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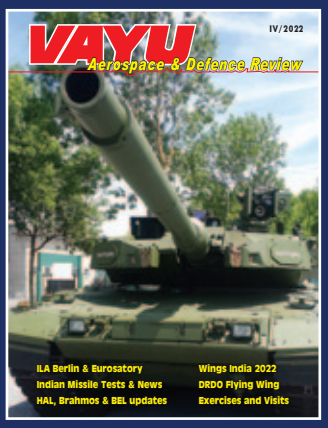

KMW Leopard 2 A7 at Eurosatory 2022 (Photo: Vayu)

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Adm. Arun Prakash (Retd) says...

The judgment of history

Former Prime Minister, Dr Manmohan Singh, disparaged, by critics, for being weak and powerless to check corruption, had ruefully remarked, that history would be kinder to him than the media and political opponents. PM Narendra Modi, has no such worries, and said, on Gandhi Jayanti, 2021: "…this is my conviction, that for my own healthy development, I attach big importance to criticism. I, with an honest mind, respect critics a lot. But, unfortunately, the number of critics is very few."

There is no doubt that PM Modi, by virtue of his political skills, eloquence and popular appeal, would find a suitable place in India's contemporary history. PM of the world's biggest democracy, twice in succession, he has led his party to repeated, overwhelming electoral victories, and made his mark, domestically as well as on the international stage.

History, however, discriminates while according recognition, and a nation's achievements matter more than individual attainments. Indians have, for long, nurtured a sense of exceptionalism, not unmixed with hubris, that India's "manifest destiny" guarantees it the status of a great power; with some even fanaticizing about "akhand (greater) Bharat."

The reality is that unless the ship of state is steered with strategic wisdom and economic prudence, it is possible that India may remain an overpopulated and under-developed nation; nuclear-armed and boasting of a huge GDP, but facing mass-poverty, jobless growth and restive youth. Our failure, since independence, to assimilate alienated citizens and deliver social justice to the deprived and the Adivasis remains a blemish on our republic.

The Modi government has, in the past 8 years, launched a host of schemes which aim at providing relief and ameliorating public privation. But its real sense of accomplishment seems to stem from fulfilment of the Sangh Parivar's long-cherished agendas, in two separate, but related dimensions.

Firstly, Article 370, which entitled J&K to its own constitution, flag, and 'Prime Minister' has been an issue of concern to the Parivar, since 1949, when the Jammu-based Praja Parishad, started agitating for "ek Nishan, ek Pradhan aur ek Vidhan" (one flag, one prime minister, and one constitution). In 1953, Shyama Prasad Mukherjee, founder of the Jan Sangh, who had joined this agitation, died in a Srinagar jail, lending an emotive edge to this issue.

In 1977, the Jan Sangh joined the Janata Party, only to break away, in 1980, as the new-born Bhartiya Janata Party. Through all these transitions, the Parivar remained consistently focused on the "assimilation" of J&K. Thus, the 2019 abrogation of Article 370 and fragmentation of India's only Muslim-majority state, represented the triumphant culmination of the Sangh's long-standing aspirations.

The agenda's second dimension relates to implementation of the "Hindutva project." In 1923, political activist and freedom-fighter, VD Savarkar, had explained the concept of Hindutva, by defining a Hindu as one, "…to whom, Hindustan is not only a Fatherland (Pitrabhu) but also a Holyland (Punyabhu)."

Via this definition, Hindutva, seeks to render the term "Hindu" synonymous with "Indian", while excluding all other citizens from its ambit. It is in furtherance of this project that the Citizenship (Amendment) Act and the impending National Register of Citizens must be seen. Nationwide relief at the peaceful settlement in Ayodhya has been replaced by grave apprehensions as new pandora's boxes are being opened.

While electoral victories are, no doubt, image-enhancing, the benefits of playing domestic party-politics, must be weighed against the cost of damage being inflicted on the nation's security and external relations. The balance-sheet shows that the law of diminishing returns has been invoked.

India's international image has, undeniably, been dented, as seen from our slide on the scale of global indices; from poverty and hunger to democracy and press-freedom. To domestic discontent, on account of unemployment and price-rise, are being added tensions, fuelled by exploitation of religion and caste related issues for political ends. Rather than blaming "foreign conspiracies to defame India", it would be far better, for national morale, to tackle these problems.

The "Modi magic" having ensured an unassailable electoral position, for the BJP, it is time for the nation's political leadership to don the mantle of statesmen. Looking beyond party agendas, they need to privilege national interests; especially where the two are divergent. Herewith, some thoughts of a septuagenarian citizen.

India's influence in the world has been rooted in the "power of its example". The capacity of Indian culture to embrace diversity and assimilate, with confidence, not only new Indic religions, but also foreign faiths, attracted universal admiration. Descent into bigotry and public hate-mongering, is damaging India's image as a tolerant civilization and invites invidious comparisons. Renowned leaders, from Garibaldi to Bismarck and from Tito to Mandela, left their mark on history, as nation-builders, because they united people of diverse ethnicities and religions, and engendered domestic peace and harmony.

The current surge of majoritarianism may help win elections, but the steady alienation of India's minorities, constituting a fifth of our population, will irreparably damage national cohesion and undermine the integrity of our multi-religious nation. As religion becomes a convenient tool of polarization, we must face the reality that fires of religious strife, once lit, will be hard to extinguish, and even worse, will side-line our existential struggle against poverty, hunger and disease.

Finally; we must face the reality that India's claims to being a "Vishwa guru" now lack conviction. While public discourse has become coarse and abusive, speaking truth to power is equated with "sedition" and political pressures have denuded the media, as well as public functionaries of their moral-fibre. Disregard for ethical and democratic norms is manifest in the open trading of legislators, and in visible rewards for pliant public-servants.

Historically, India succumbed to foreign powers, because it was a "house divided." Today, as cracks begin to show again, our leaders must do their utmost to ensure national unity and cohesion. By following "raj-dharma" or ethical conduct, they will not only ensure their niche in history, but will also set a worthy example for us and our children to emulate.

Lt Gen Kamal Davar (retd) says.....

Putin's war and early lessons for India

Updated till 27 June 2022 (Source: UK MoD)

The Russia-Ukraine conflict has impacted the geopolitical order — or the global disorder, as some would say — as never before in the last many decades. Analysts the world over are divided in their prognosis of the causes and effects of this devastating war that has brought death, destruction and disruption in the lives of thousands of innocent Ukrainians. Millions of them have fled their nation to escape the massive onslaught from the invading Russian army, which is equipped with overwhelmingly superior firepower. The Ukrainian army, not as well-equipped but strengthened by many of its citizen-volunteers has taken on the Russians displaying rare grit and matchless valour to defend their motherland. Many border towns in Ukraine, such as Mariupol, Chernihiv, Sumy and Kharkiv, and the Luhansk and Donbass regions have been razed to the ground. But that the Russians have not exactly had a cakewalk into Ukraine and that they have suffered so many casualties to their manpower, superior weaponry and equipment has surprised not only them but military analysts the world over.

Governments, professional militaries and strategic analysts do analyse the lessons and shortcomings emerging out of such conflicts to effect course corrections and prepare for the future. Wars, which in today's world can cause unimaginable havoc and humongous casualties on both sides, are launched with a clear-cut strategic objective in mind. What was in Russian President Vladimir Putin's mind when he did so does baffle many analysts. Did he go to war to prevent Ukraine from formally joining NATO, thus discouraging NATO deployments and other influences close to Russian borders? Or, was his larger, unstated ambition to resurrect the erstwhile Soviet Union, which collapsed in December 1991, and which he described as the "greatest geopolitical catastrophe of the century"? Was Ukraine about to develop a nuclear capability in the near future that would have threatened Russian security? Did the Russians, after capturing Crimea in 2014, now desire to annex Ukraine's Mariupol to obtain unhindered access into the Sea of Azov? Was his motive to effect regime change in Ukraine and install a pro-Russian government in Kyiv?

The jury is out on the question, with differing opinions on Putin's end objective — some have also proffered the opinion that Putin has perhaps fallen into the US trap of getting himself into this needless military confrontation!

Thus, the first lesson for any nation and its leaders is to have a clear-cut and achievable

politico-military aim before it launches itself into any armed conflict — the costs of which can be staggering to all sides, with severe economic repercussions for a nation's well-being in the future. The economic sanctions imposed by the West now will surely impact Russia and its people over a long period.

The second lesson that clearly emerges is that a nation must be fully prepared to ensure its security on its own. Notwithstanding any alliances or any other friendly grouping, no nation will put its 'boots on the ground' to assist its allies. It may give financial or military assistance to a friendly or allied nation, but nothing more than that. The Ukrainian plight is a good example of a nation's imperative to be prepared to singly fight for its security. Thus, for India, as its strengthens the Quad or any South-East Asian grouping, it will be appropriate to remember that in humanitarian operations or in distress situations, these alliances may come in handy, but they will most likely not in a war.

In the event of a conflict, nations supplying arms and equipment may resort to imposing sanctions and thus a nation can be in jeopardy as regards its war-fighting capabilities if the supply or import of critical ammunition/spares is denied for whatever reason. Thus, self-reliance in essential military requirements must be ensured in peacetime by both the public and private defence industry of the nation. Ordinarily, it takes inordinately long to reach satisfactory levels of self-reliance in indigenisation of equipment. To overcome this, the Indian government must push for self-reliance programmes on a war footing.

The Indian military is heavily dependent on Russia for the supply and sustenance of over 65% of its weapons and weapon platforms like aircraft, ships, tanks, artillery, air defence weaponry, missiles, etc. Thus, it will only be prudent for India to diversify its sources for these in the immediate term while vigorously striving for indigenous development and production of these.

Importantly, the performance of critical Russian equipment, which the Indian military possesses in its arsenals – such as the T-90 tanks, BMP 2/3 mechanised infantry combat vehicles, Su-30 and MiG-29 fighters, the S-400 air defence systems being bought now, the GRAD and SMERCH rocket batteries, various types of drones and helicopters should be carefully evaluated, keeping in view their performance in the current conflict.

Restoration of the military supply chains with both Russian and Ukraine will have to be adequately streamlined. In addition, the lessons emerging from this conflict at the strategic, and operational art and tactics levels must be studied as relevant to the Indian context and our own geographical terrain. Prima facie, the Russians appear to have faltered in their deployments and actions at all these levels.

This conflict has once again highlighted the significance of 'hybrid warfare'. Information warfare appears, unexpectedly, to have been the weakness of the Russians in this conflict and Putin personally has been successfully painted as a "war criminal", the Hitler of the present day, etc., to global audiences. Nevertheless, he could also have avoided causing far too much collateral damage on innocent Ukranians. As the current sole superpower in the world, the Americans too have to take their share of the blame for not being able to prevent this conflict. India, of course, in keeping with its national interests, has been walking a diplomatic tight rope between Russia and the West.

Indian Army's Russian made T-90 (Photo: Angad Singh)

India's own SAM system- the Akash

Even three months into Putin's invasion, it remains difficult to predict how this conflict will end. But the hard lessons that emerge from this conflict must be sought and analysed, and suitable measures taken for India's benefit and overall security.

(The writer was the first chief of the Defence Intelligence Agency and Deputy Chief of the Integrated Defence Staff)

Adm. Arun Prakash (Retd) says...

For a stronger navy, India needs to fast-track the submarine project

A day before Prime Minister Narendra Modi was due to visit Paris to meet President Macron, the French defence major, Naval Group, announced its inability to participate in India's Project 75-I, under which conventional (non-nuclear or diesel-electric) submarines are to be built domestically. Coming on the heels of similar withdrawals from this competition by Russian and German submarine builders, this is bad news for the crucial project.

A major issue of contention in Project 75-I appears to be the installation of an air independent propulsion system (AIP) on these vessels. Since conventional submarines are propelled underwater by electric-power, battery endurance remains a major limitation. The submarine has to periodically expose itself to draw air for running generators that charge their battery-banks. It was to overcome this major vulnerability that several types of propulsion systems were evolved in Europe using "air independent," closed-cycle diesel or steam engines which would endow conventional submarines with much longer underwater endurance.

While protracted negotiations between the MoD and the French Naval Group were underway, none of the AIP systems had been fully proven. The contract for license-production of six Scorpenes was thus signed in 2005 without including this system. The Pakistan Navy (PN), obviously less risk-averse, acquired an untried French AIP system and installed it on three Agosta 90B submarines in 2008. What invests the P-75I programme with urgency is the fact that with the addition of eight Yuan Class Chinese submarines, the PN may field up to 11 AIP-equipped boats by 2028.

Project 75-I is also the first programme to be progressed under the MoD's new Strategic Partnership concept which ostensibly offers a "level-playing field" to the private sector. In this model, MDL and Larsen & Toubro will choose a foreign submarine-builder for collaboration and offer competing bids to build six modern conventional submarines.

Here a quick look at the genesis and growth of our young submarine arm is useful. While Pakistan had acquired its first submarine from the US in 1963, it was only two years later that the Naval HQ revived an old proposal for creating a submarine

arm. Since the USA and UK were offering only surplus WWII vintage submarines, we turned to the Soviets and between 1967 and 1974 acquired eight Foxtrot class boats of contemporary design along with a submarine depot ship.

The Foxtrots, having trained a whole generation of Indian submariners, a timely step for upgradation of capabilities was initiated by contracting for the modern Type-209 hunter-killer submarines built by HDW of Germany. Between 1986 and 1994, four of the Type 209 boats entered service; two built in Germany and two in MDL.

Unfortunately, allegations of corruption in this deal scuttled plans for further indigenous construction. MDL closed its production line, representing a huge loss in terms of wasted skills/expertise and delays in capability accretion for the Indian Navy. However, concurrent negotiations with the USSR had resulted in the induction of 10 improved boats of the Kilo Class between 1986 and 2000.

By now, the Naval HQ had projected the need for a standing force of 24 subs in order to meet the growing threats to India's maritime interests. In 1999, the government accorded approval to a "30-Year Submarine Building Plan" which envisaged the simultaneous serial production of two types of submarines in separate shipyards. One of the two types was to be an advanced submarine of imported design, and it was hoped that the second line would, in due course, deliver a home-grown product, designed by our own naval architects with foreign assistance.

Delays in decision-making stalled the 30-year plan, and since 1999, the navy's submarine fleet has been seeing rapid obsolescence and steady depletion of force-levels. The 2005 contract for building six French Scorpene Class submarines under license from MDL served merely as a palliative measure, but even this programme saw huge delays over contractual issues. The sixth and last submarine was launched in April 2022, a full 17 years after signing of the contract.

With force-levels down to 17 ageing conventional submarines, the Indian Navy looked with hope at the Rs 43,000 crore Project 75-I. Commenced on time, this would have been the seamless follow-on to the Scorpene project; ensuring serial-production, and eventual indigenisation of this vital weapon-platform.

However, policy flip-flops and sluggish decision-making have kept this project in limbo for over a decade. MDL, having launched the last of the Scorpenes, will start running down its state-of-the-art submarine-building facility, losing expertise and highly-skilled workers.

An added complication has arisen from the otherwise welcome development by DRDO of an indigenous AIP system. Based on electrolytic fuel cells, this system produces energy by combining hydrogen and oxygen with only water as the waste product. It has no moving parts and is safer and more efficient than others.

The drawback, however, is that the 8-10 metre-long AIP module has to be installed on a submarine and subjected to stringent underwater trials before the Indian Navy can accept it as "operationally proven" for induction into service. Since installation and trials of this module will be a complex and time-consuming process, three major issues are likely to arise: who will provide a submarine for trials? Who will undertake installation and conduct trials? And most crucially, who in our system will take such crucial decisions in a timely manner?

This long-neglected project brooks no further delay and is important enough to attract the time and attention of our highest decision-makers. A practical way forward is for one of the strategic partners and DRDO to jointly seek a foreign collaborator for P-75I who will install the indigenous AIP on the selected submarine and conduct collaborative trials. Once proven at sea, the indigenous AIP could be installed in all new subs and retrofitted in the old ones.

There will certainly be a price to pay, but the alternative is too bleak to contemplate.

Adm. Arun Prakash (Retd) says...

Agnipath, between the lines

So dreadful is the prospect of a military defeat, and so horrifying its consequences, that nations are willing to go to any length to avoid such an outcome. It is for this reason that national security has been historically deemed, worldwide — by economists and not soldiers — as "the first charge on the treasury."

Independent India, unfortunately, saw defence expenditure being relegated to the "non-plan" category, within the ambit of a Soviet-inspired, central economy. In another anomaly, the pension bill of veteran soldiers — a separate charge on the exchequer — was linked to the defence budget and its (inevitable) growth trotted out as an excuse for the dwindling funds available for force-enhancement and hardware replacement/modernisation.

Thus, for years, governments dragged their feet, for "want of resources", over the army's demand for a mountain strike corps. But, ironically, the 2020 Chinese incursions in Ladakh resulted in the deployment of 50,000-60,000 troops — over a corps strength — and the out-flow of a huge unplanned expenditure to support this indefinite deployment.

The most disheartening aspect of this situation has been the fact that the finance ministry, instead of finding ways and means of raising essential, additional funds for national defence, has passed the buck to the armed forces, and demanded that they evolve measures for reducing the pension bill. One presumes that the Agnipath scheme, launched with much fanfare, is an outcome of this demand.

But rather than engage in a critique of this controversial project, which has already seen much debate, controversy and public disturbances, let me focus on two larger issues, which lie at the root of much that is wrong in our approach to national security.

Every nation faces the eternal "guns vs butter" dilemma, and has to find its own way to resolve, what the US military terms the "ends-ways-means" conundrum. All major powers undertake a periodic

(every 4-5 years) review of their evolving national security objectives, the options available, and the economic/military means available for achieving them. Such reviews automatically generate assessments of existing/potential adversary threats to national interests, as well as the state of own military's material/operational readiness.

From here, it is a short step to the estimation of the military capabilities required, and the funding support that the nation will need to generate. Apart from providing fiscal guidance, this process also facilitates the evolution of a national security strategy. Our neighbourhood adversary, China, has, since 2002, been issuing, with unfailing regularity, a biennial "Defence White Paper", which encapsulates all of the foregoing, and is available on the internet; for the information of foes and friends, alike.

The government of India, on the other hand, has neglected to undertake any such exercise, in the past 75 years. It has, thereby deprived itself, and the taxpayer, of a holistic, national security picture of: (a) Where we stand; (b) where do we want to go; and (c) how do we intend to get there? Unsurprisingly, India is amongst the few major powers which has failed to issue a National Security Strategy or Doctrine, and is consequently seen offering fumbling responses, to emergent threats as well as to financial stringency in the security domain.

A second fact that we need to face is that our armed forces have remained in a Second World War time-warp, as far as their organisation and doctrines are concerned. Half-hearted attempts at organisational reform have come to naught due to lack of political will as well as internal resistance from the services; with the constitution of a Chief of Defence Staff and creation of a Department of Military Affairs providing the latest examples.

However, the most troubling lacuna is that our 1.4 million strong army has neither benefitted fully from the "revolution in military affairs" of the 1980-2000 era, nor learnt all the lessons of the ongoing "hybrid war-fare," and remains fixated on the "boots-on-the-ground" syndrome. Given the transformed nature of warfare, down-sizing of the Indian army, by substituting manpower with smart technology and innovative tactics, has become an imperative need. Against this backdrop, a scheme on the lines of Agnipath, appropriately constituted, and focused on enhancing "combat effectiveness" rather than "effecting savings" or "generating employment," could have triggered a reformative process. But a number of caveats need to be borne in mind in this context.

Firstly, given the parlous security situation, on the country's northern and western borders as well as the ongoing domestic turbulence, this is not the best time to cast the armed forces — already short of manpower — into turmoil, with a radical and untried new recruitment system.

Secondly, such a scheme, in its present form, is suitable only for the army, whose large infantry component is not excessively burdened with technology. In case of the navy and air force, it must be recognised that at least 5-6 years are required before a new entrant can acquire enough hands-on experience to be en-trusted with the operation or maintenance of lethal weapon systems and complex machinery and electronics.

Thirdly, no matter how extensively the issue was discussed in meetings or on files, a radical change of this nature should have been subjected to a trial before service-wide implementation. Ideally, a few units of the regular or Territorial Army could have been earmarked as a testing ground, and feed-back obtained.

Lastly, bitter experience of the past has shown that the home ministry has resisted induction of ex-servicemen into the armed-police and para-military forces, on the grounds that it would spoil the career path of their own cadres. Similarly, state governments and other agencies have blatantly ignored the reservations mandated for ESM. Therefore, if the Agnipath scheme has to offer a meaningful promise of post-demobilisation employment or education, this must be mandated by an Act of Parliament, on the lines of the "GI Bill" enacted by the US Congress.

In conclusion, seeing the detritus of burnt trains, wrecked buses and social turmoil, often seen in the wake of many recent pronouncements, one is left wondering whether dissenting opinions are tolerated and contrarian advice accepted or given any weightage in our high-level decision-making forums?

Inverted Rifle and Helmet shifted

The Armed Forces, on 27 May 2022, in a ceremony shifted the Inverted Rifle and the Helmet from India Gate, which was the symbol of Fallen Soldiers of 1971 War, to Param Yodha Sthal at National War Memorial and installed the same during Busts of Param Vir Chakra Awardees. With this ceremony, the integration of the Memorial of Fallen Soldiers of 1971 war with National War Memorial has been completed.

IAC Vikrant in 4th phase sea trials

The fourth phase of Sea Trials for IAC was successfully completed on 10 July 2022, during which integrated trials of majority of equipment and systems onboard including some of the Aviation Facilities Complex equipment were undertaken. The ship's delivery is being targeted in end of July 2022, followed by commissioning of the ship in August 2022 to commemorate 'Azadi ka Amrit Mahotsav'.

BRO on its 63rd Raising Day

Raksha Mantri Rajnath Singh called upon Border Roads Organisation (BRO) to further enhance its capability through optimum use of technology and strive to strengthen the infrastructure of the border areas at a faster pace. He was addressing all ranks of the BRO at an event organised in New Delhi on 7 May 2022 to celebrate the 63rd Raising Day of the Organisation. In 2021-22, a total of 102 infrastructure projects - 87 bridges and 15 roads - were completed by the BRO - the most in a single year.

AMCA continues to progress

HAL CMD, Mr R Madhavan, on 13 July 2022, launched the 'Metal Cutting for Titanium Bulkhead of AMCA aircraft' as part of technology development at Aircraft Manufacturing Division, Nashik in the presence of Dr. A K Ghosh, PD(AMCA) ADA, senior officers from DMRL, ADA and other Government agencies.

New manufacturing facilities at BDL

Raksha Mantri Rajnath Singh visited the Bhanur Unit of Bharat Dynamics Limited (BDL) in Telangana on 2 July 2022 and dedicated to the Nation a number of new manufacturing facilities set up by the Defence Public Sector Undertaking (DPSU). These included a Warhead facility at the Bhanur Unit and a Radio Frequency (RF) Seeker facility at Kanchanbagh Unit.

Safran invited for co-development and co-production

A high-level delegation of French company Safran Group led by its CEO Olivier Andries called on Raksha Mantri Rajnath Singh in New Delhi on 5 July 2022. During the meeting, the CEO of Safran briefed the Raksha Mantri of their company's plans to set up a Maintenance, Repair and Overhaul (MRO) facility in India for overhaul of LEAP-1A & LEAP-1B engines in use by Indian and foreign commercial airlines. The CEO also briefed Mr. Rajnath Singh of their projects Safran Aircraft Engines and Safran Electrical & Power India Pvt Ltd; both have been recently inaugurated in Hyderabad and newly launched Safran-HAL Aircraft Engines as a joint venture in Bengaluru (full story in the next issue).

RM onboard Indian Navy P8I

Mr. Rajnath Singh, Raksha Mantri, during his visit to Mumbai undertook a sortie on the Indian Navy P8I Long Range Maritime Reconnaissance Anti-Submarine Warfare aircraft. During

the mission, long range surveillance, electronic warfare, imagery intelligence, ASW missions and Search & Rescue capabilities employing the state-of-the-art mission suite and sensors were demonstrated. The induction of P8I aircraft commencing on 2013, have significantly enhanced Indian Navy's persistent surveillance operations in the Indian Ocean Region (IOR). The flight crew for this sortie comprised of two pilots and seven naval air operations officers including three women officers.

RM sea sortie on INS Khanderi

Raksha Mantri Rajnath Singh, on 27 May 2022, conducted a sea sortie on one of the most potent platforms of Indian Navy 'INS Khanderi' during his visit to Karwar Naval Base in Karnataka. The Raksha Mantri was given a first-hand insight into the combat

capabilities and offensive strength of the state-of-the-art Kalvari class submarine. For over four hours, the full spectrum of capabilities of underwater operations of the stealth submarine was demonstrated to the Defence Minister.

12 high speed guard boats for Vietnam

India's Defence Minister handed over 12 High Speed Guard Boats to Vietnam during his visit to Hong Ha Shipyard in Hai Phong on 9 June 2022. The boats have been constructed under the Government of India's $US 100 million Defence Line of Credit to Vietnam. The initial five boats were built in the Larsen & Toubro (L&T) Shipyard in India and the other seven in Hong Ha Shipyard. Senior civil and military officials of India and Vietnam were present during the handing over ceremony.

