ltd. for supply of several essential spare parts for its aircraft and carry out the overhaul of 737 series of planes. Detailing its plans regarding such tie-ups and creation of facilities in the Indian subcontinent, Boeing officials said the company proposed to start a generic maintenance training for 747-400 aircraft in coordination with the Director General Civil Aviation at Mumbai soon.

SIA Opened New Office

Singapore Airlines has opened a new office in New Delhi. It was inaugurated by H.E. Ong Keng Yong, High Commissioner for Singapore on 17 October 1996. Singapore Airlines commenced operations to New Delhi in 1986 and the new office's inauguration coincided with SIA's completion of a decade in the Capital.

Joint AI-IA Engineering Wing?

Air India (AI) and Indian Air-lines (IA) have failed to achieve any synergy in the engineering division despite assurances of the top-brass that this would be the first step towards the eventual merger of the two airlines. The merged engineering section was planned to be hived off as a separate subsidiary. The plans, as discussed by the boards of the two airlines in June, were that AI and IA would be merged in a phased manner.

Tatas-McDonnell Douglas Partnership

According to civil aviation sources McDonnell Douglas is tying up with Bangalore based Tata Advanced Materials to produce ARODME, a composite aviation material that protects radar equipment in aircraft, possibly in a joint venture. McDonnell Douglas estimates that the initial investment will be nearly $5 million. But details on equity participation in the joint venture are not yet available. This is the first time that the Douglas Corporation is sourcing these materials outside the USA.

Golden Jubilee Of Air India's 'Maharaja'

The Air India 'Maharaja' symbol created by Mr. S.K. (Bobby) Kooka in July 1946 is celebrating its Golden Jubilee. Its extensive use in advertising and sales promotion activities of Air-India has made him the most recognisable mascot the world over. On hoardings, the Maharajah has smiled and frowned, raised an eyebrow or closed an eyelid, romped and teased - all depending on his tongue-in-cheek comment. Thanks to the Maharaja, no other airline has quite matched Air-India's panache and subtle humour in promoting its services.

Tale Spin

Well, it was a matter of time...

Wonder what took so long?

Beer tapping and airport brewery

Not an Oktoberfest, but at least an "Airbräu Wiesn" awaited guests at Munich Airport (Germany) recently. Visitors to the Airbräu Wiesn could choose between different menus and on request, guests could tap their beer from their own wooden barrel at the table. Here's hoping New Delhi International Airport's T3 can follow the example!

The IAF PR cell/Photo Division have been shocking us recently. They've been on an overdrive and posting the kind of photos not seen since eons.
Keep stunning and numbing our brains please!

Reel life to Real life!!

Star Trek anyone? Starship USS Enterprise to Blue Origin

Blue Origin successfully completed its second human spaceflight on board New Shepard on 13 October 2021. The flight included four astronauts, Dr. Chris Boshuizen, Glen de Vries, Audrey Powers and William Shatner who is better known as Captain Kirk from the Star Trek series; the latter "Boldly Going Where No Man Has Gone Before"!

William Shatner is 2nd from the left, USS Enterprise (centre) and Blue Origin liftoff

Afterburner

FLY NAVY, FLY

A HISTORY OF INDIAN NAVAL AVIATION

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