Hansa-NG progresses

India's first indigenous flying trainer Hansa-NG designed and developed by CSIR-National Aerospace Laboratories, Bangalore

under the aegis of Council of Scientific and Industrial Research, has successfully completed the sea level trials at Puducherry. The aircraft was flown to Puducherry covering 140 nautical miles in one and half hours at a cruising speed of 155 km/hr. The objectives of sea level trials were to evaluate handling qualities, climb/cruise performance, balked landing, structural performance including positive and negative G, power plant and other systems performance.

TASL and L&T deliver 100th AAFL for IAF

Tata Advanced Systems Limited (TASL) and Larsen & Toubro (L&T) have jointly delivered 100th Akash Air Force Launcher (AAFL) for the Indian Air Force, developed with Defence Research and Development Organisation (DRDO). AAFL is a Mobile

Launcher System capable of transporting and launching up to three Akash Medium Range Surface to Air Missiles in Single or Salvo Mode. AAFL comprises a self-powered and fully-automated Electro-Mechanical Launching System mounted on a trailer and towed by a prime-mover.

Kalyani Group's Bharat 150 drone unveiled

Kalyani Strategic Systems Limited (KSSL), the defence arm of Kalyani Group, Pune based Indian conglomerate unveiled its drone BHARAT 150, a multi-payload, variable mission drone indigenously developed by the group. The X-8 configuration drone is already under testing by the Indian Army in high altitude areas in Leh-Ladakh and performed 8.5 km with 20 kg payload.

Trentar Group launches fixed wing hybrid VTOL

The Trentar Group launched its UAV and propulsion systems at the Bharat Drone Mahotsav 2022. The gasoline powered, high endurance, fixed wing VTOL, the ARO X2–MK II is one of the kind hybrid UAVs made of complete composite airframe, promising an endurance of more than 3hrs and can carry a payload to 3 kgs. The ARO X2's hybrid and fully electric VTOL platforms are powered by Trishula BLDC Electric motors. The BLDC motors are the first of its kind designed, developed, and manufactured in India. These motors not only make the local drone manufacturers self-reliant but also increases their indigenous percentage to a very large number.

Zuppa's Ajeet Mini makes debut

Ajeet Mini India's Atmanirbhar answer to global brands like DJI, Parot , Skydio, Autel and the likes was unveiled by Venkatesh Sai, Chief Innovation Officer, Zuppa Geo Nav Tech at the Bharat Drone Mahotsav 2022. Ajeet Mini is fully made in India from ground up with over 75% of it manufactured in India including the key control and communication electronics at the Chip/ Motherboard level. Ajeet Mini is the first in a series of sub 2 kg nano and micro drones to be launched by Zuppa OEG Gen 5 Technologies. These drones will all be of the "Buy & fly" type which can be purchased off the shelf or online.

Garuda Aerospace deploys emergency delivery drones

India's Garuda Aerospace deployed White Knight Delivery Drones in Assam to support the state disaster management department's rescue efforts amid the ongoing floods and landslide situation. "Garuda's White Knight drones were used extensively during Covid pandemic lockdown to deliver medicines and emergency supplies in ISRO, Sriharikota and Varanasi smart city" stated Agnishwar Jayaprakash, Founder and CEO of Garuda Aerospace. The drones were used to deliver emergency food and medicines packets to survivors and victims.

Dynatron Services ties with WILO Pumps

India's Dynatron Services Pvt Ltd, a Crown Group Defence company, a strategic partner to Indian defence Forces supporting the "Atmanirbhar Bharat" initiative in a drive to support indigenisation of equipment for Indian naval ships and submarines signed an MoU with WILO Mather and Platt Pumps Pvt. Ltd, one of the world's leading premium providers of pumps and pump systems. Through the tie-up, both Dynatron Services and WILO Pumps will work together towards refurbishing/renewal of automatic system for pump control for ship lift/Naval Ship Repair Yard, Karwar.

L&T inaugurates EDC in France

L&T Technology Services Limited, a leading global pure-play engineering services company, inaugurated its Engineering Design Centre (EDC) in Toulouse, France, to initially cater to the new age digital requirements of the global aerospace and defence sectors. The EDC will initially focus on developing cutting-edge solutions for the aerospace and defence industries and LTTS will work with major OEMs in the region as an engineering partner.

INS Gomati decommissioned

Having served the nation and the Indian Navy with great distinction for 34 eventful years, INS Gomati was decommissioned at sunset at the Naval Dockyard in Mumbai on 28 May 2022, in an elegant, solemn and poignant ceremony. The third ship of the Godavari class guided-missile frigates, INS Gomati was also the oldest warrior of the Western Fleet when decommissioned.

During her service, she participated in Operations Cactus, Parakram and Rainbow, and several bilateral and multinational naval exercises.

INS Nishank and INS Akshay decommissioned

Indian Navy Ships Nishank and Akshay were decommissioned on 3 June 2022 after rendering 32 years of service to the nation. The decommissioning event was conducted at Naval Dockyard, Mumbai in a traditional ceremony wherein the national flag, the naval ensign, and the decommissioning pennant of the two ships were lowered for the last time at sunset. While INS Nishank was commissioned on 12 September 1989, INS Akshay was commissioned a year later on 10 December 1990 at Poti, Georgia. INS Nishank and INS Akshay were part of the 22 Missile Vessel Squadron and 23 Patrol Vessel Squadron respectively under the operational control of Flag Officer Commanding, Maharashtra Naval Area.

MKU showcases optronic solutions

MKU showcased its defence and security solutions at the recently concluded Eurosatory. The company has supplied it products to Germany, Spain, Norway, Sweden and Estonia. The Netro NB-3100 Aviation Night Vision Goggles and Netro Aiming Solutions have been evolved as a solution to such problems, stated Prachi Gupta, CEO of MKU's optronics division. The company showcased two optronic solutions: Netro NB-3100 Aviation Night Vision Goggles and Netro Aiming Solutions. The first is designed to help aircraft and helicopter pilots navigate while flying at low altitudes or taking off or landing in pitch darkness or threatening conditions. The latter comprises sophisticated sighting solutions for those operating grenade launchers, heavy and light machine guns and rifles.

IAF heritage centre at Chandigarh

Banwarilal Purohit, Governor of Punjab and Administrator of UT of Chandigarh and Air Chief Marshal VR Chaudhari, Chief of the Air Staff on 3 June 2022 witnessed the ceremony for signing of MoU between UT of Chandigarh and IAF for setting up the IAF Heritage Centre at Chandigarh. This Heritage Centre will have artefacts, simulator and interactive boards to highlight various facets of IAF. It will also showcase the vital role played by the Service in various wars and assistance rendered for humanitarian assistance and disaster relief. This joint project of Administration of UT Chandigarh and IAF is planned to be completed by October 2022.

IIT-M & GE joint innovation programme

A product developed by IIT Madras (IIT-M) and GE Aviation (GE) under a joint innovation programme started in 2016 has now entered the testing phase. The locally designed and developed aviation high-speed micro turbomachine is being tested at National Aerospace Laboratories (NAL), an important step towards technology maturation. During the product design process, GE and IIT-M engineers and researchers worked together to develop a local aviation supplier ecosystem for the manufacture of high-precision and high-speed turbomachinery that adhered to global aviation industry manufacturing standards.

IAMPL (R-R/HAL) signs MoU with TN Govt

International Aerospace Manufacturing Pvt. Ltd. (IAMPL), a joint venture between Rolls-Royce and Hindustan Aeronautics Ltd., signed a Memorandum of Understanding (MoU) with the Government of Tamil Nadu to support the setting up of new manufacturing facilities in Hosur, Tamil Nadu. IAMPL announced its intent to expand its operations in Tamil Nadu for supporting

the aerospace parts global supply chain on the sidelines of the Tamil Nadu Investment Conclave 2022. The proposed expansion is aimed at enhancing IAMPL's existing capabilities in India to manufacture complex components for the global supply chain for civil and defence aero-engines.

Speaking about the expansion, Kishore Jayaraman OBE, President India and South Asia, Rolls-Royce stated, "Over the last decade, our joint venture with HAL has grown from strength to strength and displayed superior capabilities across manufacturing, engineering, quality and customer services. I congratulate IAMPL on this milestone and I am confident that with this expansion, IAMPL will further enhance its contribution to the global supply chain and continue to deliver high-precision, superior quality products."

Rolls-Royce India President K Jayaraman receives Honorary British award by Her Majesty the Queen

Kishore Jayaraman, President – India and South Asia for Rolls-Royce, has received an honorary Officer of the Order of the British Empire (OBE) by Her Majesty The Queen. He received the award for services to international trade and investment, with a key focus on promotion of India-UK trade. Jayaraman is a board member of the UK-India Business Council, which supports UK businesses set-up in India. He has also been instrumental in promoting bilateral ties by setting up a strategic ecosystem for boosting manufacturing in India enabled by UK's technology. Under his leadership, the company has set up the 'Engineering Centre' in Bangalore in 2015, 'Digital Centre of Excellence' with over 60 digital technologists in 2017, and its first 'Start-up Accelerator Programme' in India in 2019.

Passing out Parade at INA Ezhimala

In a Passing out Parade (POP) held at Indian Naval Academy, Ezhimala, on 28 May 2022, 250 trainees comprising Midshipmen

of 102 Indian Naval Academy Course, cadets of 32 Naval Orientation Course (Extended), 34 Naval Orientation Course (Regular and Coast Guard), 35 Naval Orientation Course (Regular) passed out with flying colours, marking the culmination of their ab-initio training.

Lufthansa Cargo and 'Namaste India'

Mumbai's Chhatrapati Shivaji Maharaj International Airport (CSMIA), on 1 June 2022, welcomed Lufthansa Cargo freighter 'Namaste India', - the name chosen for the Boeing 777 freighter aircraft which now operates between Frankfurt and Mumbai. This special initiative by the airline symbolises the significance of India as one of the most important markets for Lufthansa Cargo and its effort to develop a prominent air cargo corridor between Germany and India, building strong and robust cargo operations between the two countries.

Air Works expands network to Dubai

Indian MRO and aviation services and solutions provider Air Works has entered into a long-term services agreement with UAE-based Mach Technik Aircraft Maintenance to provide International Line Maintenance services at Dubai International Airport. The development marks the maiden expansion of Air Works' International Line Maintenance business to foreign shores. With a pan-India presence across 19

international airports, Air Works Group is already the biggest provider of Transit or Line Maintenance services to foreign carriers (airlines and cargo) operating into India. The company holds certifications from Civil Aviation Authorities of over 25 countries to maintain both narrow body and wide body aircraft at leading airports in the country.

Virgin Atlantic's 2nd daily service between Delhi and London

Virgin Atlantic on 2 June 2022 launched its second daily service from Delhi's Indira Gandhi International Airport to London Heathrow. The additional daily connection from Delhi to London Heathrow offers more choice than ever, benefiting both business and leisure travellers. Customers will also enjoy seamless connectivity to US destinations such as New York, Boston, Austin, Los Angeles and Atlanta.

NIA selects Tata's as EPC contractor

Yamuna International Airport Private Limited (YIAPL) has selected Tata Projects Ltd. to undertake the engineering, procurement, and construction (EPC) of Noida International Airport (NIA). Tata Projects will construct the terminal, runway, airside infrastructure, roads, utilities, landside facilities and other ancillary buildings at Noida International Airport.

Transfer of IAF land to AAI

In line with the vision of Prime Minister of "Ude Desh ka Aam Nagarik" (UDAN) and to facilitate Regional Connectivity Scheme (RCS), Indian Air Force has facilitated working permission and handing over of defence land by Ministry of Defence to Airport Authority of India (AAI) at seven locations, viz, Bagdogra, Darbhanga, Adampur, Utarlai, Sarsawa, Kanpur and Gorakhpur. AAI would now be utilising the existing IAF airfields to operate civil flights under the RCS UDAN scheme. Approximately 40 acres of land is being handed over for development of civil terminals and necessary airfield infrastructure for commencing RCS flights. American Airlines and Indigo codeshare.

American Airlines and Indigo codeshare

American Airlines launched its codeshare agreement with India's IndiGo, adding new options for customers traveling to India. American's customers are now able to book travel beyond Delhi on two of IndiGo's domestic routes, Bangalore (BLR) and Mumbai (BOM), providing a convenient option for customers arriving on American's New York (JFK)- Delhi (DEL) flight. American and IndiGo plan to expand the codeshare in the near future to include more than a dozen additional destinations in India.

Vistara celebrates 50 aircraft milestone

Vistara, in June 2022, celebrated a key milestone of having a 50 aircraft strong fleet by unveiling a specially designed livery on its brand new Airbus A321neo. The celebration, that took place at the Indira Gandhi International Airport, New Delhi, was attended by Vistara's Chief Executive Officer, Vinod Kannan; Chief Commercial Officer, Deepak Rajawat and key members of its leadership team. Since April 2020, the airline expanded its fleet by over 25% while significantly growing its global network to ten international destinations. Vistara plans to have a fleet of around 70 aircraft by the end of 2023.

CSMIA launches Vertical Axis Wind Turbine & Solar PV System

Chhatrapati Shivaji Maharaj International Airport (CSMIA) is India's first airport to launch a one-of-its-kind Vertical Axis Wind Turbine (VAWT) & Solar PV hybrid (Solar Mill) to explore the possibility of utilisation of wind energy at the airport. CSMIA has introduced this pilot programme in collaboration with WindStream Energy Technologies India Pvt Ltd, which ensures 24/7 energy generation, harnessing maximum energy through wind power systems, while enabling highly efficient and low carbon future for aviation. This sustainable initiative undertaken by CSMIA reduces dependence on conventional electricity which propels its journey towards 'Net Zero' emissions.

Airbus and BSNL deliver TactilonAgnet 500

After a phase of implementation and testing, the TactilonAgnet 500 developed by Airbus Secure Land Communications (SLC) is now being fully operational in India in collaboration with Arubaito and Bharat Sanchar Nigam Limited (BSNL).This is an important milestone that marks the official commercial start of the project. TactilonAgnet is a state-of-the-art Mission-Critical Communication Service (MCS) for business andmission-critical users, based on the mobile telecommunications standard of the 3rd Generation Partnership Project (3GPP). As a future-proof modern, easy-to-use, flexible and scalable solution, TactilonAgnet 500 can acquire and transmit data, video and voice to all relevant bodies at once – securely and reliably. It allows radio-device, smartphone, tablet, and laptop users to communicate individually, or in a group.

AirAsia India retains leadership position in OTP

AirAsia India continued its dominance as the most punctual airline in India, as per the On Time Performance data reported by the Directorate General of Civil Aviation (DGCA). In May 2022, the airline topped the charts with 90.8% On Time Performance for four metro airports reported by the DGCA - Bengaluru, Delhi, Hyderabad and Mumbai.

AirAsia India deploys TaxiBot

AirAsia India flagged off the commencement of TaxiBot operations at Bengaluru International Airport, following successful trials and subsequent implementation at Delhi International Airport. AirAsia India tied up with KSU Aviation,

the exclusive operator of the TaxiBot in India. TaxiBot is a semi-robotic aircraft towing device that is a green alternative to save fuel, reduce CO_2 emissions and noise pollution, decrease aircraft wear and tear, and minimise instances of Jet Blast and Foreign Object Damage, improving efficiency and enhancing safety in the parking area. TaxiBot is an alternate taxiing solution which can tow aircraft from the aircraft boarding gate to the active runway without utilising the aircraft engines.

APPOINTMENTS

Air Marshal AP Singh is AOC-in-C Central Air Command

Air Marshal AP Singh assumed the appointment of Air Officer Commanding-in-Chief (AOC-in-C) Central Air Command (CAC) on 1 July 2022. The Air Marshal was commissioned into the fighter stream of IAF on 21 December 1984. He is an alumnus of National Defence Academy, Defence Services Staff College and National Defence College. A Qualified Flying Instructor and an Experimental Test Pilot, he has more than 4900 hours of flying experience.

MK Mishra is new HAL Chief Executive Officer (BC)

Mihir Kanti Mishra has taken over as Chief Executive Officer of HAL's Bangalore Complex. Prior to this, he was heading Aerospace Division as General Manager. His 35-plus years of experience in HAL includes a wide array of business verticals - engine, aircraft and space. He also held important positions in manufacturing, assembly, engineering, strategy planning, project management and international marketing.

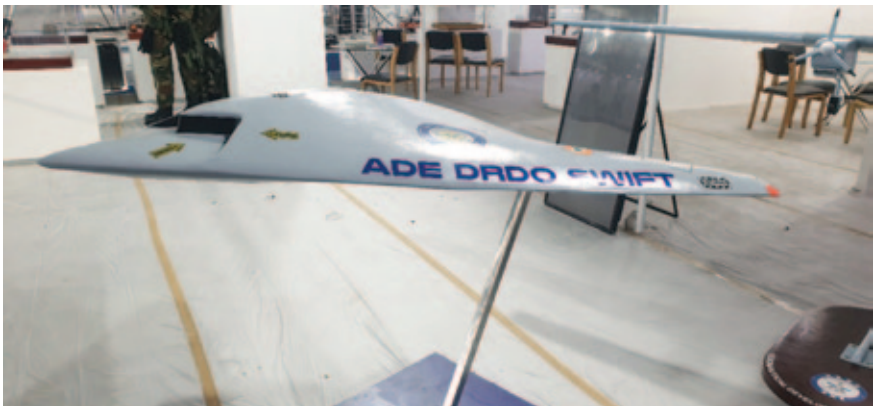
Breaking news

DRDO: Maiden flight of autonomous flying wing technology demonstrator

The maiden flight of the Autonomous Flying Wing Technology Demonstrator was carried out successfully by Defence Research and Development Organisation (DRDO) from the Aeronautical Test Range, Chitradurga, Karnataka on 1 July 2022. Operating in a fully autonomous mode, the aircraft exhibited a perfect flight, including take-off, way point navigation and a smooth touchdown. This flight marks a major milestone in terms of proving critical technologies towards the development of future unmanned aircraft and is significant step towards self-reliance in such strategic defence technologies.

The Unmanned Aerial Vehicle is designed and developed by Aeronautical Development Establishment (ADE), Bengaluru, a premier research laboratory of DRDO. It is powered by a small turbofan engine. The airframe, undercarriage and entire flight control and avionics systems used for the aircraft were developed indigenously.

Raksha Mantri Rajnath Singh congratulated DRDO and said it was a major achievement towards autonomous aircraft and would pave the way for 'Aatmanirbhar Bharat' in terms of critical military systems. Secretary, Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy appreciated the efforts of the teams associated in the design, development and testing of the system.



Tests updates

DRDO and Indian Navy test Naval Anti-Ship Missile (NASM)

Defence Research and Development Organisation (DRDO) and Indian Navy successfully conducted the maiden flight-test of indigenously-developed Naval Anti-Ship Missile launched from a naval helicopter from Integrated Test Range (ITR), Chandipur off the coast of Odisha on 18 May 2022. The mission met all its objectives. It is the first indigenous air launched anti-ship missile system for the Indian Navy.

The missile followed the desired sea skimming trajectory and reached the designated target with high degree of accuracy, validating the control, guidance and mission algorithms. All the sub-systems performed satisfactorily. The sensors deployed across the test range and near impact point tracked the missile trajectory and captured all the events.

The missile employed many new technologies, including an indigenously developed launcher for the helicopter. The missile guidance system includes state-of-the-art navigation system and integrated avionics. The flight test was witnessed by senior officers of DRDO and the Indian Navy.

Intermediate Range Ballistic Missile, Agni-4, successfully tested

A successful training launch of an Intermediate Range Ballistic Missile, Agni-4, was carried out at approximately 1930 hours on 6 June 2022 from APJ Abdul Kalam Island, Odisha. The successful test was part of routine user training launches carried out under the aegis of the Strategic Forces Command. The launch validated all operational parameters as also the reliability of the system. The successful test reaffirms India's policy of having a 'Credible Minimum Deterrence' Capability.

Vertical Launch Short Range Surface to Air Missile successfully flight-tested

Vertical Launch Short Range Surface to Air Missile (VL-SRSAM) was successfully flight-tested by Defence Research & Development Organisation (DRDO) and the Indian Navy from an Indian Naval Ship at Integrated Test Range (ITR), Chandipur off the coast of Odisha on 24 June 2022. The VL-SRSAM, a ship borne weapon system, is meant for neutralising various aerial threats at close ranges including sea-skimming targets.

The launch of the system was conducted against a high speed aerial target mimicking aircraft, which was successfully engaged. The flight path of the vehicle along with health parameters were monitored using a number of tracking instruments deployed by ITR, Chandipur. The test launch was monitored by senior officials from DRDO & the Indian Navy. Chief of the Naval Staff Admiral R Hari Kumar appreciated the Indian Navy and DRDO for the successful flight test of the VL-SRSAM and said that the

development of this indigenous missile system would further strengthen the defensive capabilities of the Indian Navy.

Secretary, Department of Defence R&D & Chairman DRDO Dr G Satheesh Reddy complimented the teams involved in the successful flight test. He said, the test has proved the integration of indigenous weapon system onboard Indian naval ships.

Laser-Guided ATGM successfully tested by DRDO

Indigenously-developed Laser-Guided Anti-Tank Guided Missile (ATGM) was successfully test-fired from Main Battle Tank (MBT) Arjun by Defence Research and Development Organisation (DRDO) and Indian Army at KK Ranges with support of Armoured Corps Centre & School (ACC&S) Ahmednagar on 28 June 2022. In the test, the ATGM hit the bull's eye with textbook precision and successfully defeated the target at minimum ranges. Telemetry systems recorded the satisfactory flight performance of the missile.

The all-indigenous ATGM employs a tandem High Explosive Anti-Tank (HEAT) warhead to defeat Explosive Reactive Armour (ERA) protected armoured vehicles. The ATGM has been developed

with multi-platform launch capability and is currently undergoing technical evaluation trials from 120 mm rifled gun of MBT Arjun.

Engaging the targets at lower ranges is a challenge due to the dimensional constraints of tank launched ATGMs, which has been successfully accomplished by the ATGM for MBT Arjun. With the trial, the ATGM's capability to engage targets from minimum to maximum range has been established. Earlier the trials have been successful for maximum range.

High speed Expendable Aerial Target ABHYAS tested

ABHYAS – High speed Expendable Aerial Target (HEAT) was successfully flight-tested from the Integrated Test Range (ITR), Chandipur off the coast of Odisha on 29 June 2022. The performance of the aircraft at low altitude including sustained level and high manoeuvrability was demonstrated during the test flight. The target aircraft was flown from a ground based controller in a pre-designated low altitude flight path, which was monitored by various tracking sensors deployed by ITR, including radar and electro-optical targeting system.

ABHYAS is designed and developed by Aeronautical Development Establishment of Defence Research and Development Organisation (DRDO). The air vehicle was launched using twin under-slung boosters which provide the initial acceleration to the vehicle. It is powered by a small gas turbine engine to sustain a long endurance flight at high subsonic speed. The target aircraft is equipped with micro-electromechanical systems-based inertial navigation system for navigation along with the flight control computer for guidance and control along with indigenous radio altimeter for very low altitude flight and data link for encrypted communication between the ground control station and target aircraft. The vehicle is programmed for fully autonomous flight.

A host of commissionings

INAS 325 Commissioned

Indian Naval Air Squadron (INAS) 325, operating the indigenously built ALH Mk-III aircraft, was commissioned into the Indian Navy by Lieutenant General Ajai Singh, Commander-in-Chief, Andaman & Nicobar at a ceremony held at INS Utkrosh, Port Blair on 31 May 2022. The newly inducted aircraft flew for the first time over the Andaman Islands earlier this year and were officially inducted on 28 January 2022. The unit is the second ALH MK III Squadron commissioned into the Indian Navy.

The Squadron derives its name from the nocturnal bird of prey, the 'Eagle Owl'. The keen sense of observation and tracking of the eagle exemplifies the Sensors and advanced avionics of the helicopter akin the nocturnal prowess of the owl, personify the night vision capabilities of the aircraft.

These helicopters come with the latest-generation avionics and role equipment. They are primarily meant for use in long range SAR and maritime recce role. They can also be used for humanitarian assistance and disaster relief in the Islands. The helicopter has a surveillance radar, EO/FLIR, homer, high-intensity searchlight and a removable Medical Intensive Care Unit for the air ambulance role.

The squadron is commanded by Cdr Avinash Kumar Sharma, who is a highly proficient and experienced pilot qualified on Chetak, UH-3H and ALH helicopters with more than 2300 hrs of flying and over 17 years of service.

Induction of CG 867 ALH Mk-III

Indian Coast Guard inducted indigenous ALH Mark-III aircraft, CG 867, into Coast Guard Region (East) at Chennai on

20 June 2022. The aircraft was received at Coast Guard Air Station, Chennai with a traditional 'water cannon salute'. By positioning the ALH MK III at Chennai, the Coast Guard has achieved a multifold capability of Beyond Visual Range detection using the state of the art ETA V3+ radar integrated with long range imaging and identification using the Electro Optical Pad and Automatic Identification System. The aircraft additionally is equipped for carrying out target neutralisation, bringing to use its cabin mounted 12.7 mm heavy machine gun.

ALH Mk-III squadron commissioned into ICG Porbandar

835 Squadron (CG), an indigenous Advanced Light Helicopter (ALH) MK III squadron, was commissioned into Indian Coast Guard at its Air Enclave in Porbandar, Gujarat on 28 June 2022. DG, Coast Guard VS Pathania presided over the commissioning ceremony which was attended by various military and civil dignitaries based at Porbandar and Gujarat area.

So far, 13 ALH MK-III aircraft have been inducted in the Indian Coast Guard in a phased manner and four of these aircraft are positioned at Porbandar. Since the induction, the squadron has flown over 1,200 hours and conducted numerous operational missions, including the maiden night SAR mission off Diu coast.

The 835 Sqn (CG) is commanded by Commandant Sunil Dutt. The commissioning will give a major fillip to the abilities of the Indian Coast Guard in the Gujarat region and further strengthen the country's maritime security.

ALH Squadron INAS 324 commissioned

Indian Naval Air Squadron 324 was commissioned into the Indian Navy in the presence of Vice Admiral Biswajit Dasgupta, Flag Officer Commanding-in-Chief, Eastern Naval Command at a Commissioning Ceremony held at INS Dega, Visakhapatnam on 4 July 2022. The unit is the first Naval Squadron on the Eastern Seaboard operating the indigenously designed and built Advanced Light Helicopter (ALH) MK III (MR) helicopters.

INAS 324 has been named "KESTRELS" which are birds of prey and have good sensory capabilities symbolising the envisaged role of the Aircraft and the Air Squadron. The Insignia of the Squadron depicts a 'KESTREL' searching over vast blue and white sea waves, which signifies the integral Maritime Reconnaissance (MR) and Search and Rescue (SAR) role of the Squadron.

MoD contract with BDL for Astra Mk-I BVRAAM

In a major boost to Prime Minister Narendra Modi's vision of 'Aatmanirbhar Bharat', Ministry of Defence, on 31 May 2022, signed a contract with Bharat Dynamics Limited (BDL) for supply of Astra MK-I Beyond Visual Range (BVR) Air to Air Missile (AAM) and associated equipment for the Indian Air Force and Indian Navy at a cost of Rs 2,971 crore under Buy (Indian-IDDM) category.

Till now, the technology to manufacture missile of this class indigenously was not available. Astra MK-I BVRAAM has been indigenously designed and developed by Defence Research and Development Organisation (DRDO) based on the Staff Requirements issued by the Indian Air Force (IAF) catering for beyond visual range as well as close combat engagement reducing the dependency on foreign sources. air to air missile with BVR capability provides large stand-off ranges to fighter aircraft which can neutralise the adversary aircraft without exposing itself to adversary air defence measures, thereby gaining and sustaining superiority of airspace. This missile is technologically and economically superior to many such imported missile systems.

Astra MK-I missile and all associated systems for its launch, ground handling and testing has been developed by DRDO in coordination with the IAF. The missile, for which successful trials have already been undertaken by the IAF, is fully integrated on the Su-30MKI fighter aircraft and will be integrated with other fighter aircraft in a phased manner, including the Light Combat Aircraft (Tejas). The Indian Navy will integrate the missile on the MiG-29K fighters.

The Transfer of Technology from DRDO to BDL for production of Astra MK-I missile and all associated systems has been completed and production at BDL is in progress. This project will act as a catalyst for development of infrastructure and testing facilities at BDL. It will also create opportunities for several MSMEs in aerospace technology for a period of at least 25 years. The project essentially embodies the spirit of 'Aatmanirbhar Bharat' and will help facilitate realising the country's journey towards self-reliance in air to air missiles.

DAC clears proposals worth Rs 76,390 crore

Following Prime Minister Narendra Modi's call for 'Aatmanirbharta', Defence Acquisition Council (DAC), in a meeting chaired by Raksha Mantri Rajnath Singh on 6 June 2022, accorded Acceptance of Necessity (AoN) for Capital Acquisition Proposals of the Armed Forces amounting to Rs 76,390 crore under 'Buy (Indian)', 'Buy & Make (Indian)' and 'Buy (Indian-IDDM)' categories. This will provide substantial boost to the Indian defence Industry and reduce foreign spending significantly.

For the Indian Army, the DAC accorded fresh AoNs for procurement of Rough Terrain Fork Lift Trucks (RTFLTs), Bridge Laying Tanks (BLTs), Wheeled Armoured Fighting Vehicles (Wh AFVs) with Anti-Tank Guided Missiles (ATGMs) and Weapon Locating Radars (WLRs) through domestic sources with emphasis on indigenous design and development.

For the Indian Navy, the DAC accorded AoN for procurement of Next Generation Corvettes (NGC) at an estimated cost of Rs 36,000 crore. These NGCs will be versatile platforms for variety of roles viz. surveillance missions, escort operations, deterrence, Surface Action Group (SAG) operations, Search & Attack and Coastal Defence. These NGCs would be constructed based on new in-house design of Indian Navy using latest technology of ship building and would contribute to further the Government's initiative of SAGAR (Security and Growth for all in the Region).

The DAC accorded AoNs for manufacture of Dornier aircraft and Su-30 MKI aero-engines by the Hindustan Aeronautics Limited with focus on enhancing indigenisation particularly in indigenising aero-engine material.

In pursuance of the Government's vision for digital transformation in Defence, 'Digital Coast Guard' project under Buy (Indian) Category has been approved by the DAC. Under this project, a pan India secure network for digitising of various surface and aviation operations, logistics, finance and HR processes in Coast Guard will be established.

Akasa Air takes delivery of 1st of 72 aircraft

On 16 June 2022, Akasa Air, India's newest airline took delivery of its much anticipated first Boeing 737 MAX aircraft in Seattle, USA. With a strong commitment to "democratise the skies", the airlines' total order of 72 aircraft includes an initial delivery of 18 aircraft by March 2023, followed by delivery of the remaining 54 aircraft over the course of the next four years. Commenting on the successful delivery, Vinay Dube, Founder, Managing Director & Chief Executive Officer, Akasa Air stated, "This is indeed a symbolic milestone in the journey of Akasa Air, bringing us one step closer to the process of obtaining our Air Operator's Permit (AOP) and leading to our commercial launch. While we are extremely happy with this achievement, we want to keep ourselves focussed on the task of delivering on our vision to transform India's air transportation ecosystem, support the nation's economic growth engine and help fellow Indians chase their dreams. We are grateful to Boeing and Griffin for their trust in us and supporting us early in our journey".

"We are honoured to deliver the first 737 MAX to Akasa Air, India's newest airline focused on making air travel inclusive and affordable for all," stated Stan Deal, Boeing Commercial Airplanes President and CEO. "Flying an advanced, environmentally progressive 737 MAX fleet with greater fuel efficiency and lower operating costs will enable Akasa Air to profitably serve the Indian market while passing those savings on to its passengers."

"With a commitment to being socially responsible, Akasa Air has placed a firm order of 72 Boeing 737 MAX airplanes, powered by CFM fuel efficient, LEAP-1B engines. The 737 MAX family aircraft deliver superior efficiency in reducing fuel use and carbon emissions, fulfilling the airline's promise of being an environmentally friendly company with the youngest and greenest fleet in the Indian skies" stated airline officials.

Griffin mandate for purchase/leaseback of 5 Boeing 737-8 MAX with Akasa Air

Griffin Global Asset Management (Griffin) announced the mandate for purchase and leaseback of five Boeing 737-8 aircraft with Akasa Air. The aircraft deliveries began in June 2022 and include Akasa Air's first several aircraft. "We were introduced to Akasa Air's management team over a year ago and have watched with excitement as they skillfully built the airline from the ground up. We are honoured to enter into this long-term relationship right from Akasa's launch. They have developed a business strategy that addresses a need in the market and assembled a very impressive team to execute that plan," stated Ryan McKenna, Griffin's Chief Executive Officer. Commenting on the alliance, Vinay Dube, Founder, Managing Director and CEO at Akasa Air stated, "We are pleased to have Griffin as our partners in growth as we embark on our aviation journey. The high degree of confidence and endorsement from the Griffin team is a testimony to Akasa Air's robust and sustainable future."

Space news and India

Ariane 5 orbits Indian telecom payload

Ariane 5 has launched the telecommunication satellite GSAT-24 into its planned geostationary transfer orbit. Arianespace announced liftoff of flight VA257 at 23:50 CEST on 23 June (18:50 local time) from Europe's Spaceport in French Guiana. The first Ariane 5 mission of 2022 lasted about 40 minutes, from liftoff to release of the second payload.

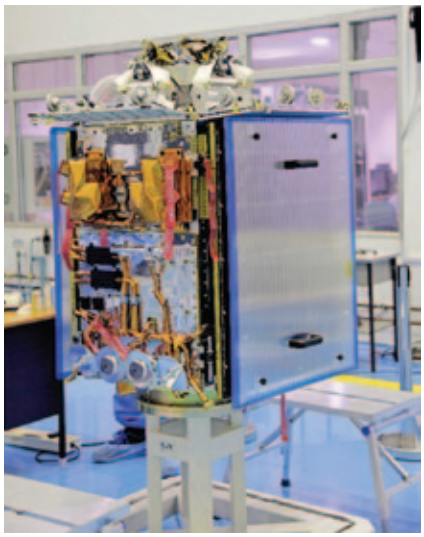
GSAT-24 is a Ku-band 4t-class communications satellite built for NewSpace India Limited by ISRO, the Indian Space Research Organisation. This satellite will provide television, telecommunications, broadcasting and direct-to-home services for Indian customers. Flight VA257 was the 113th Ariane 5 mission.

ISRO's PSLV-C53/DS-EO mission

The countdown and subsequent successful launch of PSLV-C53/DS-EO on 30 June 2022 was yet another feather in ISRO's cap!

Transfer of 10 in-orbit comms satellites to NewSpace

India's Union Cabinet has approved the transfer of 10 in-orbit communication satellites from Government of India (GoI) to NewSpace India Ltd. (NSIL), a wholly owned Public Sector Enterprise of GOI under the administrative control of the Department of Space. The Union Cabinet has also approved increasing the authorised share capital of NSIL from Rs.1000 crore to Rs.7500 crore.



Transfer of these assets to NSIL will further provide the desired financial autonomy to the company to realise capital intensive programmes/projects and thereby offering huge employment potential and technology spin-off to other sectors of the economy. This approval is expected to trigger domestic economic activity in space sector and increase India's share in the global space market.

The Space Sector reforms mandated NSIL to undertake end-to-end commercial space activities and function as a full-fledged satellite operator. NSIL functioning as a single-window operator will also facilitate the ease of doing business in space sector. NSIL Board will now be empowered to price the transponders as per the market dynamics and global trends in the Satellite Communication sector. NSIL is also authorised to offer and allocate capacity as per its internal policies and guidelines.

Safran Data Systems in HAL order for VS1510 recorders for Tejas MK-1A

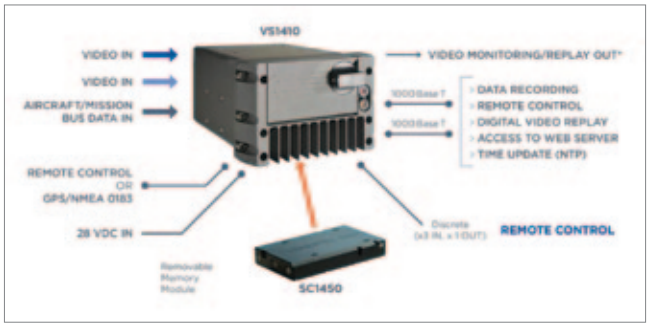
LCA Tejas Mk.1 (photo for representational purpose)

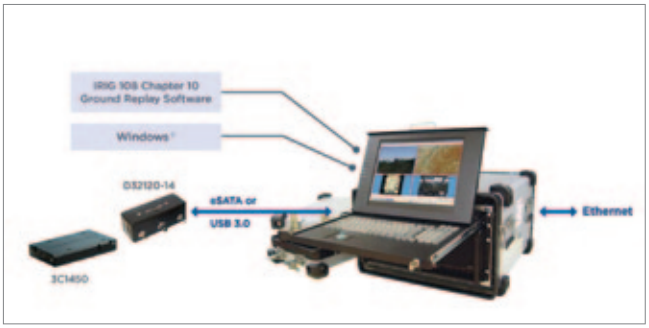
Safran Data Systems has received an order from HAL for VS1510 recorders for its upcoming Tejas MK-1A. The recorders will equip all Mk.1A's in the future. The ENERTEC VS1410/VS1510 airborne recorders/servers submit the uncompressed digitised motion imagery to either ISO MPEG2 or ITU H-264 video compression algorithm. Either ISO MPEG2 or ITU H-264 video compression algorithm is implemented in FPGA components, which provides considerable advantage over "commercially-available" ASIC's in terms of system design flexibility, where specific operational requirements involve non-standard video formats or video processing/distribution capability (scan conversion, text overlay, etc.), obsolescence management and product support, the average lifetime of "commercially-available" ASIC's hardly exceeding two-four years.

The ENERTEC VS1410/VS1510 airborne recorders/servers can be configured to handle the SC145C-series removable memory module (RMM) fitted with encrypted solid-state devices. Selection of "encryption enabled" or "encryption disabled" mode is operated on the ground, with the SC145C RMM connected to the host PC, using Safran Data Systems-supplied dedicated utilities - all data stored on the RMM is encrypted using a strong AES-256 XTS encryption algorithm - the encryption key is provided via Ethernet and stored in volatile memory. Access to the RMM requires prior upload of encryption key after power up.

The ENERTEC VS1410/VS1510 airborne recorders/servers provide field/mission data acquisition, processing, storage, exploitation and dissemination, for on board operation manned or unmanned ground, air and sea vehicles. These products and solutions are submitted to extensive validation and formal qualification testing, per standard test methods (DO-160, MIL-STD-810).

Post-flight data download and replay can be operated by direct connection of the SC1450 removable memory module (RMM) to the eSATA or USB 3.0 port of the PC host platform, using the Safran Data Systems-supplied DS2120-14 RMM interface module. When operating with IRIG 106 Chapter 10 recording format, dedicated utilities are required. Safran Data Systems can propose a Ground Replay Software package that allows easy installation and user-friendly operation in the PC/Windows environment, for video, audio and data playback and display, and for basic RMM management.





Successful firing of Su-30MKI launched Brahmos-ER

India, on 12 May 2022 successfully fired the Extended Range version of BrahMos air launched missile from Su-30 MKI fighter aircraft. The launch from the aircraft was as planned and the missile achieved a direct hit on the designated target in the Bay of Bengal region.

It was the first launch of Extended Range version of BrahMos missile from Su-30MKI aircraft. With this, the IAF has achieved the capability to carry out precision strikes from Su-30MKI aircraft against a land/sea target over very long ranges. The dedicated and synergetic efforts of the IAF, Indian Navy, DRDO, BAPL and HAL have proven the capability of the nation to achieve this feat. The extended range capability of the missile coupled with the high performance of the Su-30MKI aircraft gives the IAF a strategic reach and allows it to dominate the future battle fields.

(File photos courtesy IAF)

HAL pushes ahead

First flight of ALH (wheeled version)

The first flight of Advanced Light Helicopter (Wheeled Version) with segmented MRBs (Main Rotor Blades) and MRH (Main Rotor Head) in pre-cone configuration was carried out in Bengaluru on 30 June 2022. The flight was carried out by Wg. Cdr. Unni Pillai, ED (CTP-RW).

"The 2-Segment Main Rotor Blades (MRBs) and Pre-Cone Configuration of Main Rotor Head (MRH) have been developed to address the stringent stowage dimension requirement specified by Indian Navy and to improve the Time Between Overhauls (TBO) life of the Main Gear Box", stated Mr R. Madhavan, CMD, HAL.

"On completion of mandated ground testing of various factors, the prototype helicopter was built with 'Segmented Pre-Cone MRBs' and 'Pre-Cone MRH'. The RTB runs, Ground Resonance test and Clamped Power Ground Run were carried out to be found satisfactory", the CMD further stated.

The Indian Navy and Coast Guard are operating ALHs for the last 18 years supporting their operations for various missions. However, the ship deck based operations of ALH have been limited as the stowage size required for ALH exceeds the hanger sizes available in Indian Navy ships. Segmented blade feature reduces the folded length and width of ALH making it compatible with the hangar space available on most of the Indian Navy ships. Further, the time required for folding or unfolding operations is reduced.

Mr. Arup Chatterjee, Director (Engg. and R&D), HAL said the project was carried out in the shortest possible time with the support of RCMA and DGQA. Detailed flight evaluation is scheduled to ensure the efficacy of the pre-cone configuration.

HTT 40 progresses

On 6 June 2022, HTT 40 received its airworthiness clearance certificate from CEMILAC. The project set a record as the fastest to reach certification from the first flight. HTT 40 is designed to PSQR issued by IAF and FAR 23 standards.

GOCL secures order from HAL

GOCL Corporation Limited, a Hinduja Group Company, has received a purchase order from Hindustan Aeronautics Limited to supply Canopy Severance Systems (CSS) worth Rs. 19 crores. This has emerged as the single largest order received by the Special Products Group of GOCL Corp Ltd.

Bharat Electronics Ltd marches forward

Mrs Anandi Ramalingam, CMD, BEL, briefing journalists about BEL's performance during 2021-22 during BEL's annual Press Conference held in Bengaluru on 25 May 2022

In the year 2021-2022 BEL registered a turnover growth of 9% over the previous year, despite challenges due to Covid-19 pandemic, global chip shortage and stiff competition. Export turnover was 33.30 million USD and it achieved market capitalisation of Rs. 60,000 crores. Some major events were BEL's Armoured Engineer Reconnaissance Vehicle inducted into Indian Army, first prototype of indigenously developed Universal Driver Training Simulator for Rolling Stock (i-UDTS) inaugurated by Secretary (MoHUA), turnover from indigenous technology was 78% and sales from their defence business being 88%.

Some of the major orders executed during the year included Long Range Surface to Air Missile; Akash Weapon System; Fire Control System; Integrated Air Command & Control System; Advanced Composite Communication System; Integrated Electronic Warfare Suite and Coastal Surveillance System. Some of the new products/systems introduced during the year included Laser Fence System, IR Jammer for Active Tank Protection System, Gimbal for Tethered UAV, Drainage Intrusion Detection System, Solid State Power Controller Cards for Akash NG / QRSAM, S-Band 150W Power Amplifier, GNSS Receiver, Managed Ethernet Switch -12 Port, IP EPABX System, Navigation Complex System, C BAND GaN PA & C BAND GaAs MMICs and Oxygen Concentrator 5LPM & 10 LPM and Dialysis Machines.

During the year 2021-22, the Company received many orders. Significant among these orders included avionics package for LCA, Advanced Electronic Warfare (EW) suite for fighter aircraft, Instrumented Electronic Warfare Range (IEWR), CDR TI cum Day Light Sights for T-90 Tanks, Electronic Voting Machine & VVPAT, RWR & MAWS for C-295 aircraft, Gun Electronic Upgrade, Electronic Warfare Systems for Ships, Weapon Locating Radar and Integrated Observation Equipment.

As for export performance, BEL achieved sales of $33.3 million, an order book of $269 million and acquired orders worth $179 million. Major products included Coastal Surveillance System, sub-systems of Radar and EW Systems, Data Link II, Cable Looms, Communication Equipment, Radar Finger Printing System, etc. BEL signed a contract with Airbus for supply of Radar Warning Receiver (RWR) and Missile Approach Warning Systems (MAWS) as part of Offset under C295 aircraft programme of GoI, collaborated with new local partners in Kenya, Chile, Suriname, Malaysia, Nepal and Bangladesh. BEL increased contract manufacturing portfolio by increasing empanelment as global supply chain partner with OEMs, made strategic alliances with Indian platform manufacturers initiated processes for signing agreements to create strong support within the country and with foreign OEMs to address global markets.

R&D initiatives included successful development, testing and completion of Multi Target Tracking Radar and successful completion of BMP Electro Optic Upgrade and Combat Management System. BEL signed LAToT with DRDO in the areas of Radar, EW Systems, Robotics and Weapon Systems and signed MoUs with the Tri-Services towards technology co-operation and innovation.

BEL signs MoU with Defense Initiatives, Belarus

Bharat Electronics Limited (BEL) on 24 June 2022 signed an MoU with Defense Initiatives (DI), Belarus, and Defense Initiatives Aero Pvt Ltd, India (a subsidiary of DI Belarus), in the presence of Joint Secretary (DIP) and senior Indian Air Force officials. The MoU is aimed at co-operation between the three companies for supply of Airborne Defense Suite (ADS) for the helicopters of the Indian Air Force (IAF). BEL will be the prime contractor and will be supported by DI with ToT (Manufacturing and Maintenance) for supply of advanced EW suite for helicopters under 'Make in India' category. The MoU also aims at exploring various business opportunities for India and global markets for ADS. The partnership has evolved under the guidance of Mr Sanjay Jaju, Addl. Secretary, Department of Defence Production, and Indo-Belarusian Joint Commission (IBJC) on Military Cooperation.

India's shipbuilders: GRSE and MDL forge ahead

GRSE launches 2nd Survey Vessel (Large)

Survey Vessel (Large) - Yard No 3026 - being built by Garden Reach Shipbuilders and Engineers (GRSE) Ltd, was launched by Smt Sarbani Dasgupta, wife of Vice Admiral Biswajit Dasgupta, Flag Officer Commanding-in-Chief, Eastern Naval Command on 26 May 2022. Vice Admiral Biswajit Dasgupta was the Chief Guest at the occasion. This is the second vessel in a series of four such ships being built by GRSE for the Indian Navy to be launched in less than six months. The first ship, INS Sandhayak, was launched in Kolkata on 5 December 2021.

Among the others present at the ceremony were Vice Admiral Kiran Deshmukh, Controller of Warship Production & Acquisition, Vice Admiral Adhir Arora, Chief Hydrographer, Cmde P R Hari IN (Retd), Chairman and Managing Director (Officiating) GRSE, R K Dash, Director (Finance), GRSE, other senior officials of GRSE, L&T and Indian Armed Forces.

GRSE has a vast experience in building survey ships for the Indian Navy. In the 1980s, a series of six hydrographic survey vessels were delivered by GRSE to the Indian Navy. The first of them was named INS Sandhayak. After serving for 40 years, the ship was decommissioned in 2021, a few months before the new INS Sandhayak was reborn in Kolkata in December 2021. The launch of INS Nirdeshak now signals the rebirth of ex-INS Nirdeshak, another survey ship of the Sandhayak Class built by GRSE in 1983 and later decommissioned in 2014 after 31 years of service.

The latest series of Survey Vessels (Large) being built by GRSE are far more advanced as compared to the earlier series of survey ships in the Indian Navy's fleet. These modern, indigenously developed 110-metres long and 16-metres wide ships have a displacement of nearly 3,400 tonnes and can attain a top speed of 18 knots with an endurance of 6,500 nautical miles.

Congratulating GRSE on the achievement, Vice Admiral Dasgupta acknowledged that a large number of ships of the Eastern Fleet were being built by GRSE. He stated, "The newer ship 'Nirdeshak' will be more capable, larger, modern, state-of-the-art with advanced propulsion and maneuvering and will be able to operate autonomous and remotely operated systems. The ship's ability to perform full spectrum of hydrographic and oceanographic operations of the Indian Navy will make us even more potent and foreign navies are looking to the Indian Navy for the hydrographic co-operation. The vessel has achieved 80% of indigenisation by cost which is a significant achievement for Indian shipbuilding."

In order to ensure swift delivery of quality, GRSE has now enhanced its capacity through tie-ups with capable Private Shipyards under the Public Private Partnership (PPP) mode for part construction of ships. Further, these ships are now being built using the 'Integrated Construction' concept through which maximum pre-outfitting is being carried out at the block stage itself.

GRSE is the only shipyard in the country to have built and delivered 105 warships to the Indian Navy and Indian Coast Guard. Two warships built by this shipyard were also exported by the Government of India to Mauritius and the Seychelles. At the moment, GRSE is working on 23 ships. Seven of these are for foreign orders. This defence PSU has also been bagging orders through competitive bidding. Among the larger ships that GRSE is working on now are stealth frigates under the Indian Navy's Project 17A. The shipyard is also building Anti-Submarine Warfare Shallow Water Craft for the Indian Navy.

GRSE: Keel laying of 4th SVL and 2nd/3rd ASW/SWC

Keel for the fourth ship of Survey Vessel (Large) and second and third ships of ASW SWC for the Indian Navy was ceremoniously laid on 17 June 2022 by VAdm SN Ghormade, Vice Chief of Naval Staff at L&T, Kattupalli in the presence of RAdm GK Harish, DGND (SSG), RAdm Sandeep S Sandhu, ACWP&A, Cmde P R Hari (Retd), CMD, GRSE, Cmde Ashok Khetan (Retd), Head L&T shipbuilding, Directors, and other senior officials of the Indian Navy, GRSE and L&T.

The contract for construction of four SVL and eight ASW SWC for the Indian Navy was awarded to GRSE as part of indigenous shipbuilding programme in October 2018 and April 2022 respectively. As part of the yard's build strategy, GRSE has subcontracted part construction of three ships of SVL and four ships of ASW SWC to L&T, Kattupalli.

Keel laying is a major milestone activity in the construction of ships, symbolising formal commencement of the erection process of the warships on the building berth.

The Chief Guest highlighted that 39 out of 41 warships under order by Indian Navy today were being built indigenously. He also appreciated the collaborative approach between GRSE and L&T and opined that this model of Public Private Partnership between GRSE and L&T would be the harbinger of more such successful collaborations between Indian shipyards for warship construction in India. Survey Vessel Large (SVL) ships are capable for full scale coastal survey, deep-water hydrographic survey and determination of navigational channels/routes. In addition, these platforms collect oceanographic and geophysical data for defence applications. State of art equipment such as Autonomous Underwater Vehicle (AUV), Remotely Operated Vehicle (ROV), Single/ Multi Beam Echo Sounders and Data Acquisition and Processing System (DAPS) are fitted onboard SVL vessels to increase the ocean research capability. VCNS during the event highlighted that the ASW SWC platforms would augment the Navy's ASW capability and serve as a deterrent against submarine threats. Armed with torpedoes, rockets, state of the art Hull Mounted Sonar (HMS) and Low Frequency Variable Depth Sonar (LFVDS), the ASW SWC ships will significantly enhance Indian Navy ASW capability.

Keel laying of 7th Project 17A ship

The keel for the seventh ship (Y- 12654) of the prestigious P17A of Indian Navy was ceremoniously laid on 28 June 2022 by Rear Admiral GK Harish, Director General Naval Design (Surface Ship Group) at Mazagon Dock Shipbuilders Ltd., Mumbai. The ceremony was performed in the presence of senior officials of the Indian Navy and MDL. Keel laying is a major milestone activity in the construction of ships, symbolising formal commencement of the erection process of warships on the building berth.

Seven frigates under P17A class are being constructed of which four are being constructed at MDL and three in GRSE with MDL as lead yard. The P17A class frigates are being built using indigenously developed steel and fitted with weapons and sensors along with Integrated Platform Management System. The construction of these vessels is a major boost for AatmaNirbhar Bharat and India's Make in India commitment with orders for equipment and systems on indigenous firms including MSMEs amounting to indigenous content to the order of 75%.

Construction of P17A ships differ in the very concept of warship building by way of adoption of the modern technology 'Integrated Construction (IC)' where the blocks are pre-outfitted before joining to reduce the build period of warships.

Surat (guided missile destroyer) and Udaygiri (stealth frigate) launched

Raksha Mantri Rajnath Singh launched two frontline warships of the Indian Navy, Surat and Udaygiri, at Mazagon Docks Limited (MDL), Mumbai on 17 May 2022. 'Surat' is the fourth guided missile destroyer of P15B class, while 'Udaygiri' is the second stealth frigate of P17A class. Both warships have been designed in-house by the Directorate of Naval Design (DND) and built at MDL, Mumbai. The Raksha Mantri, in his address, described the warships as an embodiment of the Government's unwavering commitment to enhance the country's maritime capability, with focus on achieving 'Aatmanirbharta', at a time when the world is witnessing disruption in global supply chain due to COVID-19 and the Russia-Ukraine conflict. He congratulated the MDL for continued ship production activities despite the pandemic and meeting the strategic requirements of the Indian Navy in the current geo-political scenario.

The Raksha Mantri lauded the Indian Navy for responsibly discharging its duties of keeping the Indo-Pacific region open, safe and secure. "The Indo-Pacific region is important for the economy of the whole world. India is a responsible maritime stakeholder in the region. We support consensus-based principles and peaceful, open, rule-based and stable maritime order. Being an important country in this region, it is the primary objective of our Navy to keep the Indo-Pacific open, safe and secure. The Prime Minister's vision of Security and Growth for All in the Region (SAGAR) is based on the spirit of friendship, openness, dialogue and co-existence with the neighbours. With that very vision, Indian Navy is effectively discharging its duties," he said.

Mr. Rajnath Singh appreciated the fact that the Indian Navy had always been at the forefront in ensuring self-reliance through manufacturing of indigenous ships, submarines etc. "Joining hands with initiatives like 'Make in India', Navy has given 76% Acceptance of Necessity (AON), and 66% cost-basis contracts to Indian vendors in 2014 and indigenisation of about 90% naval ammunition has taken place. In addition, more than two-thirds of the Navy's Modernisation Budget has been spent on indigenous procurement in the last five financial years. Of the 41 ships

and submarines ordered by the Navy, 39 are from Indian shipyards".

The Project 15B class of ships are the next-generation stealth guided-missile destroyers of the Indian Navy, being built at the MDL, which are follow-on class of the weapon intensive P15A (Kolkata Class) destroyers. P17A frigates are warships that are follow-on class of the P17 (Shivalik Class) frigates with improved stealth features, advanced weapons and sensors and platform management systems.

Exercises and visits

Visit of INS Kolkata to Djibouti

INS Kolkata visited Djibouti from 4-7 May 22, as part of the anti-piracy patrol being undertaken by the Indian Navy to ensure safe transit of merchant vessels in the Gulf of Aden. Captain Prashant Handu, the Commanding Officer called on Colonel Ahmed Daher Djama, Commander of the National Navy of Djibouti and Colonel Wais Omar Bogoreh, Commander-in-Chief of Djibouti Coast Guard during the visit. Both dignitaries also visited INS Kolkata, along with personnel from the Djibouti Navy and Coast Guard. The courtesy and camaraderie exhibited by the Djibouti Coast Guard and Navy to INS Kolkata "reflects the strong friendship they share with the Indian Navy".

Visit of 1TS to Jeddah, Saudi Arabia

The ships of First Training Squadron visited to Jeddah, Saudi Arabia as part of their five nation Overseas Deployment. Captain Aftab Ahmed Khan, Senior Officer, First Training Squadron along with Commanding Officers of the 1TS ships called on Rear Admiral Yahya Bin Mohammed Al-Assiri, Western Fleet Commander of the Royal Saudi Naval Forces. Issues of bilateral naval cooperation and training initiatives between the two countries were discussed. During the visit,

the ships were involved in interaction with officials from Royal Navy of Saudi Arabia and various other dignitaries as well as training exchange.

INS Gharial to Seychelles – Mission Sagar IX

As part of ongoing deployment of Indian Naval Ship Gharial in South West Indian Ocean, under Mission SAGAR IX, the Ship called at Port Victoria, Seychelles from 11 to 14 May 2022. Following up on the proposal received from the Govt of Seychelles earlier, three ceremonial Saluting Guns, with ammunition, were delivered by the ship to

the Seychelles Defence Forces (SDF). These were formally presented by Gen Dalbir Singh Suhag (Retd), High Commissioner of India to Seychelles to Brigadier Michael Rosette, the Chief of Defence (CDF), SDF in a solemn ceremony held onboard INS Gharial on 13 May 2022. INS Gharial also transshipped one 15 m Wave Rider Patrol Boat, sourced by Seychelles from Colombo and was handed over to Seychelles Defence Forces (SDF).

During the stay of the Ship at Seychelles, the Indian Navy facilitated training of SDF personnel in domain specific maritime disciplines. Coming close to the recent official visit of Admiral R Hari Kumar, Chief of the Naval Staff, Indian Navy to Seychelles from 21-23 Apr 2022, the activities undertaken during the port call of INS Gharial, amply "demonstrate the commitment of Indian Navy in making positive contribution to capacity building and capability enhancement efforts of the Seychelles Defence Forces".

Before calling at Port Victoria, the ship had also visited Colombo, Sri Lanka and Male, Maldives to deliver essential medical supplies. Successive deployments of the Indian Navy under Mission SAGAR are aligned with the vision of 'Security And Growth for All in the Region' and strengthen the concept of 'Collective Responsibility' for maritime security in the Indian Ocean Region.

Indian Army's Integrated Battle Group exercise

Lt Gen Nav K Khanduri reviewed offensive manoeuvres of newly test bedded IBGs of the Rising Star Corps on 20 May 2022. The operational Synergy exhibited by integrated application of numerous force multipliers reflected enhanced combat potential of the IBGs.

Indian Navy–Bangladesh Navy Ex Bongosagar

The third edition of Indian Navy (IN)–Bangladesh Navy (BN) Bilateral Exercise 'Bongosagar' commenced at Port Mongla, Bangladesh on 24 May 2022. The Harbour Phase of exercise took place from 24-25 May which was followed by a Sea Phase in the Northern Bay of Bengal from 26-27 May. Exercise Bongosagar was aimed at developing a high degree of interoperability and joint operational skills through the conduct of a wide spectrum of maritime exercises and operations between the two navies.

Indian Naval Ships Kora, an indigenously built guided missile corvette, and Sumedha, an indigenously built offshore patrol vessel participated in the Exercise. Bangladesh Navy was represented by BNS Abu Ubaidah and Ali Haider, both guided missile frigates.

The harbour phase of the exercise included professional and social interactions, and friendly sporting fixtures, in addition to the tactical level planning discussions on the conduct of the exercises at sea. The sea phase of the exercise facilitated ships from both the navies to participate in intensive surface warfare drills, weapon firing drills, seamanship evolutions and coordinated air operations in a tactical scenario.

India-Bangladesh joint military Ex Sampriti-X

As part of the ongoing India Bangladesh bilateral defence cooperation, a joint military training exercise Ex Sampriti-X was conducted at Jashore Military Station in Bangladesh from 5 June to 16 June 2022. Exercise SAMPRITI is an important bilateral defence cooperation endeavour conducted alternately by both countries which aims to strengthen and widen the aspects of interoperability and cooperation between both the armies. The aim of the exercise is to strengthen interoperability between the two armies and to understand each other's tactical drills and operational techniques. The Indian contingent of company strength was represented by a battalion of the DOGRA Regiment.

During the joint military exercise Ex Sampriti-X, armies of both the Nations shared expertise in multiple simulated scenarios of Counter Terrorism, Humanitarian Assistance and Disaster Relief and UN Peacekeeping Force under UN mandate. In addition to sharing best practices and understanding each other at the tactical level, this exercise was an opportunity for greater cultural understanding to strengthen trust and cooperation between armies of both the Nations. The exercise will "benefit both the armies by gaining from each other's vast experience which will further contribute to peace and stability in the region".

Indian Army in Ex Khaan Quest 2022, Mongolia

A Multinational Peacekeeping exercise "Ex Khaan Quest 2022" featuring participation from military contingents from 16 countries commenced in Mongolia in June. Mr Ukhnaagiin Khurelsukh, the President of Mongolia inaugurated the Exercise in an impressive ceremony organised at the exercise location in Mongolia. Indian Army was represented by a contingent from

the Ladakh Scouts. The 14 day exercise was aimed at enhancing interoperability, building military to military relationships, developing peace support operations and military readiness among participating nations. The exercise also enabled sharing of best practices between the Armed Forces of participating nations and will include field training exercises, combat discussions, lectures and demonstration.

INS Satpura visits Manila

Towards enhancing military cooperation with the navies of friendly foreign countries, Indian Naval Ship Satpura on a deployment to the South China Sea (SCS) and West Pacific, visited Manila from 3 to 6 June 2022. The visit was aimed at

strengthening mutual working relationships and interoperability between the Indian Navy and the Philippines Navy. During the visit, the Commanding Officer, Captain Saket Khanna called on Commodore Roy Vincent Trinidad, Deputy Commander of the Philippines Fleet. The IN ship was visited by officers and sailors of the Philippines Navy, who were briefed about the indigenous design and construction of the modern stealth frigate. Personnel from both navies also participated in friendly football and basketball matches.

INS Satpura is an indigenously designed and built 6000 tonnes guided missile stealth frigate equipped to seek and destroy adversaries in air, surface and undersea. The ship is a part of the Eastern Fleet based at Visakhapatnam.

Visit of RAAF P8A to Goa

P8A aircraft of Royal Australian Air Force (RAAF) arrived at Goa on 6 June 2022 to undertake coordinated operations with the P8I of Indian Navy (IN) from 7-9 June 2022. The P8I squadron INAS 316 at INS Hansa, Goa interacted and hosted the RAAF P8A aircraft. The RAAF P8A and IN P8I aircraft undertook coordinated operations involving Anti-Submarine Warfare and Surface surveillance. Previously, IN

P8I aircraft had operated from Darwin, Australia in April 2022 and undertaken coordinated operations with RAAF P8A in Northern Australian waters. The Indian and Australian P8 aircraft have been regularly undertaking coordinated operations, as part of various bilateral and multilateral exercises like MALABAR and AUSINDEX.

38TH India–Indonesia CORPAT

The 38th edition of India–Indonesia Coordinated Patrol (IND-INDO CORPAT) between Indian Navy and Indonesian Navy was conducted from 13-24 June 2022. Indian Naval Ship INS Karmuk, an indigenously built missile corvette based at the Andaman and Nicobar Command, along with a Dornier maritime patrol aircraft, participated in the CORPAT whilst the Indonesian Navy was represented by KRI Cut Nyak Dien, a Kapitan Pattimura (PARCHIM I) class corvette.

Maritime interaction between India and Indonesia has expanded substantially with frequent port visits, participation in bilateral/multilateral exercises and training exchanges. Under the broad ambit of this strong maritime relationship, the two navies have been carrying out CORPATs along the International Maritime Boundary

Line (IMBL) every year since 2002, with the aim of keeping this vital part of the Indian Ocean Region safe and secure for commercial shipping and international trade. The CORPAT has also strengthened understanding and interoperability between the navies and facilitated institution of measures to prevent unlawful activities at sea as well as conduct Search and Rescue (SAR) operations.

IAF and Egyptian AF

UAE Air Force Airbus A330MRTT refueling IAF Su-30MKIs enroute Egypt

The Indian Air Force participated in the Tactical Leadership Programme at Egyptian Air Force Weapon School from 24 June to 24 July 2022 in Egypt (Cairo west Airbase) with three Su-30MKI aircraft, two C-17 aircraft and 57 IAF personnel (including C-17 contingent). It was a unique exercise with air assets in a large force engagement environment, simulating various conflict scenarios. The exercise was aimed at enhancing defence cooperation between the two countries and exchange of best practices.

In the present geopolitical scenario, this exercise provided a unique opportunity to showcase reach and capability of the IAF. It also provided an opportunity to showcase the Su-30MKI manufactured in India by HAL and "our country's expertise for deeper indigenisation of spares and components".

INS Chennai at Saudi Arabia

Indian Navy Ship INS Chennai which arrived at Jeddah, Saudi Arabia port on an operational turnaround visit on 26 June 2022. On its arrival, it was received by Saudi Naval and Indian Embassy officials.

INS Satpura at Pearl Harbour in Hawaii for RIMPAC-22

INS Satpura entered Pearl Harbour in Hawaii Islands on 27 June 2022 to participate in RIMPAC-22. INS Satpura and one P8I maritime patrol aircraft from the Indian Navy participated in one of the largest multilateral Naval Exercises, the US Navy led biennial Rim of the Pacific (RIMPAC) exercise 2022. The exercise spanning over six weeks of intense operations and training was aimed at enhancing interoperability and to build trust among navies of friendly foreign countries; 27 countries participated in the current edition of the multi-dimensional exercise.

INS Satpura is an indigenously designed and built 6000-tonne guided missile stealth frigate; a frontline unit of Eastern Fleet based at Visakhapatnam, INS Satpura is currently on an extended operational deployment in the 75th year of India's Independence.

INS Kochi visits Safaga, Egypt

INS Kochi, Mission Deployed in the Red Sea visited Port Safaga, Egypt from 28-30 June 2022.

During the ship's visit, Rear Admiral Sameer Saxena, Flag Officer Commanding Western Fleet (FOCWF), along with Captain Himadri Bose, Commanding Officer, INS Kochi, called on Rear Admiral Mohamed Nabil Ibrahim Ahmed, Base Commander of Safaga Naval Base, Egyptian Navy. His Excellency Mr. Ajit Gupte, Ambassador of India to Egypt, also met Rear Admiral Sameer Saxena, FOCWF onboard INS Kochi.

Engagements between Indian Navy and Egyptian Navy personnel included a friendly football match at the Red Sea Navy Base, where RAdm Mohammed Nabil Ibrahim Ahmed, was the Chief Guest. Personnel from both the navies also carried out ship visits. On her departure from Safaga on 30 June 2022, INS Kochi participated in a Maritime Partnership Exercise with the Egyptian Navy ships ENS Al Zubair and ENS Abu Ubadah (Lurssen Class Offshore Patrol Boats). The exercise comprised of Visit Board Search and Seizure (VBSS) drills, communication exercise, flag hoist drills and operational manoeuvres including ceremonial steampast.

India's participation in Seychelles Independence Day celebrations

The Indian Navy contingent joined personnel of the Seychelles Defence Force (SDF) and citizens of Republic of Seychelles for the Independence Day celebrations. INS Kolkata, an indigenously built stealth guided missile destroyer of the Indian Navy, was deployed to Port Victoria, Seychelles to coincide with the Independence Day of Seychelles on 29 June 2022 and was dressed overall to mark the ceremonial occasion. A marching contingent of IN personnel along with Musical Band joined the Military Parade held at the Unity Stadium at Roche Caiman on 3 July 2022. During the port call, INS Kolkata delivered two engines of Dornier aircraft of the SDF, which were overhauled at Hindustan Aeronautics Ltd (HAL), Hyderabad. A set of engineering spares were also delivered to Seychelles Coast Guard (SCG) for sustenance of SCG ships.

SCG personnel embarked INS Kolkata from 29 June to 3 July 2022 to conduct joint surveillance operations in the Exclusive Economic Zone (EEZ) of Seychelles along with Dornier Maritime Patrol Aircraft of Seychelles Air Force. During this phase, the ship facilitated operational training of SCG personnel to complement the ongoing training support provided by Indian Navy.

Eastern Fleet ships visit Singapore

As part of their deployment to South East Asia, Indian Naval Ships Sahyadri and Kadmatt under the Command of Rear Admiral Sanjay Bhalla, NM, Flag Officer Commanding Eastern Fleet, visited Singapore from 1-3 July 2022. INS Sahyadri is an indigenously built multi-role stealth Frigate and INS Kadmatt is an indigenously built ASW Corvette.

During the visit, the IN crew participated in professional interactions with the Republic of Singapore Navy (RSN) towards enhancing mutual cooperation and interoperability. Social and informal exchanges, aimed at consolidation of ties and mutual understanding between the Navies were also undertaken. The visit of IN ships helped "enhance maritime co-operation and bolster India's strong bonds of friendship with Singapore that would further contribute towards security and stability in the region". The ships' visit also coincided with Singapore Armed Forces (SAF) Day. Rear Adm Sanjay Bhalla FOCEF visited the Kranji War Memorial in Singapore and paid tribute to men and women who laid down their lives in the line of duty during the Second World War.

INS Satpura and P8I at RIMPAC

Indian Navy's indigenous Frigate INS Satpura and P8I LRMRASW aircraft were

at Pearl Harbour in Hawaii taking part in one of the largest multilateral naval exercises, the Rim of the Pacific exercise, also known as RIMPAC. While Satpura reached Hawaii on 27 June 2022, the P8I aircraft arrived on 2 July 2022. The harbour phase of the exercise saw participation in multiple symposiums, exercise planning discussions and sports competitions. The crew also visited the historic museum ship USS Missouri and paid homage to fallen soldiers who made the supreme sacrifice during World War II at USS Arizona Memorial.

INS Satpura and the P8I maritime patrol aircraft participated in the exercise which spanned over six weeks of intense operations and training aimed at enhancing interoperability and building trust among navies of friendly foreign countries. 28 countries, 38 warships, 9 land forces, 31 unmanned systems, 170 aircraft and over 25,000 personnel participated in the multi-dimensional exercise.

Indian Navy's P8I LRMRASW aircraft arrived at AFB Hickam, Joint Base Pearl Harbour, Hawaii, USA to participate in the 28th edition of the biennial Rim of Pacific (RIMPAC-22), the world's largest international maritime exercise. The P8I Detachment led by Cdr Puneet Dabas was received by Wg Cdr Matt Stuckless (RAAF), Head of MPRA operations from Hickam airfield. P8I participated in coordinated multinational, multiplatform advanced Anti-Submarine Warfare operations along with 20 MPRAs from seven participating nations.

INS Tarkash visits Djibouti and exercises with Sudan Navy

Indian Navy's stealth frigate INS Tarkash, visited Djibouti as part of her long range overseas deployment followed by Maritime Partnership Exercise with Sudan Navy. The

ship was on a deployment to Rio de Janerio, Brazil, which is intended to coincide with the Independence Day enabling her to hoist the tricolour in South America on the occasion as part of Azadi ka Amrit Mahotsav.

At the strategically-vital port, Captain Abraham Samuel, Commanding Officer of the ship, called on Mr. Ramachandran Chandramouli, Ambassador of India to Djibouti. The Indian Navy maintains continuous presence in the Gulf of Aden region as part of its mission-based deployment philosophy. INS Tarkash also conducted a Maritime Partnership Exercise with Sudan Navy ships Almazz (PC 411) and Nimer (PC 413) in the Red Sea near the Sudan Naval Base on 07 July 2022. The exercise included manoeuvres, flying operations for vertical replenishment, visit and board operations, and communication procedures. It provided opportunity for exchange of professional experiences and strengthening maritime cooperation between the two countries.

INS Tarkash is a state-of-the-art platform and has a weapon-sensor fit that enables her address threats in all dimensions. The ship is part of the Indian Navy's Western Fleet and functions under the operational command of the Flag Officer Commanding-in-Chief, Western Naval Command.

Wings India 2022

Asia's largest event on civil aviation at Hyderabad

Wings India 2022, Asia's largest event on civil aviation (Commercial, General and Business) kicked off on 24 March 2022 at Begumpet Airport, Hyderabad with the first day witnessing a chock full of activity. More than 125 international and domestic exhibitors along with 11 hospitality chalets, 15+ country delegations and 29+ States and UT's participated.

Some of the exhibitors participating in the event included Government of Telangana (Host State), Government of Haryana, CSIR – National Aerospace Laboratories, Government of Madhya Pradesh, Andhra Pradesh Airports Development, Airbus, Embraer, GMR Infrastructure Ltd., Pawan Hans Ltd., Pratt & Whitney, Rolls Royce, Turbo Aviation, etc.

At the start of the day, Airbus released its India Market Forecast and briefed about their A350. IAF's Sarang team performed spectacular helicopter aerobatics and wowed the gathering. National Aerospace Laboratories (NAL) had a demo flight of NAL-Hansa NG, its two-seater trainer aircraft. NAL also showcased it NAL-Octacopter with drone formation show as well as unveiled the SARAS-Mk II aircraft mockup.

Ms. Usha Padhee, Jt Sec Ministry of Civil Aviation seen participating in the Round Table on Helicopter Industry

An agreement between CSIR-National Aerospace Laboratories and Scientech Technologies Pvt Ltd was signed for "Technology Transfer on Multicopter Drones" for societal applications like medicine delivery, agriculture, earth surveillance (Octacopter, Hexacopter, Quadcopter).

Embraer displayed its largest commercial aircraft, the E195-E2 at Wings India 2022. With its stunning 'TechLion' livery, the E195-E2 was the cynosure of all eyes. The aircraft is the largest member of the new generation E-Jets family, the E-Jets E2, and is designed to seat up to 146 passengers in its signature two by two seating.

Airbus showcased its long-haul aircraft A-350 at the static display. The company also displayed a scale model of its single aisle A220 aircraft, purpose-built for the 100-160 seat market.

The Sarang team in action

The day was marked with various panel discussions and round tables with including senior Ministry officials and key policymakers, global experts, corporate leaders and other stakeholders.

A Round Table on 'Helicopter Industry' discussed the growth story of Indian Helicopter industry (India@75), the issues, challenges, and brainstorming solutions for the way ahead. Helicopter Emergency Medical Service (HEMS) and Urban Air Mobility emerged to be the use cases that were going to drive the future of helicopter sector in India as per the panel. Ms. Usha Padhee, Joint Secretary, Ministry of Civil Aviation, Government of India expressed her happiness to witness full-scale participation of various delegations in the Wings India 2022, the biggest event of the ministry after the onset of COVID. Ms Padhee informed the panel that the Helicopter Acceleration Cell was the governments dedicated tool to engage with the sector to address and cater to the dynamics needs of helicopters and its operations in India.

Round Table Discussion on Helicopter Industry held on the first day of Wings Aviation 2022

Mr Sunny Guglani, Co-Chair, FICCI General Aviation Taskforce and Head of Airbus Helicopters, India & South Asia stated that the helicopter was the key thread of the fabric of aviation in India and mentioned that it was an honour to start the Wings Aviation Show with the first roundtable on Helicopters. Informing the roundtable panel about the return of commercial flights to pre-covid levels, Mr Guglani called for a 'Vision 1000 Helicopters' in India. Emergency rescue, Aerial work, Disaster response and Airborne law enforcement were a few use cases that the panel discussed as critical for viewing Helicopters as a nation building tool, he added.

The Business Aviation Roundtable focused on the use of General Aviation aircraft for business purposes; business aviation being a part of general aviation focuses on the business use of airplanes and helicopters.

Mr Rohit Kapur, President of Jet HQ Asia said that business Aviation suffered during the COVID pandemic but had seen a huge demand for charter services. The demand for charter aircraft was huge and the supply not adequate, he said. He urged the Government to look for ways to make easy finance available for people who wanted to enter the industry.

Speaking on the occasion Mr Rajan Mehra, CEO of Club One Air, said that the pandemic highlighted the importance of safety. Chartered flights, in the earlier days, were looked at as for only the rich and famous; the pandemic changed the perception. It made public realise that there was more to general aviation than as it was thought earlier. General Aviation is an enabler for economic growth, and employment generation. General Aviation has grown exponentially, he said. Further, Mr. Mehra said that people had realised that safety was more important than luxury and comfort. And that travelling charter was not as expensive as they thought it to be.

Moderator Ms Kanika Tekriwal, Co-Chair FICCI General Aviation Taskforce & Co-Founder & CEO, JetSetGo Aviation Services Pvt. Ltd India while commenting on the growth said that earlier Dubai Airport used to witness about 20 VT (Indian-registered aircrafts) landings per month, but now it was 4 VT landings per day.

Addressing the audience at the panel discussion 'The Outlook: Aviation Financing and Leasing', Mr. Dipesh Shah, Executive Director, International Financial Services Centres Authority (IFSCA) stated that IFSCA India could match the flourishing aircraft leasing sector of Ireland. He also mentioned that India now hosted 15 aircraft lessors. Talking with the panel, Mr Simran Singh Tiwana, CEO, Star Air noted that though the commercial aviation load factor in India was fast approaching pre-Covid levels, the rising fuel costs was having a detrimental impact on operations. Mr Vasuki Prasad, Sales Director – APA, Embraer claimed the Regional Connectivity Scheme (RCS) to be an effective risk reduction tool which guaranteed fixed revenue to an airline, thereby making aircraft leasing more lucrative for those in the aviation finance and leasing sector.

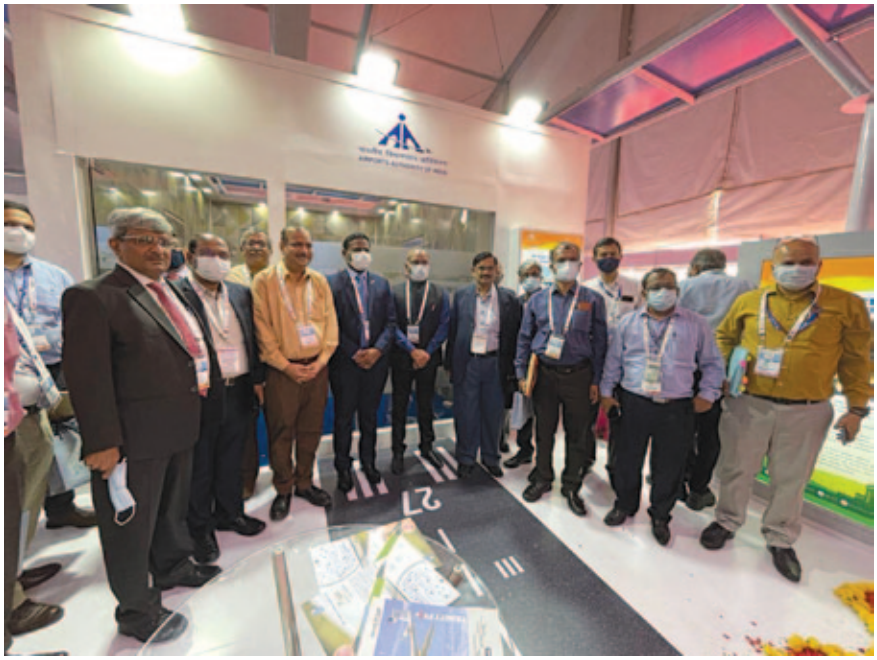
Mr Suvendu Choudhary, Managing Director of International Operations, FedEx Express explained the challenges involved in creating a sterile corridor for transportation of vaccines in the panel discussion around air cargo.

A panel discussion on 'Making India a Global Drone Hub by 2030: Issues & Way Forward' discussed how the perception had changed on drones especially with the use of drones as life saving tools in the battle against Covid-19. The session examined the future of drones with emphasis on technology, infrastructure, standard/ regulations, safety, privacy, collaborations, R&D and public acceptance.

BEL and AAI collaborate on Air Traffic Management Systems

In a major boost to its own diversification drive into non-defence and the Government's 'Make in India' programme, Bharat Electronics Limited (BEL) and Airports Authority of India (AAI), under it's R&D initiative, at Wings India 2022, entered into an agreement for the joint, indigenous development of systems for air traffic management and surface movement of aircraft at airports in the country which were hitherto being imported.

Under this Agreement, BEL and AAI will jointly develop Civil Air Traffic Management System (ATMS) with



Advanced-Surface Movement Guidance and Control System (ASMGCS), a complex ground surveillance system that manages air traffic at airports and in Indian Civil Airspace for safe operation of flights from take-off to landing.

The aim of ATMS with ASMGCS is to provide the air traffic controller with the complete air traffic picture of the coverage area while interacting with Primary/ Secondary Radar, Automatic Dependent Surveillance-Broadcast (ADS-B), Multi-lateration System (MLATs), and navigational equipment such as GPS, Instrument Landing System (ILS) and Doppler Very High Frequency Omni Range (DVOR). It also interfaces with multiple sub-systems including Aeronautical Fixed Telecommunications Network (AFTN), Airport Operational Database (AODB), Airport Collaborative Decision Making (ACDM) and Centralised Air Traffic Flow Management system (CATFM). The system is used in congested airports and airspaces to serve large volume of air traffic, including military flights.

Pratt & Whitney announces new capabilities centre in Bengaluru

Pratt & Whitney announced its plans to open a world-class global supply chain support centre in Bengaluru, India. The India Capability Centre (ICC) will employ hundreds of analysts and data scientists to augment Pratt & Whitney's global supply chain, focused on digital capabilities.

The center began recruiting for its first tranche of 160 aerospace analysts and data scientists and is expected to begin initial operations by April 2022. The centre will be co-located at Collins Aerospace's campus in Yelahanka, Bengaluru.

"India provides the perfect ecosystem of aerospace talent, innovation and capabilities for us," stated Ashmita Sethi, president and country head, Pratt & Whitney. "Over the years we have made significant investments, including our state-of-the-art India Customer Training Centre in Hyderabad and our advanced R&D centre in Bengaluru. Our new centre is a great example of our continued commitment to India, and we aim to grow our in-country capabilities further."

The India Capability Centre will collaborate with teams across Pratt & Whitney's global supply chain, and will focus on supply chain operations, procurement, and digital analytics. "India's ICC will deliver seamless international collaboration. We look forward to building a team that is curious, innovative and aligned to Pratt & Whitney's mission – and Bengaluru serves as the perfect talent hub," stated Sandeep Sharma, director, India operations, supply chain, Pratt & Whitney Canada.

Boeing: India to lead South Asia air traffic growth

Boeing shared projections for South Asia's commercial aviation sector over the next 20 years, with the region leading the world in yearly passenger traffic growth. The company shared its annual South Asia and India Commercial Market Outlook (CMO) at Wings India 2022, anticipating resilient long-term demand for commercial airplanes and services following the COVID-19 pandemic.

South Asia's air travel sector is dominated by the Indian market, which accounts for about 90% of the region's passenger traffic. India's continued economic growth and its expanding middle class will fuel demand across South Asia for 2,400 new commercial jets valued at nearly $375 billion during the 20-year forecast period, according to Boeing.

Single-aisle airplanes will increase their share of total airplane demand to

serve India's vast domestic market and competitive regional market, which includes established carriers as well as start-up airlines. To improve and expand long-haul connectivity – especially routes from India to North America and Europe – carriers will continue to invest in versatile, fuel-efficient widebody airplanes.

"We project robust demand for air travel in South Asia with carriers increasing services, and passengers feeling confident about travel to see family and friends and do business, as well as from air cargo," stated Dave Schulte, managing director, regional marketing, Boeing Commercial Airplanes. "Key elements that will promote continued growth in the region will be the competitive domestic market and opportunities in international routes, both backed by government policies to reduce airline cost and taxes," added Schulte.

Salil Gupte, President, Boeing India, stated, "India continues to develop as one of the world's largest civil aviation markets as it ramps up its capabilities and capacity in infrastructure and services. At Boeing, we are committed to support this growth through our Make in India supplier partnerships, next-generation products and solutions, technologies and services, to advance the future of commercial aviation."

Other insights from Boeing's CMO forecast through 2040 include:

- Indian operators will need just over 2,000 new single-aisle airplanes to meet demand during the forecast period. Single-aisle airplanes such as the 737 family will continue to serve growth in domestic and regional markets, including flights from India to the Middle East and Asia Pacific regions.
- Indian carriers will need 240 new widebody airplanes such as the 787 Dreamliner to meet long-haul demand.
- India's air cargo growth is expected to average 6.3% annually, driven by the country's manufacturing and e-commerce sectors, including its Make in India initiative. Boeing forecasts demand for more than 75 freighters, including 10 widebodies and 737 Boeing Converted Freighters.
- India's civil aviation industry will require close to 100,000 new pilots, technicians and cabin crew personnel, with an increasing number of women pursuing aviation careers.

Airbus: India aircraft demand seen at 2,210 over next 20 years

India will require 2,210 new aircraft over the next 20 years, according to Airbus' latest India Market Forecast. That fleet could comprise 1,770 new small and 440 medium and large aircraft.

Over the next decade, India will grow to have the largest population in the world, its economy will grow the fastest among the G20 nations, and a burgeoning middle class will spend more on air travel. As a result, passenger traffic in India will grow at 6.2% per annum by 2040, the fastest among the major economies and well above the global average of 3.9%.

India has witnessed an upward trend in the growth of air traffic over the last ten years – with domestic traffic growing almost threefold and international traffic more than doubling. On international routes, India has only about 1/10th of the widebody fleet installed in similar markets, depriving homegrown carriers of a larger share of the profitable long-haul routes now dominated by foreign airlines.

"We have seen India's domestic market develop strongly with our flagship A320 aircraft. It is time now for Indian carriers to unlock the potential of international travel in and out of India, leveraging the country's demographic, economic and geographic dividends," stated Rémi Maillard, President and MD, Airbus India & South Asia.

"Whether it is expanding existing airlines or supporting new airlines, there must now be a re-fleeting and rethinking about future-oriented solutions with technology that paves the way for sustainable long-range travel. The A350 is the perfect solution for that," Maillard said, announcing the India Market Forecast on the opening day of the Wing India air show. "The complete Airbus product line comprises the only

aircraft specifically designed for the small single-aisle market, the A220, the world's best-selling A320 Family, the mid-size widebody A330/330neo and the Long-Range Leader, the A350. In the freight market, Airbus aircraft are available with the A320/321P2F (Passenger to Freighter), the A330-200F and A330P2F as well as the world's newest freighter, the A350F", he further added.

To serve its growing aviation industry, India will require an additional 34,000 pilots and 45,000 technicians by 2040.

Airbus India highlights:

- New aircraft needs: 1,770 small, 440 medium and large
- 6.2% annual growth in passenger traffic (global average 3.9%)
- New pilot needs: 34,000; New technician needs: 45,000
- About 64% backlog order share; 74% of in-service fleet
- Airbus will deliver more than one aircraft to India every week for the next 10 years
- Airbus supports 7,000 jobs, including about 1,650 engineers in India
- Annual sourcing from India at more than US$650 million

Airbus A350 takes centre stage at Wings India

The Airbus A350 was the focus of attention at the Wings India airshow. Showcasing the 'future of long-haul travel', Airbus put the A350 on static display along with its portfolio of products and services that are fostering the growth of commercial aviation in India. Hyderabad was also the last stop of the A350's demonstration tour of India.

At Hyderabad, Airbus was present at Stand 12 in Hall A. The company displayed a scale model of its single aisle A220 aircraft, purpose-built for the 100-160 seat market that can 'prove to be a game changer' for regional connectivity in India. Alongside it was a cutaway model of the A350-900. Airbus Helicopters showcased scale models of the ACH130 from its corporate portfolio and the multi-role H160.

India's flybig to acquire 10 DHC Twin Otter Series 400

De Havilland Aircraft of Canada Limited announced that Big Charter Private Limited had signed a Letter of Intent to purchase up to ten new Twin Otter Series 400 aircraft for operation by its promoted airline, flybig. The companies will work towards a definitive purchase agreement that would include five firm-ordered aircraft and options for another five. "In conjunction with the UDAN initiative, the Indian Government's recently released policy to assist in serving small and remote communities, flybig's goal is to provide connectivity to communities that were not previously accessible by air," stated Captain Sanjay Mandavia, Chairman and Managing Director, flybig. "De Havilland Canada's Twin Otter Series 400 is the right aircraft for our operations because of its proven record for safe, reliable operations and its versatility including the capability to land on land or water."

JetSetGo participates at Wings India

JetSetGo, an ascent to India's private charter industry, that manages and operates the largest private jets and helicopter fleets in the country, displayed it's Legacy 600 VT-SFU and Hawker XP 800 VT-POP as a part of their static display.

The intent of displaying the aircraft is connecting the buyers, sellers and investors at a common forum to initiate the dialogues of the business. JetSetGo's strategic placement of The Hawker 800XP at the airshow displayed its potential and showcased it being the right choice for today's travel. The Hawker 800XP is a

well-known business jet ideal for mid-range destinations. Manufactured by Hawker Beechcraft, the Hawker 800XP provides a luxury flight experience in a spacious cabin that fits up to 6 passengers. The six-seater luxury jet has a unique AFT closet and can fly at a cruise speed of 448 knots and a range of 2,572 nm.

The other displayed aircraft Legacy 600 VT-SFU features among one of the few aircraft with a seating capacity of 13 passengers. Manufactured by Embraer, Legacy 600 VT-SFU is also one of the 'favourite among group travellers'. Capable of traveling on longer routes with an added range via extra fuel tanks in the tail behind the baggage compartment and forward of the wing, winglets, and an extensive drag reduction programme, Legacy is ideal for traveling internationally. It is certified to fly at 41,000 feet (12,000 m) altitude versus 37,000 feet (11,000 m) for the airline configuration.

Boeing, SpiceJet, CSIR-IIP to lead in SAF

Boeing, SpiceJet, and CSIR-Indian Institute of Petroleum (IIP) announced that they were working together to explore opportunities for the use of Sustainable Aviation Fuel (SAF) in the Indian aviation industry, as part of the organisations' commitment to help reduce carbon emissions, contributing to the Indian Government's environmental goals. The companies will work together to leverage SAF supply from CSIR-IIP and its production partners and licensees to help SpiceJet decarbonise its fleet. SAF can reduce CO2 emissions by as much as 65% over the fuel's life cycle with the potential to reach 100% in the future. It is recognised as offering the most immediate and greatest potential to decarbonise aviation over the next 20 to 30 years.

Made from several feedstocks, SAF is certified for commercial use and can be blended with traditional jet fuel without modifications to airplanes, engines, or fueling infrastructure.

In 2021, Boeing committed to deliver its commercial airplanes capable and certified to fly on 100% SAF by 2030. This announcement builds on Boeing's long-term industry leadership and investment to develop SAF around the world, partnering with airlines, fuel companies, governments and research institutions to expand SAF supply and reduce its cost. This announcement builds on Boeing's 'long-term industry leadership and investment to develop SAF around the world, partnering with airlines, fuel companies, governments and research institutions to expand SAF supply and reduce its cost'.

IOC signed between HAL and PHL for helicopter purchase/lease

Mr. Sanjeev Razdan, CMD, PHL (right) and Mr. S Anbuvelan, CEO, Helicopter Complex, HAL (left) exchanging the Intent of Cooperation documents in the presence of Mr. Jyotiraditya M. Scindia, Minister of Civil Aviation (centre)

An Intent of Cooperation (IOC) was signed between HAL and PHL for purchase or long term lease for 20 helicopters, 10 each civil variants of ALH Dhruv and Light Utility Helicopters at Wings India-2022. This would also bring synergy between HAL and PHL in helicopter ecosystem and strengthen helicopter business in India's civil aviation market.

HAL's LUH

The IOC was signed between Mr. Sanjeev Razdan, CMD, PHL and Mr. S Anbuvelan, CEO, Helicopter Complex, HAL in the presence of Mr. Jyotiraditya M. Scindia, Minister of Civil Aviation, Mr. Vemula Prashanth Reddy, Minister of Roads, Buildings, Legislative Affairs and Housing, Telangana, Mr. R Madhavan, CMD, HAL and others. The IOC has been signed in-line with the Government's vision of "Aatmanirbhar Bharat".

Rolls-Royce Explores Opportunities for its Trent engines for widebodies

Rolls-Royce, one of the world's leading industrial technology companies, is keen to explore opportunities in the growing Indian civil aviation market. At the Wings India 2022 event the company focused on familiarising customers with its advanced Trent family of engines, including the Trent 700, Trent 1000, Trent 7000 and Trent XWB. The Trent family is the most successful widebody programme and Trent powered fleets account for over 25% of all engine flying hours on routes to and from India today. All of Rolls-Royce engines are certified to run on a blend of up to 50% sustainable aviation fuel (SAF) and Rolls-Royce is committed to making all its engines compatible with 100% SAF by the end of 2023.

Kishore Jayaraman, President - India & South Asia, Rolls-Royce, stated, "Rolls-Royce has a strong legacy of partnership with India starting with powering the first commercial aircraft of Tata in 1932, and since then we have been contributing towards the development of a strong aerospace ecosystem in India. With India poised to become the third largest air passenger market, Rolls-Royce is well-positioned to meet the demands of a growing civil aerospace sector. As India sees more domestic and international routes opening up, there is a strong case for induction of widebody aircraft into the fleet mix of airlines in India."

Rolls-Royce have a strong supply chain for Trent engine components in India. Last year at Aero India, Hindustan Aeronautics Limited (HAL) was awarded new business from Rolls-Royce to supply forgings including shrouds, cases and seals for Rolls-Royce's Trent family of engines and for the Pearl 15 engines.

Boeing develops modernisation roadmap for AAI

Boeing announced the completion of its milestone project for Airports Authority of India (AAI), to develop a comprehensive 10-year Communication, Navigation and Surveillance/Air Traffic Management (CNS/ATM) modernisation roadmap, undertaken with a grant from the US Trade and Development Agency (USTDA). Boeing, with AAI, conducted a comprehensive analysis across operational, environmental, regulatory, technological, safety, and financial factors to develop and present a roadmap that AAI can use as guidance to modernise the Indian National Airspace System across communication, navigation, surveillance, and capacity and traffic management – aligned with global best standards.

AAI provides ANS infrastructure such as Air Traffic Services (ATS) Automation Systems at the airports, Surveillance Systems (RADAR/MLAT/ADS-B/SB-ADS-B), Communication equipment, Navigational Aids like Instrument Landing Systems (ILS), DVOR/DME. Presently, AAI has 44 ATM Automation Systems at different airports, One Centralised Air Traffic Flow Management Centre at Delhi, 48 Surveillance Radar and 22 ADS-B Sensor spread across Indian subcontinent, 11 Airports equipped with ASMGCS for surface movement monitoring & guidance, 64 CAT-I, one CAT-II and 9 CAT-III ILS system at various airports. AAI in collaboration with ISRO provide state of the art GAGAN services for enhancing navigation capabilities to users in India and nearby subcontinents. AAI has three Civil Aviation Training Institutes at Prayagraj, Hyderabad and Gondia to provide trained ANS manpower for Indian airspace.

Mr Kishore Jayaraman, President - India & South Asia, Rolls-Royce and Chris Davie, Senior Vice President Customers -Asia Pacific

(L-R): AAI team led by Sanjeev Kumar, Chairman, Airports Authority of India, and Boeing team led by Ahmed Elsherbini, MD, BIETC, and Chief Engineer, Boeing India, commemorating the completion of CNS/ATM project at Wings India 2022

VAYU on-the-spot report

Successful conclusion to ILA Berlin Airshow

Federal Chancellor Olaf Scholz opened ILA Berlin with a tour of the show. "For those who want to find out what the future of aviation really has in store, ILA is the right place to be", he said in his opening speech. Pioneering aerospace – the slogan of this year's ILA, not only harked back to the origins of the oldest aerospace show and aviation's traditional pioneering spirit. It above all reflected the expectations of an industry which almost unlike any other stood for innovation and progress. The federal chancellor expressly thanked the exhibitors and companies present. They were the true "pioneers of aerospace". "They whet our appetite for aviation's future – climate-neutral, low-noise and highly innovative."

Among those who accompanied the chancellor were Federal Transport Minister Dr. Matthias Wissing, Governing Mayor of Berlin Franziska Giffey, Minister President of Brandenburg Dr. Dietmar Woidke, and Federal Government Aerospace Coordinator Anna Christmann. Federal Minister of Economics Robert Habeck took part in a tour to also find out about

Eurofighter Typhoon, Bundeswehr

Airbus Beluga XL

NH-90 Sea Lion, Bundeswehr

aerospace innovations for achieving climate-neutrality. Federal Minister of Defence Christine Lambrecht visited the representations of the Bundeswehr on the Static Display and at the Military Support Center. The Bundeswehr was the largest exhibitor at ILA.

This year, around 60 aircraft of all sizes and categories were displayed at ILA. There were the "giants of the sky", an A380 airliner and Beluga transporter from Airbus, military aircraft including a Lockheed Martin F-35 multi-role combat aircraft, a Boeing CH-47 Chinook heavy-lift helicopter, as well as mock-ups of innovative devices such as the Volocopter flying taxi, the fully electric Rolls Royce Spirit of Innovation, and the hydrogen-powered Apus i-2.

ILA Berlin again confirmed its standing as Europe's leading aerospace exhibition. At the Space Pavilion the focus was on the benefits of space flight for life on Earth. One high point was the Astronaut Talk featuring Matthias Maurer, Alexander Gerst, Thomas Reiter and Reinhold Ewald. The Advanced Air Mobility displays presented the entire spectrum of unmanned aircraft systems and electric vertical take-off and landing aircraft (eVTOLs). At the Future Lab the main topic was the path to achieving climate-neutral aviation by 2050. At the Military Support Centre the Luftwaffe and industry demonstrated how together

Flypast with an A330MRTT and Tornados plus Typhoons

they are working to ensure the operational readiness of aircraft and equipment. And on the stage of the International Supplier Center ISC the focus was on the latest topics that concern suppliers – including climate-neutral aviation, digitalisation and the stability of supply chains.

For five days (22-26 June 2022) the Berlin/Brandenburg region was a hub and platform for exchanging views on the future of aerospace. Taking as its slogan 'Pioneering Aerospace', it gathered representatives of international industry, politics, the armed forces and science. Around 550 exhibitors from 29 countries presented a wide range of high-tech products and research and development projects. Some 260 speakers discussed the latest aerospace topics on five stages. Key issues included climate-neutral flight, military security and the benefits of space flight for humanity. There was keen public interest in the event – tickets for the general public on the open weekend sold out quickly.

Volker Thum, chief executive of the BDLI stated, "ILA was the first aerospace show to take place in Europe since the pandemic began. The keen interest shown by visitors and exhibitors, the significant presence of German policymakers and the partnership with the European Commission sent a clear message: aviation, space flight and defence have become mainstream topics in society. They are a decisive and integral part of our everyday lives. With that comes a special responsibility for us. From the perspective of long-term sustainability, the focus is on how to hand over today's world to a future generation with the ecology, economy and security in mind. ILA highlighted the big progress we have already made, with research and development on climate-neutral aviation, communications and climate observation from space, and with technologies for our security and defending our values. But we also saw that we still have a long way to go. In that sense 'Pioneering Aerospace', this year's slogan at ILA, remains our commitment to the future."

Martin Ecknig, CEO of Messe Berlin GmbH stated, "Following the break due to the pandemic we are delighted that ILA has made a strong comeback. The past few days showed that face-to-face meetings are vital for the aerospace industry. As Europe's leading innovative trade show for the aerospace industry, ILA Berlin has brought its members back together – in person and on the grounds at BER Airport in the heart of Europe. ILA 2022 was impressive proof that, more than any other event, it stands for innovation and the new technologies of this high-tech industry."

Airbus' successful ILA Berlin Air Show

Airbus made headlines during ILA Berlin with key developments spanning the company's military, civil, air mobility and cybersecurity businesses – led by a landmark contract for Spain's acquisition of 20 latest-generation Eurofighter combat aircraft. ILA Berlin was the first major European air show since 2019, and this event enabled Airbus to underscore how it pioneers sustainable aerospace for a safe and united world. It had a full range of aircraft on static display and in the flight demonstrations, as well as at the indoor exhibits at Berlin ExpoCenter Airport.

Topping the ILA Berlin news was Spain's order for a fleet of E-Scan (electronically scanned) radar-equipped Eurofighters to replace F-18s operated by the Spanish Air Force from Gando Air Base on the Canary Islands. With deliveries to begin in 2026, these new single- and twin-seat combat aircraft will increase the Spanish Air Force's overall inventory to 90 Eurofighters, positioning it among NATO allies with the most modern fighter jet developed in Europe.

Six other announcements at ILA Berlin spotlighted Airbus' efforts to move the aviation industry's goals forward for aviation sustainability and advanced air mobility, with the company undertaking an increasingly diverse range of initiatives and lining up key partnerships. This included Airbus support for the German Air Force's start-up of future flight trials using A400M multi-role airlifters powered by up to 50 percent Sustainable Aviation Fuel (SAF).

Another development announced during ILA Berlin was the first ever helicopter flight performed with 100 percent SAF that powered both Safran Makila 2 engines on an H225 rotorcraft. Such tests are expected to continue on other helicopter types with different fuel and engine architectures, with a view to certifying the use of 100 percent SAF by 2030.

A delivery ceremony at ILA Berlin marked the handover of the first of two A321LR (Long Range) aircraft for the German armed forces. It was reconfigured from the commercial version by Lufthansa Technik AG for flexible troop and passenger transport – as well as parliamentary flight operations – on short, medium and long-haul routes.

With the H145M battlefield support helicopter displayed at ILA Berlin, the air show was a highly appropriate venue for Airbus' contract announcement for six of these rotorcraft to be operated by the Cypriot National Guard. The order, from the Government of Cyprus, is for the H145M version with a six-blade main rotor – and includes options for another six.

Successful 27th edition of Eurosatory

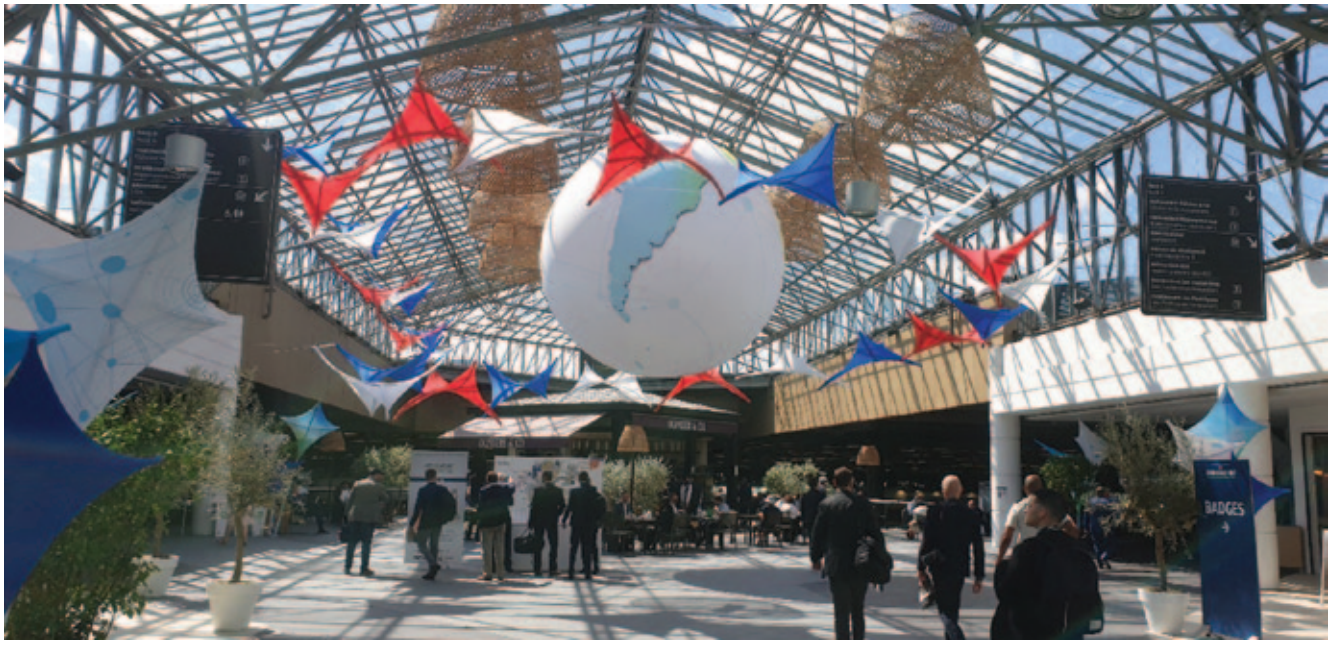
After a four-year absence due to the health crisis, the 2022 edition of the international land and airland defence and security exhibition was eagerly awaited by the entire international community of the sector. In the particular context of conflicts at the gates of Europe, this edition was one of the most significant in the history of the exhibition.

1,743 companies and more than 100,000 professionals gathered in Paris from 13 to 17 June for this "must-attend" event, which brought together all the players in the global defence and security market. 250 delegations from 96 countries, high-level executives and decision-makers from the public and private sectors, and project leaders came to the event over the 5 days. The success of this record-breaking edition lay in the "reunion" and meetings between exhibitors, partners and international visitors eager to discover the latest developments in the global defence and security capabilities. Busy stands, busy exhibitors and crowded aisles were the hallmarks of the five-day event.

"The exhibition was very qualitative, with stands designed and decorated for the occasion. For this comeback edition, exhibitors put a lot of energy into welcoming visitors and official delegations. Everyone was happy to be at Eurosatory 2022", stated Jérémy Vigna, Sales Director of the exhibition.

For the first time, the exhibition was inaugurated by the President of the French Republic, Emmanuel Macron. In the context of the war in Ukraine, the President of the Republic took advantage of the exhibition's inauguration to recall the central role of the defence and security industry in the preservation of national and European sovereignty.

Visitors discovered the first French demonstrator of capabilities to respond to



all types of humanitarian, industrial and/or environmental crises. 75 companies exhibited in the "HELPED - Humanitary Emergency Logistic Projet and Eco Development" area, to present the whole spectrum of global capacities needed to support populations in case of major crisis and to restore the environment. A global response designed specifically for the exhibition.

Foresight, the new post-crisis world order, experience sharing and the dissemination of professional practices suitable for each profession were at the heart of 110 international conferences held throughout the exhibition. More than 300 speakers from all over the world came to share their vision and reflect on the evolution of Defence and Security.

The Eurosatory Lab, a space dedicated to startups, attracted many visitors. As well as the pitching programme, which allowed to discover many innovative startups during the different sessions on current themes: performance, maintenance, robotics, security and safety of territories, artificial intelligence.

In conclusion, this 2022 edition, which stood out as a record year in terms of attendance, was part of the momentum of three major global trends: the return of inter-state conflicts, global warming, and the digital revolution. Charles Beaudouin, the exhibition's CEO, concluded, "Held in the context of a new world order, Eurosatory reinforces its position as the world's most important D&S event, setting trends in the management of all crises, from war to environmental disasters".

Nexter's air defence aspirations

Nexter exhibited solutions that meet the needs of anti-drone and ground-air defence in partnership with Thales by offering the RAPIDFire weapon system for low altitude ground-air defence. In the future, Nexter will position itself as a system integrator for new anti-drone systems. RAPIDFire in its land version can defend against targets that are 4 km away and is a 1/10th scale model

identical to the naval version that will equip the new French Navy's supply ships (BRF) by the end of 2022. This remotely operated multi-role artillery system, armed with the Jaguar's 40CTA gun, is equipped with its own tracking and pointing systems designed by Thales. Accurate and ergonomic, RAPIDFire offers a close-in self-defence capability against surface and air threats, from the smallest civilian drone to rockets, missiles, helicopters and aircraft.

Nexter Arrowtech FB 375 Mk2 artillery fuze

Nexter/KNDS showcased the wide range of artillery systems and 155mm shells offered by Nexter Arrowtech at Eurosatory.

Nexter showcased the design of the LU 220 explosive shell, which in the future will provide even greater range and terminal effect with a new architecture and greater explosive capacity, while maintaining a high level of precision and safety. Nexter Arrowtech also presented its new "FB 375 Mk2" multimode artillery fuze. The FB 375 Mk2 features an inductive fuze that can be programmed according to the mission, which will complete its range.

KNDS continues to grow

The defence technology group KNDS, in which Krauss-Maffei Wegmann (Germany) and Nexter (France) merged to form the leading European company for military land systems, ammunition and related services, presented its key figures for fiscal year 2021. The company continued its growth trajectory on a solid basis in an environment that remained strongly affected by the coronavirus pandemic and other uncertainties. With a slight decline in incoming orders of 2.8 billion euro, KNDS' consolidated order backlog reached another record high of 10.7 billion euro. Major orders came from Germany with the upgrade of the Puma infantry fighting vehicle to the latest standards, as well as from the Czech Republic and France for the Caesar artillery system. The Group generated sales of 2.7 billion euro in 2021, while its workforce grew to 8,767 employees. The revenue contributions to the 2021 financial year consisted of deliveries of the Griffon and Jaguar vehicle systems

to the French Armed Forces as well as the realisation of the enhanced combat effectiveness programme for the Leopard 2 fleet of the German Bundeswehr.

Eight Milrem Robotics' THeMIS UGVs exhibited

Milrem Robotics, the leading European robotics and autonomous systems developer, was the most represented in its field at this year's Eurosatory exhibition in Paris with a total of eight differently configured THeMIS intelligent robotic systems on display. Of the eight unmanned ground vehicles

(UGV) at the show, two were exhibited at Milrem Robotics' stand, one at the live demonstration and five in the stands of various partners. Eurosatory 2022 featured

five THeMIS Combat UGVs integrated with weapon stations by the top of their field manufacturers like KONGSBERG, Hornet, Nexter, EOS and FN Herstal.

In addition, the company exhibited their autonomous THeMIS Observe UGV intended for intelligence, surveillance and reconnaissance (ISR) missions that is also integrated into Milrem Robotics' command and control (C2) system.

Kongsberg and Milrem and the Type-X RCV

units the means to breach enemy defensive positions with minimal risk to their own troops. It can be fitted with a cannon up to 50 mm, anti-tank missiles and a tethered drone for continuous situational awareness. Milrem Robotics' Type-X is equipped with intelligent functions such as follow-me, waypoint navigation and obstacle detection with Artificial Intelligence being part of the algorithms. With the Type-X Milrem Robotics also introduces a feature called Indirect Drive that allows remote-controlled operations on higher speeds.

Milrem Robotics and Kongsberg Defence & Aerospace successfully performed the first live firing of the Protector Remote Turret from the Type-X Robotic Combat Vehicle (RCV). The first firing on the second week of June was carried out with Kongsberg's Protector RT40 which includes the Bushmaster 30 mm cannon and a linkless ammunition handling system.

The Type-X, which the NRW is based on, provides equal or overmatching firepower and tactical usage to a unit equipped with IFVs and gives mechanised

Robotic solutions from General Robotics

General Robotics introduced at Eurosatory the latest versions of robotics systems developed by the company and used by special operations and counter-terror operators worldwide. On display were the third generation DOGO MKIII assault robot, a new lightweight reconnaissance robot – the CHAMELEON, and the latest version of the PITBULL lightweight remote-controlled weapon station (RCWS) enhanced with advanced Smart-AI capabilities.

Scarabée: a recce and anti-tank version

Scarabée is a tribute to Arquus' expertise for designing reconnaissance, scouting and combat vehicles. It is a product thought for export markets, which aims at conquering new markets in the fields of recon, cavalry and high-intensity anti-tank combat. Scarabée is also Arquus' effort towards the future VBAE (Véhicule Blindé d'Aide

à l'Engagement, Armoured Vehicle for Engagement Support) programme which aims at renewing the French Army's VBLs, as well as supplying partner European armies with light armor capabilities. The Scarabée exhibited at Eurosatory has evolved since its last appearances in le Bourget (2019), the Arquus Day (2020), IDEX (2021) or the Arquus Technoday (2021). It was presented in a reconnaissance and combat version, with a 12.7mm and AKERON Hornet RCWS on top.

Scorpion programme: the Griffon SAN qualified

In accordance with the framework set by the Scorpion programme, the Sanitary version of the Griffon has recently been qualified by the French procurement agency (DGA). Designed within the GME EBMR (Nexter, Arquus and Thales), the Griffon is a modern 24-ton multi-role armoured vehicle (VBMR) integrated into the Scorpion

information system. The 1872 Griffon planned by the Scorpion programme are being delivered to the Army since 2019. The first Griffon SAN are expected in 2023.

Arquus presents its upgraded VAB MK3

The VAB Mk3 is Arquus' flagship on the 6x6 market. Already in service and combat-proven in various armies around the world, it is a modern APC/IFV that Arquus "constantly upgrades to better answer the operational needs of the operators on the battlefield". The VAB MK3 is a very agile and well protected vehicle, which can serve as an APC or an IFV depending on the mission at hand.

Rafael and Diehl Defence strengthen cooperation

In light of the growing security threats in Europe, Diehl Defence and Rafael are strengthening their partnership by introducing for the first time the recently-unveiled SPICE 250 ER, alongside the gliding SPICE 250 as a system intended to be manufactured in Germany by Diehl Defence. SPICE 250 is the smallest of the SPICE Family, which includes the SPICE 250, SPICE 1000, and SPICE 2000. SPICE is a stand-off, air-to-surface weapon system that strikes targets with pinpoint accuracy and at high attack volumes, independent of GPS, by applying scene-matching algorithms. SPICE is combat-proven and in service with the IAF and with a number of international customers. SPICE 250 ER preserves the same characteristics of the SPICE 250, incorporating a small turbojet engine to provide substantial range extension, enabling stand-off range for the modern dynamic battle field and new advanced SAM threats, while retaining the same mission-planning system, aircraft interfaces, and aircrew operation.

XTEND highlights its Xtender Gen2

A company specialising in human-guided autonomous drone operating systems for military forces and law enforcement agencies presented its Xtender Gen2 indoor tactical UAS and provided a first look at the Wolverine Gen2, its multi-mission UAS (MMU) system at Eurosatory 2022. The company also showcased its nest UAS solution, integrated with Easy Aerial's EGV 50 compact autonomous drone-nest solution for military vehicles and Plasan's ultralight armoured vehicle, the WILDER. The collaboration between the three companies brings new capabilities

to the battlefield. Forces can now perform indoor and outdoor missions safely from within the armoured vehicle, and remotely perform tasks such as IED clearance while on patrol and assessment of suspicious facilities encountered.

Camero-Tech launches Xaver 1000

Member of Samy Katsav Group- SK Group, and world leader and pioneer in developing, producing and marketing pulse-based UWB micro-power radar 'Through Wall Imaging' systems, launched the Xaver 1000, the new generation of the Camero Xaver product line that offers unprecedented operational capabilities to military forces, law enforcement agencies, Intelligance units, and first responders. The Xaver 1000 has an AI-based tracking algorithm of live targets and its own 3D 'Sense-Through-The-Wall' capability, enabling it to detect and 'see' people or static objects behind walls and obstacles. Live objects can be seen in high resolution down to the level of specific body parts. This includes whether an object is sitting, standing or lying down, even after they have been stationary for a long period of time.

Airbus selects Elbit to provide DIRCM

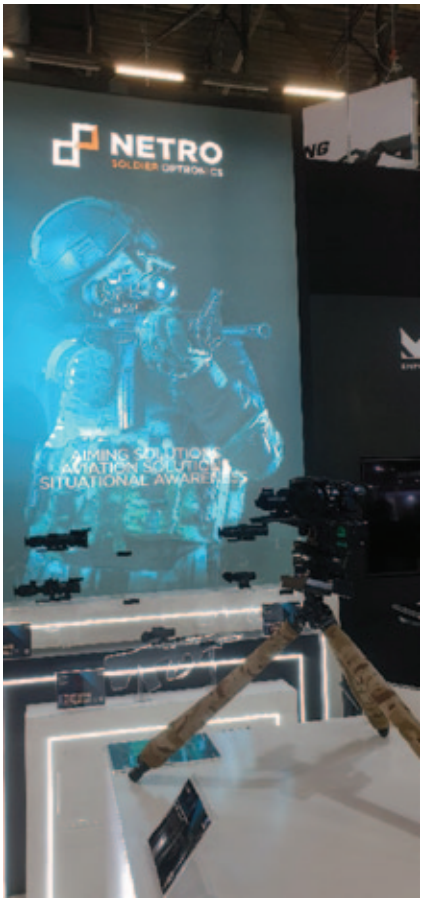
Elbit Systems has been selected by Airbus Defence and Space to provide J-MUSIC DIRCM (Direct Infrared Countermeasures) including the Infra-Red-based Passive Airborne Warning Systems (PAWS IR), for Airbus A330-200 MRTT aircraft of additional European Air Force. The Company's DIRCM systems integrate the latest laser technology, high frame-rate thermal cameras and a compact, dynamic high-speed sealed-mirror turret, delivering high performance defense against ground-to-air IR missiles. Elbit Systems has been cooperating with Airbus on equipping aircraft of additional countries with DIRCM and Electronic Warfare (EW) systems, including NATO's Multinational Multirole Fleet, German Air Force's aircraft, aircraft of the UAE Air Force and others.

Pakistan at Eurosatory

India at Eurosatory


BOMB
1000 LBS HE


DCM TRISHUL
DCM KAILASH


NETRO
AIMING SOLUTIONS
AVIATION SOLUTIONS
SITUATIONAL AWARENESS


AMOGHA VII ANTI TANK
GUIDED MISSILE


BDL


PINAKA DPICM


MKU
EMPOWERING HEROES
EMPOWERING HEROES
PEARSON ENGINEERING
NETRO
KAVRO
KAVRO
AUTRO
MKU
MKU
MKU

Nammo at Eurosatory

Nammo extends artillery range with smarter 155mm rounds

It was interesting to see the range of 155mm artillery systems on display by Nammo during Eurosatory 2022. While the US Army is working on the Extended Range Cannon Artillery (ERCA) programme to provide it with a longer 58cal gun capable of firing over longer distances, Terry Russell, VP of business development for Nammo Defense Systems, noted the pressing need to modernise tactical fires too. He stated, "Most NATO artillery systems are still confined to a short range of about 20 miles, which leaves them vulnerable to counter-battery fire. With this in mind, Nammo at Eurosatory 2022 is showcasing its portfolio of smarter artillery ammunition. Examples include the 155mm IM HE-ER (base-bleed), the 155mm HE-LR (rocket-assist) and the 155mm HE-ExR (ramjet) munitions. These are designed to meet various international programmes, especially the Long-Range Precision Fires programme for the US Army".

The HE-ER variant uses base-bleed technology to extend the range of Nammo 155mm ammunition from 30km to 40km. The 155mm HE-ER round is likely to replace standard 20 mile-capable ammunition. The HR-LR is powered by solid rocket propellent grain to provide additional propulsion and range. The round has an ignitor that lights the rocket motor inside.

Whereas an average 155mm round might reach 30km, range with the HR-LR more than doubles to around 70-85km. Nammo also displayed its ramjet HE-ExR round that it is developing with Boeing. Once the programme is completed, Nammo expects the ExR to reach ranges of 150km.

With its ultra-long range, a ramjet-powered artillery round has the potential to fundamentally change how artillery systems could be used in future.

Boeing, Nammo conduct ramjet 155mm artillery tests

A team from Boeing and the Norwegian company Nammo has conducted successful ground-fire tests of its Ramjet 155 Extended Range Artillery Projectile – a technology to enable long-range precision fires, one of the US Army's key modernisation priorities. The tests, led by Nammo and conducted during the months of January and March in Norway, validated gun-launched survivability and performance predictions, and expanded Ramjet 155's employment envelope.

"Long-range precision-fires is a top modernisation priority for the US Army," stated Steve Nordlund, Boeing Phantom Works vice president and general manager. "Therefore, it also is a top priority for Boeing. We are very encouraged by the development progress, maturation and ongoing testing of our Ramjet 155 projectile, which we believe will offer a superior, affordable capability against emerging threats."

"We are seeing excellent progress in the development of the ramjet, with no major stumbling blocks," stated Nammo CEO Morten Brandtzæg. "The latest tests have been extremely promising."

Since 2019, Boeing Phantom Works and Nammo have been working together under a strategic partnership to jointly develop and produce the next generation of boosted artillery projectiles to meet the Army's long-range, precision-fire priorities. Ramjet 155 uses an engine in which the air drawn in for combustion is compressed solely by the forward motion of the projectile at supersonic speeds. The team continues to develop and mature the technology, with further testing and demonstrations planned in the coming months.

Turkey's Otokar displays 6 armoured vehicles at Eurosatory 2022

Otokar, Turkey's global land systems manufacturer participated in Europe's largest defence industry exhibition, Eurosatory 2022, on June 13-17, in Paris, France. During the 5-day exhibition, Otokar promote its wheeled and tracked armoured vehicles as well as its capabilities in land systems. The company presented the following vehicles:

- TULPAR Medium Tank, with COCKERILL 3105- 105 mm turret system
- TULPAR Infantry Fighting Vehicle, with 30 mm RAFAEL SAMSON Remotely Controlled Turret
- ARMA 8x8 Multi-wheeled Armored Vehicle, with 30 mm OTOKAR MIZRAK Remotely Controlled Turret
- ARMA 6x6 Multi-wheeled Armored Vehicle, with 25 mm OTOKAR MIZRAK Remotely Controlled Turret
- COBRA II MRAP Mine-resistant Ambush Protected Vehicle
- COBRA II Personnel Carrier

Pointing out that Eurosatory was one of the most important events of the defence industry, Otokar General Manager Serdar Görgüç stated, "As a global player in defence industry, we are delighted to exhibit our vehicles again at Europe's largest defense industry event. In 1990s when Otokar decided to exhibit Turkey's first armoured vehicle abroad, our first choice was Eurosatory. Since then this exhibition is particularly important for us to meet our current users and develop partnerships with potential users. We are proud to be here with 6 vehicles of different types and features from our broad product range."

Reminding Otokar is a listed NATO and UN supplier, Görgüç continued. "Otokar's military vehicles are actively in service in more than 35 countries and more than 55 end users in different climates and geographies around the world. Our combat proven know-how in land systems and related R&D, engineering and testing capabilities as well as our wide product range put us at the forefront of the global defence industry. We analyse different needs and expectations of our users, simulate these requirements in house and develop solutions that meet these requirements in the fastest manner. As a global brand in international defence industry, we are closer to our current and potential users at Central Asia and Gulf Region more than ever, thanks to our subsidiary companies Otokar Central Asia and Otokar Land Systems. We constantly continue to improve our capabilities and look for expansion opportunities in different regions".

Aeronautics at Eurosatory 2022

Unmanned Hover Plane (UHP) Trojan launched

Aeronautics Group, a leading provider of integrated solutions based on unmanned aerial systems, payloads and communications for defence and HLS applications, launched a brand new aviation category - the Unmanned Hover Plane (UHP). "The company is proud to introduce Trojan, a one-of-a-kind system, which bridges the gap between the need to hover and the need to reach long ranges. The new UHP category is a game changer, due to its ability to perform aerial missions with pinpoint precision" stated the company.

The system's capabilities support challenging operational missions while simultaneously performing point-to-multipoint Intelligence, Surveillance and Reconnaissance (ISR), thereby creating a solution for versatile and dynamic environments, and achieving Wide-Area-Persistent-Surveillance (WAPS). The system's multi-platform architecture utilises multiple sensors, together with advanced analytics capabilities, to ensure accurate, reliable, real-time situational awareness.

The revolutionary UHP configuration gives Trojan long endurance - 2.5-hour flight time, long-range - up to 150 km, and fast flight capabilities, combined with the capacity to carry multiple payloads up to 12 kg in weight, all packed into a small tactical platform. The system enables execution of demanding, complex missions by tactical base stations, each of which control up to four platforms, simultaneously. Each platform, in face of a battle scenario can channel and produce sensor data which can optimise the mission's performance.

Trojan has been designed to enable operations in harsh environments - characterised by adversary operations, day and night operational activity and extreme environmental conditions - while maintaining high efficacy within a small footprint.

The UHP's Ground Control Station (GCS) is controlled via a user-friendly interface and can be safely operated by a single operator. Collecting field information, it supports mission planning and monitoring in all operational modes, and payload control.

"Aeronautics is proud to be a pioneer in the field of tactical UAS, and our latest innovative platform introduces a new category in the world of aviation, which will expand force capabilities in the field and create superiority in ISTAR missions," stated Moshe Elazar, President & CEO of Aeronautics. "Trojan is the first ever Unmanned Hover Plane (UHP), and we are delighted to introduce its unique capabilities to the world in this 25th anniversary year of the company - an important milestone for us. Just as with our other winning systems, we are constantly developing new technologies to deal with evolving battlefield and HLS challenges."

SMARTSHOOTER unveils SMASH X4

SMARTSHOOTER, a designer, developer, and manufacturer of innovative fire control systems that significantly increase the accuracy and lethality of small arms, presented the SMASH X4, a Fire Control System with a x4 magnifying optic scope, at the Eurosatory exhibition in Paris.

SMASH X4 combines a x4 magnifying optic scope with SMARTSHOOTER's SMASH unique fire control capabilities, thus providing extended detection, recognition and identification ranges for the shooter as well as extended lethality ranges. The SMASH X4 also includes an etched reticle to allow shooting without battery power. An optional integrated laser range finder (LRF) enables range measurement both as a user-initiated capability as well as a system input for improved precision. Night-capability is also available by using the X4 with thermal night vision devices as a clip-on.

SMARTSHOOTER has recently completed the delivery of thousands of additional SMASH systems for the IDF and other customers. Deployed and combat-proven, the SMASH family of fire control systems lock on target and ensure precise target elimination of ground, aerial, static or moving targets during day and night operations. Equipped with an onboard computer to perform complex targeting solutions, SMASH enables

superior situational awareness and can be operated as a stand-alone solution as well as combined with other systems to provide an effective multi-layer defense solution.

The company presented its range of solutions at Eurosatory, including handheld operated solutions such as the SMASH X4, SMASH 3000, SMASH 2000 plus and SMASH AD; remotely controlled solutions such as the SMASH Hopper, a Light Remotely Controlled Weapon Station (LRCWS) that can be mounted on different manned and unmanned platforms and also the SMASH Dragon which is a lethal payload for small UAVs.

Michal Mor, SMARTSHOOTER CEO stated, "Handheld operated, remotely controlled, robotic or UAV mounted, the SMASH technology provides a multi-applicative capability and enables the platoon to be smart, precise and connected. The SMASH family of products can be provided separately as stand-alone solutions or in various combinations explicitly tailored to each customer's operational needs and tactical scenarios. By combining advanced augmentation display with connectivity to sensors, C4I systems and other SMASH solutions, the SMASH technology enhances the force's situational awareness and lethality. With a rich record in designing unique solutions for the warfighter, SMARTSHOOTER technology enhances mission effectiveness through the ability to accurately engage and eliminate ground, aerial, static or moving targets during both day and night operations. Designed to help military and law enforcement professionals swiftly and accurately neutralise their targets, the company's combat-proven SMASH Family of Fire Control Systems increase assault rifle lethality while keeping friendly forces safe and reducing collateral damage. With a unique technology that makes it possible for every battlefield element to be connected with every other battlefield element, SMASH creates a micro-tactical network that dramatically enhances real-time situational awareness and ensures that the entire platoon shares a common operational picture".

Roboteam and SMARTSHOOTER unveil TIGR UGV

Roboteam, a leading global provider of tactical ground robotic systems, and SMARTSHOOTER unveiled an integrated solution: a tactical ground robot utilising the SMASH technology that ensures precise hit capabilities as well as air defence against drones (C-sUAS). A highly mobile, all-weather system capable of operating in any terrain, Roboteam's Transportable Interoperable Ground Robot (TIGR) is a medium-sized, two-man carried UGV. Incorporating SMARTSHOOTER's SMASH Hopper, a Light Remotely Controlled Weapon Station (LRCWS) with pin-point accurate lethal capability, the integrated solution enhances tactical forces' lethality and survivability by providing them the ability to hit ground, aerial, moving or stationary targets from a safe stand-off distance. Lightweight, with high maneuverability and stair-climbing ability, this solution is ideal for urban scenarios, border control, subterranean and other tactical, operational missions.

UVision and SpearUAV at Eurosatory

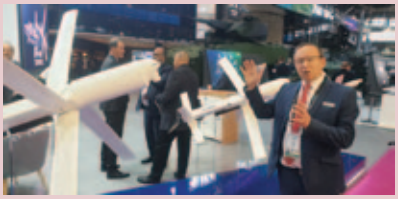
UVision and Rheinmetall present integrated capabilities of Hero LM's

UVision presented an integration of its high-precision Hero Loitering Munitions into Rheinmetall next generation manned and unmanned infantry fighting vehicles at Eurosatory 2022. The integrated solution provides frontline forces with a new independent ability to locate, track and accurately eliminate heavily-armoured targets from long ranges, in challenging battlefield conditions, including GPS-denied environments and communication jamming, without the need for external support. The joint solution provides forces with a combination of advanced ISR and long-range heavy firepower that until now could only be achieved by complicated cooperation between several units and echelons.

The integrated solution displayed at Rheinmetall's is yet another step forward in the cooperation between Rheinmetall and UVision. The strategic partnership leverages both companies' capabilities to provide the European market with precise, combat-proven weapon systems. The Hero family of loitering munitions will be available to European customers to satisfy contemporary and emerging operational requirements.

Chat with Mr Yair Ramati, Chairman of UVision

"An important tactical advantage of the field-proven HERO systems to military forces lies in their high precision strike capabilities. The unique design of the Hero HERO Loitering Munition makes it possible to conduct precision attacks in urban areas or remote locations while avoiding collateral damage. With this integrated solution, autonomous unmanned and manned ground vehicles extend the breadth of the military forces' potential and operational effectivity, by providing high-precision strike capabilities" stated Mr Yair Ramati, Chairman of UVision who took us on a personal tour around their stand and explaining in detail (and great enthusiasm) the wonderful products the company manufactures!



The Chairman went on to say that the unique design of the HERO series enabled pinpoint munition strikes in urban areas or remote locations, with minimal collateral damage. In the case of mission abort, the systems can be recalled and another target selected. The HERO series has low noise and thermal signature, integrates highly-advanced, stabilised electro-optic day/night cameras, and is ideal for deployment from air, land and naval platforms.

UVision designs and manufactures smart loitering munition systems, providing military organisations around the globe with precise and effective operational attack capabilities. Its innovative, cost-effective systems are based on cutting-edge technology and 30 years of extensive field experience by military professionals, engineers, and the company's own management team.

UVision's loitering munitions are designed with unique flight qualities for precision attack, with advanced airborne guidance and sophisticated navigation algorithms, integrated with C4I stations – thereby meeting the requirements of today's modern battlefield for combat in complex and dynamic environments.

Based on unique aerodynamic platform configurations, UVision's HERO series of loitering munitions systems provides high-precision strike capabilities, suitable for tactical and strategic targets – whether for short, medium or long-range – utilising a variety of warheads to ensure maximum mission effectiveness. The units are operationally deployed and field proven. ISO certified, UVision is "fully committed to providing turnkey solutions to its extensive network of partners and customers around the world, with high-quality service and swift support".

Spear is an Israel-based technology company, active since 2017 in the development and manufacturing of unmanned air systems for defence and HLS applications. As a single source supplier for several Israeli MOD programmes, Spear provides military clients, organisations, and governments around the globe with robust, autonomous, AI-based aerial systems. SpearUAVs' Ninox family of encapsulated UAS are instantly launched - in individual or swarm configuration - and intuitively operated. Providing combat-proven on-demand and on-the-move air capabilities, and delivering instant ISTAR missions and aerial loitering munition for precision-attack capabilities, Ninox empowers individual warfighters, and equips manned and unmanned vehicles and allied systems with a new aerial dimension that meets the challenges of today's urban battlefield.

UVision unveils its Hero-120 OPF-M (Organic Precision Fire-Mounted)

UVision USA recently unveiled its Hero-120 OPF-M (Organic Precision Fires-Mounted (OPF-M), along with the family of HERO aerial loitering munition systems, installed on both ACVs and ARVs. In 2021, the company was awarded a multi-year contract, to supply the Hero-120 OPF-M systems to the United States Marine Corps (USMC), together with its multi-canister launcher, tailored to the specific requirements of the USMC and integrated onto armoured vehicles and maritime platforms.

The Hero-120 is a mid-range, anti-armour, beyond-line-of-sight weapon system which meets the requirements of modern battlefield challenges. The high-precision, smart loitering munition system has a aerodynamic structure that carries out pinpoint strikes against anti-armour, anti-material and anti-personnel targets, including MBTs, vehicles, concrete fortifications and other soft targets in populated urban areas, while ensuring minimal collateral damage. Its wide range of multi-purpose warheads enable the operational user to effectively engage all targets.

Rheinmetall at Eurosatory

A new tank for a new era!

Rheinmetall presented the KF51 Panther at Eurosatory 2022 – "a game changer for the battlefields of the future."

Rheinmetall debuted its new KF51 Panther at Eurosatory 2022. The latest member of their family of tracked vehicles (KF is short for "Kettenfahrzeug", i.e., tracked vehicle), the KF51 Panther is destined to be game changer on the battlefields of the future. The main battle tank concept sets new standards in all areas – lethality, protection, reconnaissance, networking and mobility. All weapon systems are connected to the commander's and gunner's optics and the fire control computer via the fully digitalised NGVA architecture. This enables both a hunter-killer and a killer-killer function and thus instantaneous target engagement – in the future also supported by artificial intelligence (AI).

With its main armament, the 130mm Rheinmetall Future Gun System, the KF51 Panther offers superior firepower against all current and foreseeable mechanised targets. In addition, further armament options are available to provide concentrated firepower for long-range strikes and against multiple targets.

The Rheinmetall Future Gun System (FGS) consists of a 130 mm smoothbore gun and a fully automatic ammunition handling system. The autoloader holds 20 ready rounds. Compared to current 120 mm systems, the FGS delivers over fifty percent greater effectiveness at significantly longer ranges of engagement. The FGS can fire kinetic energy (KE) rounds as well as programmable airburst ammunition and corresponding practice rounds.

A 12.7 mm coaxial machine gun complements the main weapon. Several options for the integration of remotely controlled weapon stations (RCWS) offer flexibility for proximity and drone defence. The KF51 Panther presented at Eurosatory 2022 was equipped with Rheinmetall's new "Natter" (adder) RCWS in the 7.62 variant.

Integrating a launcher for HERO 120 loitering munition from Rheinmetall's partner UVision into the turret is equally possible. This enhances the KF51's ability to strike targets beyond the direct line of sight.

The Panther has a fully integrated, comprehensive, weight-optimised protection concept, incorporating active, reactive and passive protection technologies. The concept's most compelling feature is its active protection against KE threats. It increases the level of protection without compromising the weight of the system.

Rheinmetall's Top Attack Protection System (TAPS) wards off threats from above, while the fast-acting ROSY smoke/obscurant systems conceals the KF51 from

enemy observation. Moreover, its digital NGVA architecture enables integration of additional sensors for detecting launch signatures. Thanks to its pre-shot detection capability, the KF51 Panther can recognise and neutralise threats at an early stage. Designed to operate in a contested electromagnetic environment, the KF51 is fully hardened against cyber threats.

The KF51 Panther features an innovative operating concept. It is basically designed for a three-person crew: the commander and gunner in the turret and the driver in the chassis, where an additional operator station is available for a weapons and subsystems specialist or for command personnel such as the company commander or battalion commander.

Designed in accordance with NGVA standards, the tank's fully digital architecture enables seamless integration of sensors and effectors both within the platform as well as into a networked "system of systems". Operation of sensors and weapons can be transferred instantly between crew members. Each operator station can take over the tasks and roles from others, while retaining full functionality. Since the turret and weapons can also be controlled from the operator stations in the chassis, variants of the KF51 Panther with unmanned turrets or completely remote-controlled vehicles are also planned in the future.

Thanks to the panoramic SEOSS optical sensor and EMES main combat aiming device, the commander and gunner are both able to observe and engage targets independently of each other, both day and night, while a stabilised daylight and IR optic with integrated laser rangefinder is available to both. In addition, via a display in the fighting compartment, the crew has a 360°, round-the-clock view of the vehicle's surroundings. Integrated, unmanned aerial reconnaissance systems enhance the crew's situational awareness in built-up areas and in the immediate vicinity of the vehicle. With these, the crew can also conduct reconnaissance under armour protection and share the results with other actors in a networked manner.

The KF51 Panther builds on the mobility concept of the Leopard 2. With an operational weight of just 59 tonnes, it delivers far greater mobility than current systems and has a maximum operating range of around 500 kilometres. Without prior preparation, it fits into the AMovP-4L profile, something no other current main battle tank upgrade can do. Consequently, the KF51's tactical and strategic mobility set it apart.

Thanks to Rheinmetall's innovative development approach, users, maintenance specialists, logisticians and procurement experts from all current and future user nations can play an active role in shaping the vehicle's future. Rheinmetall has longstanding experience in establishing global supply chains in order, in cooperation with user nations, to make sure that a large share of production is carried out in-country, thus helping to create and/or preserve sovereign capabilities and capacities.

In developing the KF51, Rheinmetall not only set out to modernise existing main battle tank concepts. Starting from scratch, it completely reconceived the platform. The KF51 Panther can be easily updated and equipped with the latest capabilities and functions. Its advanced, modular, open NGVA system architecture enables iterative development, which can then be updated in harmony with innovation cycles. The KF51 is the first representative of a new generation of combat vehicles. Soon, future innovations will enable environmentally friendly peacetime operations and further optimisation regarding automation and combat effectiveness.

Busting the myth: Why you are probably wrong about the Russian tanks

Jack-in-the-box effect (Image: Wikimedia)

Since the beginning of the Russia Ukrainian war in the last week of the February 2022 this year journalists, analysts, researchers and defence enthusiasts alike are arguing if the days of the tanks are over. Incomplete data, factual inaccuracies, myths and unconfirmed claims have created a lot of fallacies regarding the Russian tanks. Let's bust the bubble!

According to the independent military research blog "Oryx" Russia has lost at least 850 tanks of which around 500 are destroyed (by 8 July). There might be data to challenge it but it cannot be discarded that the Russian losses are much higher than had been anticipated before the start of the war. Western media has purportedly has flooded the social media and news outlets with the images of burnt and destroyed Russian tanks. Once a precious weapon for the offense now lies in rubble here and there in the countryside of Ukraine. This is not the first time Russia has lost a large amount of equipment because the same happened in the Chechen conflict as well. While it cannot be discarded that these images are used for propaganda, the fact also cannot be neglected that Russian tanks are falling prey to Ukrainian equipment. Not just the old equipment like T-72A/B/AV or T-64BV but heavily upgraded and newer platforms like T-72B3M, T-80BVM and T-90A have also destroyed in the large numbers. In fact the most advanced platform in the Russian Army, the T-90M has also been destroyed. Though still now (as on 16 May) only one has been deployed and exact reason behind its destruction is not known.

So are the Russian tanks absolute trash? Should they be discarded at once? Are they no match for Western counterpart? Absolutely not! These are some serious fallacies must be discarded.

We are not going to question training of crews, loopholes in tactics, logistical failures, lack of farsightedness, blunders made by the authorities, absence of other supporting platforms or failure to establish absolute air superiority; because these are human factors and can lead any army towards their doom. We will just compare the platforms of the both the sides - the shield and the sword.

If you are keeping eye on this ongoing conflict you might have heard that the US and various European nations have supplied a wide range of weapons including man portable anti-tank guided missiles (ATGM) to Ukraine. These ATGM are the second most important reason behind the destruction of such a huge number of Russian platforms. First is the artillery strike!

Russian forces are seen on the streets of Mariupol on 15 April 2022. (Photo: CNN)

Russia's forces were not prepared for the resistance posed by Ukraine (Photo: BBC)

Javelin, NLAW, Brimstone, Panzerfäust-3, Carl Gustaf, M72 LAW, Stugna, Corsar etc. are some of the most lethal weapons to be used by the Ukrainian forces successfully rendering a huge chunk of Russian armoured thrust obsolete. Another weapon should he mentioned here is PARM DM22. Unlike a missile it's an off-route anti-tank mine. But this too has tasted blood! And why these are so lethal? Let's discuss.

The anti-tank guided missiles (and such mines) carry a kind of warhead known as HEAT - High Explosive Anti Tank. It has a hollow charge which comprises of an outer casting housing a cone shaped metal liner and an explosive. If the explosive is detonated too close to the target optimum penetration might not be achieved. To overcome this HEAT warheads carry stand-off probe at the nose which houses piezoelectric trigger. When it hits the target at a stand-off distance the trigger generates an electric current which is transmitted to the fuze detonating the explosive. However modern ATGM uses RF (radio frequency) proximity for same. When the explosive is detonated, it generates a very high pressure turning the liner into semi liquid stage. The shock wave created by the explosion deforms the structure squeezing the cone resulting collapse. This creates a jet of high temperature which is squirted through in hypersonic velocity thus defeating even heavily armoured platforms. By the way spinning leads toward less efficiency of the warhead as the centrifugal force generated by such spinning disperse the jet. For better stabilisation both the anti-tank shells and missiles with HEAT warhead have fins attached at the end of their body.

To counter such threats many defensive mechanism have been taken. Two of the most widely used are - statistical armour and reactive armour.

Statistical armour means slat/bar/cage armour where the platform is covered by a rigid metal railings or barrier in form of a cage. The gap between these netting is small enough to stop flight of a RPG warhead but allows the stand-off trigger to slip through. The attached main body of the warhead collides with the net in high speed and gets deformed generating short circuit. So now the fuze can't trigger the mechanism negating the threat. But this might work against only RPG type of weapons. Anti-tank missiles are larger in diameter and they use different kind of proximity. Warhead in the modern ATGM also is placed much behind of other components ensuring detrimental penetration.

Russian military vehicles are seen at the Chernobyl power plant near Pripyat, Ukraine, on 24 February. Russian forces seized control of the plant, the site of the world's worst nuclear disaster. (From Telegram.)

An armoured convoy of pro-Russian troops travel on a road leading to Mariupol on 28 March

(Photo: Alexander Ermochenko/Reuters)

Reactive armour is a passive layer of armour reacting upon strike by the anti-tank round. Russia mainly uses ERA- explosive reactive armour. In ERA a layer of explosive is sandwiched between a pair of metal plates. When triggered by imminent HEAT attack, the explosive inside detonates triggering the plates to move in high speed effectively disrupting shaped charge jet as well as increase the length of the path to cover, thus reducing lethality significantly. Though it was Israel who pioneered the mechanism, Russia embraced it soul heartedly and currently is ahead of anyone in this field. In past decades Russia has developed several ERA gradually enhancing their defensive capability- Kontakt 1, 5, Kaktus, Relikt and the latest Monolit. To counter such defensive mechanisms current anti-tank missiles carry multiple warheads, two or sometimes even three, known as tandem charge. While precursor charge triggers the ERA, follow on warheads take care of the armour behind.

Modern man portable weapons are "fire and forget" and have the "top attack" capability. That means such platforms do not need illumination or constant guidance by the operator. Thus the operator can conceal himself once the weapon is fired and the missile will hit the target on its own. And the top-attack signifies their capacity to strike a tank on the top of the turret where it is the least armoured, thus increasing the lethality. Javelin and NLAW are such top attack weapons. Currently there is no proven remedy against such threats.

So doesn't Russia know about all this? Absolutely they do. Then where did they make the blunder? Choosing wrong shield and the wrong sword!

A convoy of Russian military vehicles is seen 23 February in the Rostov region of Russia, which runs along Ukraine's eastern border. (Photo: Anadolu Agency/Getty Images)

Russian howitzers are loaded onto train cars near Taganrog, Russia, on 22 February. (Photo: The New York Times/Redux)

During the 2020 Nagorno-Karabakh conflict tanks of the both the sides (Armenia and Azerbaijan) fell prey to loitering munitions. Taking lessons from this conflict Russia equipped its fleet of tanks with a cage armour on the tank top, which earned the nick name "cope cage". This is just another slat armour but placed on the top of the tank. Unfortunately for them the cope cage didn't prove to be too effective. Rather loitering munitions, top-attack anti tank missiles rained upon it as the harbinger of death. It is already explained how any top-attack missile be proved deadly for such platform. It cannot be said how much effective it would be against a loitering munitions. Such warhead has proximity or contact fuze. The bar armour could disrupt the warhead of the munition, the ERA bricks would further mitigate the effect. But it's capability against an anti-tank missile is doubtful. The tandem charges are likely to defeat these defences and burn everything inside. But once again, the lack of proven evidence turns this into mere hypothesis.

But these were the vulnerabilities we were discussing till now. Not necessarily those ATGM were successful in each and every of their strikes. There are plenty of cases where a platform was subjected to multiple hit. There are clear examples of defeat of incoming projectiles by activated ERA plates. The fog of war doesn't let come out the clear picture and most of the cases the cause behind they can't be determined easily. It is evident many of the Russian platforms were destroyed after they had been abandoned by the crew. So the shield actually does work. Tests of such ERA plates by both the West and Russia have showcased their importance. So if they are much capable what led the tanks towards their grave? A fatal weakness?

Whatever weapons have hit the Russian tanks, they have fallen prey to the "jack-in-the-box" effect. The countless pictures of the destroyed Russian origin tanks, lying turret less, are actually result of this. The T series use an auto-loader and ammunitions are arranged in a carousel. The crew sits directly on the auto-loader itself! A successful penetration by any anti-tank round likely to hit the storage causing cooking-off one or multiple ammo. Even hit by fragmentation or spalling can trigger one. This leads towards a massive and instantaneous pressure inside the turret, along with continuous detonation of other

stored ammunitions in a chain reaction and conflagration, resulting violent blow of the turret.

But there's a catch. The carousel is actually very well protected. The top is covered by a thick armoured plate as a measure against fragments. The wheels of

Ukrainian service members unpack Javelin anti-tank missiles that were delivered to Kyiv as part of a US military support package for Ukraine. (Photo: Valentyn Ogirenko/Reuters)

Destroyed T-90M, top view (screen grab from a video)

the tanks make a well armoured position for the carousel. The vulnerability is created by additional storage of the ammo outside of the carousel! While the carousel carries 22 shells, the maximum storage capability by a T-72B (and follow-on platforms) is 45 which are stored in a very unprotected manner, mainly near the engine compartment and side hull. So in case of a penetration these are the one which trigger the entire event.

However, this design should be considered as a weakness not any flaw in the designs as believed by many. In fact for decades Western tanks too have fallen prey to this. Soviet wanted to keep their tanks a low profile platform. Such designs have not only made T series tanks a low silhouette but addressed the weight issue as well. But this vulnerability has cost the reputation.

The most potent mechanism against ATGM could be the APS (active protection system). Unfortunately, Russia lost (on 17 March in Sumy Oblast) its sole T-80UM2 equipped with Drozd 2 APS in this conflict. And no T-72B3 equipped with Arena has been deployed. So the capability of the Russian APS can't be determined.

So how does western tanks fare against such threats? Let's talk about the Big Three- M1A2 Abrams, Leopard 2 and Challenger 2.

Burnt turret of T-90A, front view (Image: Wikimedia)

They use a much larger turret than the Russian counterpart. Along with the crew safety, crew comfort is taken care of as well. Such turrets are heavily armoured and often are incorporated with additional armoured plates reducing the vulnerability. Due to the larger space, the chance of crew getting caught by HEAT jet by a top-attack ATGM is also minimised. Yes, top armour of the even most protected tanks are also vulnerable to such weapons. The jet itself has much narrow radius but after penetration likely to disperse at an angle up to 45° around enhancing the danger. But again the large space inside and other things present their though doesn't nullify but decreases the chance of the crew getting hit. This however doesn't mitigate probability of the tank getting knocked out.

Though still now most of the Western tanks like Leopard 2, Challenger 2, Leclerc or Merkava IV storage the ammunition in the hull either fully exposed or in a lightly armoured capsule. This has lead towards catastrophe for them as well, like what Russia has suffered. Only in the Abrams, this problem has been addressed extensively. Here the ammunition stowage both in the hull and turret is fully isolated by sliding armoured blast doors while magazines are equipped with BOP (blow off panels). This help to vent out explosion gases through BOP in case of a penetration. The latest Leopard 2A7 and Challenger 3 also have taken measures for safer ammunition storage in the bustle. The M1A2 SepV3, Leopard 2A7A1 and Challenger 3 are not only heavily armoured but also equipped with Trophy active protection system. No doubt, these three current are the most protected and safest tanks in the world.

Russia has taken note of the vulnerabilities of its own platforms and negated most of them in their T-14, the latest design by them. However, it's still under trials. While, the current platforms have been modernised as much as possible to address drawbacks. The actual performance of such platform can be determined only by unbiased tests and analysis. The fog of war doesn't let this happen. So reports are to be taken with a pinch of salt!

Tanks are not obsolete. And not will be in the near future. There always will be the need of a combination of firepower, protection and mobility. The sheer capability of a tank always will remain unmatched by any other. At the end, let's pray for the peace. Wish the sheer madness and bloodbath is over as soon as possible.

Sankalan Chattopadhyay
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1st flight of Airbus A321XLR

Airbus' first A321XLR (Xtra Long Range) successfully accomplished its first flight. During the flight, the crew tested the aircraft's flight controls, engines and main systems, including flight envelope protections, both at high and low speed. The A321XLR is the next evolutionary step in the A320neo single-aisle Family of aircraft.

Spain orders 20 Eurofighters

The NATO Eurofighter and Tornado Management Agency (NETMA) signed a landmark contract for the acquisition of 20 latest generation Eurofighter jets. Known as the Halcon programme, the order will cover the delivery of a fleet of E-Scan (Electronically Scanned) radar equipped fighter aircraft consisting of 16 single-seaters and 4 twin-seaters to replace the F-18 fleet operated by the Spanish Air Force on the Canary Islands. This contract will see the Spanish Eurofighter fleet grow to 90 aircraft.

Sikorsky in US$2.3 billion US Army Black Hawk contract

Sikorsky has signed a five-year US$2.3 billion contract for a baseline of 120 H-60M Black Hawk helicopters, with options to reach a total of 255 aircraft to be delivered to the US Army and Foreign Military Sales (FMS) customers. The contract value for expected deliveries has a potential value of up to $4.4 billion, should options for additional aircraft be fully exercised. Multi-Year X deliveries are scheduled to begin in July and continue through 2027.

Northrop Grumman F-16 EW suite integration

Northrop Grumman has received a contract from the US Air Force to continue preparing the AN/ALQ-257 Integrated Viper Electronic Warfare Suite (IVEWS) for developmental test and full hardware qualification. Northrop Grumman is preparing IVEWS for a series of hardware and software verification tests leading up to F-16 flights planned for later in 2022.

Airbus awarded new orders in China

Airbus confirmed the signature of orders with Air China, China Eastern, China Southern, and Shenzhen Airlines for a total of 292 A320 Family aircraft, demonstrating the positive recovery momentum and prosperous outlook for the Chinese aviation market. Once the relevant criteria are met, these orders will enter the backlog.

Qantas for Trent XWB-97 powered A350-1000

Australian airline Qantas has committed to a deal for 12 Trent XWB-97 powered Airbus A350-1000s that will support its ambitions to operate the world's longest commercial non-stop flights. Rolls-Royce and Qantas have also committed to sign a TotalCare service agreement for the Trent XWB-97 engines that will power the 12 aircraft.

Qantas for P&W GTF to power A220/A320neo's

Pratt & Whitney announced that Qantas Airways had confirmed selection for Pratt & Whitney GTF engines to power 40 Airbus A220 and A320neo family aircraft, including A321XLR, which the airline will operate on domestic and short-haul international routes.

Cessna Citation XLS Gen2 FAA certification

The Cessna Citation XLS Gen2 is the latest model of the Citation 560XL midsize business jet series, which began with the introduction of the Citation Excel in 1998. More than 1,000 560XLs have been delivered throughout the past 25 years.

Cessna SkyCourier for FedEx Express

Textron Aviation has delivered the first Cessna SkyCourier twin utility turboprop to FedEx Express. This is the first of 50 freighter aircraft that global logistics firm FedEx Express ordered as the Cessna SkyCourier's launch customer.

BAE Australia in guided weapons export contract

BAE Systems Australia has underscored its Australian guided weapons design and manufacturing credentials by announcing it has secured a $50 million export contract to deliver critical hardware and software sub-assemblies into the global Evolved SeaSparrow Missile (ESSM) programme. The ESSM is a medium-range, surface-to-air missile developed to protect warships from advanced anti-ship cruise missiles.

GA-ASI grows Mojave line

To further extend the versatility of its MQ-9B line of Remotely Piloted Aircraft, General Atomics Aeronautical Systems, Inc. (GA-ASI) announced that it will begin developing a short takeoff and landing (STOL)-capable MQ-9B aircraft, which includes the SkyGuardian and SeaGuardian models.

APG-79(V)4 is an APG-79 radar derivative that employs the first airborne GaN-AESA fire-control radar to help pilots detect and track enemy aircraft from greater distances with greater accuracy and meets the power and cooling requirements of legacy aircraft.

Raytheon's lower tier air and missile defence sensor

The first Lower Tier Air and Missile Defence Sensor, built by Raytheon Missiles & Defense has arrived at the US Army's White Sands Missile Range. The radar is the newest air and missile defence sensor for the US Army, providing significantly more capacity and capability against the wide range of advancing threats facing air defenders around the world.

USAF conducts successful hypersonic weapon test

A US Air Force B-52H Stratofortress successfully released an AGM-183A Air-launched Rapid Response Weapon, or ARRW, off the Southern California coast. Following separation from the aircraft, the ARRW's booster ignited and burned for expected duration, achieving hypersonic speeds five times greater than the speed of sound.

Raytheon successfully tests AESA radar

Raytheon Intelligence & Space's pre-production APG-79(V)4 radar system, was successfully flown on a US Marine Corps F/A-18 Hornet earlier this year, at Naval Air Weapons Station in China Lake, California. This is the radar system's first flight on the aircraft since RI&S delivered the prototype radar in 2021. The

Raytheon developing counter-hypersonic missile

The US Missile Defence Agency has selected Raytheon Missiles & Defense to continue to develop a first-of-its-kind counter-hypersonic missile, the Glide Phase Interceptor. GPI is designed to

intercept hypersonic weapons in the glide phase of flight, providing the US and allies with an additional layer of defence against regional hypersonic missile threats.

Korea selects Bell 505

Bell Textron announced the selection of the Bell 505 as the new Republic of Korea military helicopter trainer. The new Bell 505 helicopters will be used by both the Republic of Korea Army (ROKA) and Republic of Korea Navy (ROKN) to train their next generation of helicopter pilots.

New MQ-8 Fire Scout mine countermeasure system

The US Navy is working to develop a new mine countermeasure (MCM) sensor suite for the MQ-8C Fire Scout that will enable the unmanned helicopter to detect and localise mines and obstacles on land and at sea.

USMC JAGM achieves IOC

The US Marine Corps declared Initial Operating Capability for the AGM-179A Joint Air-to-Ground Missile (JAGM) on the AH-1Z Viper. JAGM, a joint programme with the Army, is a precision-guided missile that combines semi-active laser guidance and millimeter-wave radar. It is an air-to-surface precision-guided munition (PGM) used on joint rotary-wing, unmanned aircraft systems and fixed-wing platforms to destroy high-value, stationary, and moving, land and maritime targets.

Egypt for 5000 TOW 2A's

Egypt has requested to buy five thousand TOW 2A, Radio Frequency (RF) missiles, BGM-71E-4B-RF; and seventy TOW 2A, Radio Frequency (RF) missiles, BGM-71E-4B-RF (Fly-to-Buy Lot Acceptance missiles) etc for an estimated total cost of $691 million.

BAE Systems CV90 delivered to Norway

The first CV90 combat support vehicles were delivered to the Norwegian Armed Forces during a ceremony hosted by local industry partner Ritek AS in Levanger, Norway. The four vehicles are the first of 20 modernised CV90 engineering vehicles BAE Systems will deliver, in partnership with Ritek and the Norwegian Defence Materiel Agency.

US Army awards Airbus for continued logistics support

Airbus has signed a follow-on Contractor Logistics Support (CLS) contract with the US Army to provide spare parts, material, and engineering support for the Army's entire UH-72A and UH-72 B Lakota fleet of 482 utility and training helicopters. The contract includes a six-month base and 4.5 option years, with a potential total value of more than $1.5 billion.

Gulfstream G700 continues test accomplishments

Gulfstream Aerospace Corp announced the new industry flagship Gulfstream G700 continues to make progress through Gulfstream's rigorous flight test programme. The G700 is proving strong maturity through a multitude of test points as it heads toward customer deliveries later this year.

Camcopter S-100 and the Danish Navy

The Royal Danish Navy (RDN) is operating the Schiebel CAMCOPTER S-100 for maritime surveillance. The Remotely Piloted Aircraft System (RPAS) service is delivered by the European Maritime Safety Agency (EMSA). The UAS is equipped with an L3 Wescam Electro-Optical / Infra-Red (EO/IR) camera gimbal, an Overwatch Imaging PT-8 Oceanwatch and an Automatic Identification System (AIS) receiver.

Australia for 20 HIMARS

Australia has requested to buy twenty (20) M142 High Mobility Artillery Rocket Systems (HIMARS); thirty (30) M30A2 Guided Multiple Launch Rocket Systems (GMLRS); thirty (30) Alternative Warhead (AW) Pods with Insensitive Munitions Propulsion Systems (IMPS); thirty (30) M31A2 GMLRS Unitary (GMLRS-U) High Explosive Pods with IMPS; thirty (30) XM403 Extended Range (ER)-GMLRS AW Pods; thirty (30) EM404 ER GMLRS Unitary Pods and ten (10) M57 Army Tactical Missile System (ATACMS).

Netherlands for 72 AIM-9X Block II's

Netherlands has requested to buy seventy-two AIM-9X Block II Tactical Missiles; and forty-three AIM-9X Block II+ Tactical Missiles that will be added to a previously implemented case. The original FMS case, valued at $16.8 million, included twenty-three AIM-9X Block II Tactical Missiles. The Netherlands has also requested a new FMS case for twenty-two AIM-9X Block II Tactical Missiles; forty-three AIM-9X Block II+ Tactical Missiles and one AIM-9X Block II+ Tactical Guidance Unit.

USMC C-UAS programme

Production of the Marine Air Defense Integrated System (MADIS) Remote Weapon Station (RWS) has successfully moved from Kongsberg, Norway to Kongsberg Protech Systems USA in Johnstown, Penn. with the inaugural system completing assembly and testing. Additional systems are also being built for MADIS as part of the US Marine Corps' Ground Based Air Defence (GBAD) modernisation effort.

Rolls-Royce Pearl 10X engine progresses

The Rolls-Royce Pearl 10X engine development programme is making good progress and has successfully cumulated more than 1,000 testing hours, both on the Advance 2 demonstrator and the Pearl 10X engine configuration. The Pearl 10X is the newest member of the state-of-the-art Pearl engine family and the first Rolls-Royce engine ever to power a business jet of the famous French aircraft manufacturer.

Rolls-Royce CorporateCare Enhanced Service demand

Rolls-Royce announced it has signed the 1,000th CorporateCare Enhanced service contract since the start of the programme in 2019. The enhanced service was introduced as standard for all new CorporateCare customers and is also available as an upgrade to existing contracts. The CorporateCare Enhanced service covers a wide range of additional services items for the AE 3007 and Tay engines, including troubleshooting and mobile repair team travel costs. For the Pearl 15, Pearl 700, BR710 and BR725 engines it also covers maintenance for the whole powerplant, including nacelle, engine build-up and thrust reverser, unit-related services as well as erosion and corrosion on all engine and nacelle parts.

NHV Group achieves 70,000 FH with H175

NHV Group announced that their fleet of Airbus H175 had achieved over 70,000 flying hours, a whopping 50% of the total 140,000 H175 flying hours worldwide. The success story with the H175 commenced in 2014, when NHV Group became the launch helicopter operator for this super medium aircraft type.

Sweden joins 6x6 vehicle R&D programme

Sweden has decided to join the research and development programme of the common armoured 6x6 vehicle system (CAVS programme). The agreement was signed by the Swedish materiel administration (FMV), the Ministry of Defence of Finland, the Ministry of Defence of Latvia and Patria.

Raytheon contract for SM-3 Block IIA

Raytheon has been awarded an $867 million Missile Defence Agency contract to deliver SM-3 Block IIAs to the United States and partners. The SM-3 interceptor is a defensive weapon the US Navy uses to destroy short- to intermediate-range ballistic missiles. The interceptor uses sheer force, rather than an explosive warhead, to destroy targets in space. Its "kill vehicle" hits threats with the force of a 10-ton truck traveling 600 mph. This technique, referred to as "hit-to-kill," has been likened to intercepting a bullet with another bullet.

Cyprus National Guard for six H145M

The Government of Cyprus has signed a contract with Airbus Helicopters for the purchase of six H145Ms with an option for another six aircraft. The five-bladed helicopters will be operated by the Cypriot National Guard.

Rosoboronexport showcases upgraded military helicopters

Rosoboronexport JSC (part of Rostec State Corporation) showcased new and upgraded versions of Russian helicopters at the 15th International Helicopter Industry Exhibition (HeliRussia 2022), which was held from 19 to 21 May 2022 at the Crocus Expo IEC in Moscow. At HeliRussia, Rosoboronexport showed its partners and potential customers Russian Helicopters for a wide range of applications in various weather and climatic conditions in the form of scale models and advertising materials.

In particular, Rosoboronexport demonstrated the Ka-52 scout/attack helicopter, upgraded versions of the Mi-28NE attack and Mi-171Sh military transport helicopters, as well as the Mi-38T transport/assault helicopter. In addition, visitors to the company's booth had the opportunity to get acquainted with the Mi-35M transport/attack helicopter, Mi-17V-5, Ka-32A11M, Ka-226T and Ansat military transport and utility helicopters. The entire range of various helicopters under development and production in Russia, whose delivery is possible through Rosoboronexport, were on display at the booths of Russian enterprises, including Russian Helicopters (part of Rostec State Corporation), one of the world's leading helicopter-building holding companies.

The Ka-52 scout/attack helicopter, exhibited at HeliRussia 2022 as a scale model, is currently the best in the class of attack helicopters in terms of its fighting capacity and the range of aircraft weapons used, hover ceiling and rate of climb, maximum weapons load weight and sortie radius, as well as safe and autonomous operation in field conditions. Thanks to its coaxial rotor configuration, the Ka-52 offers unique in-flight performance and maneuverability, allowing it to dominate the battlefield. It is the world's only helicopter equipped with a catapult crew rescue system. The upgraded Mi-28NE attack helicopter is fitted with the latest guided missile systems and data link equipment

for interoperability with unmanned aerial vehicles, thus enhancing its capabilities against enemy targets covered by air defences. The Mi-28NE helicopter has an increased flight speed and a higher service ceiling. The Ka-52 and Mi-28NE are equipped with a state-of-the-art defensive aids system, which automatically protects them against infrared guided missiles, thereby greatly increasing their survivability in combat conditions.

Pavel Sukhoi's combat family: "fighters that have no match in the world"

2022 marks the 45th anniversary of the maiden flight of the Su-27 fighter prototype developed by the Sukhoi Experimental Design Bureau, which marked the birth of the famed family of Su-27/Su-30 fighter jets. In the 21st century, the Su-27/Su-30 became among the most in-demand fighters in the world: they were purchased by Angola, Belarus, Venezuela, Vietnam, India, Indonesia, Kazakhstan, China, Malaysia, Uganda and other countries. Much of the credit for this should go both to aircraft designer Pavel Osipovich Sukhoi personally and the team of his unparalleled Design Bureau, which "managed to derive a technically perfect formula for the global success of the Sukhoi brand".

"Air superiority is a key factor in any confrontation. That is why we pay great attention to developing new advanced platforms. At one time, the Su-27 became a technologically breakthrough machine and the progenitor of a whole family of outstanding aircraft: the Su-30, Su-34 and Su-35. Today, these jets are the mainstay of the Russian Aerospace Forces and successfully perform missions even under especially adverse conditions on a daily basis. This is a vivid demonstration of our technological capabilities," stated Vladimir Artyakov, First Deputy Director General of Rostec State Corporation.

Currently, the family of Russia's Sukhoi high-performance heavy multi-mission aircraft systems offered for export is represented by Su-30SME, Su-34E and Su-35 4+/4++ generation aircraft.

"Rosoboronexport has delivered about 700 Su-27/Su-30 combat aircraft abroad since 2000. In 2021, the company's order portfolio was replenished with new contracts for the supply of Su-30SMs," stated Alexander Mikheev, Director General of Rosoboronexport (part of Rostec State Corporation). "Over the past 10 years, the share of aircraft supplies in Russia's total arms exports has stood at 40-50%, and even exceeds this figure today. Currently, our partners highly appreciate the fact that engines, avionics, weapons, systems and components in Russian combat aircraft are exclusively Russian-made. This ensures the independence of the purchasing countries from unfair actions taken by third countries. In addition, an open architecture of avionics and weapons systems, implemented in Russian fighters, enables foreign customers, with the involvement of the Sukhoi Design Bureau, to integrate some of domestically-made systems and air-launched weapons into them."

The Russian Aerospace Forces is the largest operator of Sukhoi combat aircraft. According to the Russian Ministry of Defence, Su-30SM and Su-35 aircraft can effectively intercept air targets and attack military installations with precision-guided weapons from low, medium and high altitudes. Their airborne equipment enables the use of air weapons with maximum accuracy. According to Hero of Russia fighter pilot Major Viktor Dudin, the Su-35 is a perfect fighter that surpasses all its foreign counterparts.

The Su-35 is a powerful 4++ generation aircraft system that incorporates fifth-generation fighter technologies. The Su-35 handles the entire range of fighter missions over a wide altitude and speed envelope. A large number of hardpoints allows the use of up to 12 medium-range air-to-air guided missiles or 6 air-to-surface missiles in one sortie. Its powerful onboard radar can detect aerial targets at long ranges (up to 350 km).

One of the most notable foreign operators of Su-30 type fighters is India, where the programme of licensed production of Su-30MKI fighters, which make up the backbone of the country's Air Force, has been successfully implemented. Rosoboronexport, within the framework of the Make in India programme, is ready to supply additional completely knocked down kits for the assembly of the Su-30MKI and carry out joint work on their modernisation, including the integration of the latest air weapons, avionics, etc. At the same time, the existing portfolio of aviation projects allows the company to globally develop technological cooperation in a broad range of areas.

Updates from Saab

Order for Gripen C/D upgrade

Saab has received an order from the Swedish Defence Materiel Administration (FMV) to ensure the continued operation of JAS 39 Gripen C/D and to provide capability enhancements to preserve the operational relevance of the fighter aircraft. The order value is SEK 500 million.

Gripen C/D is the system that will be used for many years to come in Sweden and in other countries that have purchased Gripen. The development is also done to further ensure a cost-effective solution regarding construction, design and procurement. "Gripen C/D is the backbone of the Swedish Armed Forces today and will continue to be for many years to come, so this is an important order where we will ensure the continued operation and operational relevance of Gripen C/D," stated Jonas Hjelm, Head of Saab's Aeronautics business area.

Contract for new Gripen launch system

Saab has received an order from the Swedish Defence Materiel Administration (FMV) for the development and integration of a new launch system for Gripen C/D and Gripen E. The order includes the development and integration of a new launch system for air-to-air missiles and countermeasure pods on Gripen C/D and Gripen E. The contract also includes options for subsequent series orders of launcher systems. The launchers can be integrated with existing variants of weapon pylons and can carry all Gripen air-to-air missiles.

Denmark is 15th Carl-Gustaf M4 customer

Saab has received an order from the Danish Ministry of Defence Acquisition and Logistics Organisation (DALO) for the multi-role, man-portable Carl-Gustaf M4 weapon, making Denmark the 15th customer for the M4 version. Deliveries will take place in 2022. The recoilless Carl-Gustaf M4 weapon increases tactical flexibility. Built to satisfy future requirements, it is compatible with advanced fire control devices and prepared for specialised ammunition, putting advanced technology at forces' fingertips. The Danish Armed Forces has been using Carl-Gustaf, which is designated Dysekanon in the country, since the 1970s.

Programmable Carl-Gustaf munition

Saab's programmable Carl-Gustaf munition, designated HE 448, was fired for the first time in front of an audience at a live fire event in Karlskoga, Sweden. The firings took place 3-4 May 2022 in front

of an audience with representatives from 30 different nations and included shoulder-fired engagements demonstrating the capabilities of the new programmable High Explosive (HE) round. A new Fire Control Device (FCD), designated FCD 558, was also demonstarted at the event. The new HE 448 programmable round has the ability to communicate with the new Fire Control Device 558 via a new protocol known as Firebolt. The HE 448 round provides the FCD 558 with the exact information on round type and propellant temperature and combines this with target distance entered by the operator to determine the best trajectory. This means that Carl-Gustaf operators will be able to quickly configure a chambered round and so increase their operational effectiveness.

In December 2021, Saab was contracted to deliver the new HE 448 munition and Fire Control Device 558 to the Swedish Armed Forces.

Sirius Compact for EW users

Saab has unveiled Sirius Compact - a lightweight electronic warfare passive sensor to meet surveillance challenges across all levels of tactical operations by locating threats while remaining undetected. Sirius Compact brings new capabilities thanks to its low size, weight and power, particularly in comparison to equivalent larger static solutions. Because it can easily be integrated to drones, vehicles, vessels, masts or man-portable applications, users can rapidly deploy the system and its coverage as the situation demands.

Sirius Compact is modular, scalable and can be used stand-alone, in a network of sensors or as a complement to existing sensors. By enhancing situational awareness through silent detection, classification and prioritisation of radar and datalink emissions, it is also a force-multiplier enabling users to locate threats whilst remaining undetected. Autonomous operation enables assimilation and compilation of situational awareness information without the need to store sensitive data in the sensor.

Sweden orders Carl-Gustaf ammunition

Saab has received an order from the Swedish Defence Materiel Administration (FMV) for deliveries of ammunition for the

recoilless Carl-Gustaf rifle. The order value is approximately SEK 800 million and deliveries will take place 2023-2025. The order was placed within a framework agreement, which was updated in April 2022, and allows FMV to place orders for ground combat weapons and ammunition from Saab during a ten-year period. The order comprises the new programmable high explosive ammunition, designated HE 448.

Together with the new Fire Control Device, FCD 558, which Sweden ordered in late 2021, the new programmable high explosive ammunition HE 448 gives the Carl-Gustaf operator the ability to quickly configure a chambered round. The wide range of ammunition available for Carl-Gustav further strengthens the system's tactical flexibility, enabling faster engagement, increased hit probability and greater effectiveness for the soldiers.

US Army for Carl-Gustaf recoilless rifles

The US Army MAAWS Programme Office has awarded Saab a contract for Carl-Gustaf M4 recoilless rifles. The Carl-Gustaf rifles are also known as Multi-purpose Anti-Armor Anti-personnel Weapon System (MAAWS) and M3A1 in the US Army. The order will include deliveries of weapons for both the Army and the US Marine Corps. The contract has a total value of USD 16 million and is awarded under a current ID/IQ agreement. Saab will provide Carl-Gustaf recoilless rifles to continue supporting the ongoing fielding effort in both the Army and the Marine Corps. The Carl-Gustaf system of lightweight weapons, now in its fourth generation. It is in use in more than 40 different countries, including many NATO allies.

Saab 340B(F) cargo aircraft

Ameriflight and Jetstream Aviation Capital have partnered on the lease and delivery of 15 Saab 340B(F) cargo aircraft for the nation's largest Part 135 Cargo airline. The addition represents another step forward in a multifaceted corporate strategy shift for Ameriflight. The first aircraft are intended to join the Ameriflight operation in the fourth quarter of this year. This latest fleet type will be used to support unprecedented demand for the company's services, including Ameriflight's expedited supply chain services, dedicated operations, and regional feeder service for the world's largest overnight express carriers.

Swedish order for torpedo tubes

Saab has received an order from the Swedish Defence Materiel Administration for a new torpedo tube for lightweight torpedos. The order value is approximately SEK 150 million, and there is an option to increase the quantity of the order. Deliveries will take place during 2023. The new torpedo tube will have the customer designation Tub m/20 in Sweden, and will replace the tube currently in use on the Swedish Navy's corvettes.

The tube is designed to meet future requirements, enabling a larger torpedo payload as well easier and more user friendly loading and unloading. Saab designed the launch system to provide higher availability and to enable surveillance of the tube from a naval command and control centre. The torpedo tube was developed when Finland placed its order for the Saab New Lightweight Torpedo for its Pohjanmaa class corvettes.

Studies on future fighter aircraft development

Saab has received an order from the Swedish Defence Materiel Administration, FMV, relating to future fighter aircraft development. The contract includes studies on future combat air capabilities. The study is preparatory in nature and its purpose is to widen the work on how future combat air capabilities can be developed and realised. The order value is approximately SEK 250 million.

Order for integrated ATC in Dubai

Saab's Integrated Air Traffic Control Suite has been selected through competition for implementation at Dubai International Airport and Al Maktoum International Airport in the United Arab Emirates. The contract, awarded to Saab by Dubai Aviation Engineering Projects includes approximately 95 controller working positions which will be distributed between the two airports, the Emirates Flight Training Academy, and the Contingency Operations Centre.

Saab's Integrated Air Traffic Control Suite (I-ATS) is a next-generation solution that builds on widely deployed Air Traffic Control automation products. I-ATS is a flexible and scalable digital platform that provides tower and approach controllers with a comprehensive set of tools to safely and efficiently manage traffic flow. The solution for Dubai International Airport (DXB) and Al Maktoum International Airport (DWC) also includes a Departure Manager (DMAN), which supports sequencing of departing aircraft.

Saab completes EMD T-7A Red Hawk deliveries

Saab has shipped the last of five fully installed T-7A Red Hawk aft fuselages from its factory in Linköping, Sweden to Boeing's production site in St. Louis. In addition to the five Engineering and Manufacturing Development (EMD) aft fuselages, Saab has over the programme also delivered two test fuselages, one for static testing and one for fatigue testing. The final delivery, which took place on 6 May 2022, marks an important milestone in the programme. All production will now be transferred to Saab's new and smart production facility in West Lafayette, Indiana where all future production of the T-7 aft fuselage will take place, supported by both Saab's Swedish- and US-based personnel.

Saab used its experience in advanced digital engineering to contribute to the design and development of the T-7 as part of the partnership with Boeing, as well as to manufacture the aft fuselage with its fully installed systems.

Saab and Arquus unveil Sherpa Light Scout in CBRN configuration

Arquus and Saab presented jointly at Eurosatory 2022 a Sherpa Light Scout by Arquus equipped with a CBRN solution by Saab. Saab's CBRN Reconnaissance Vehicle Kit (CRVK) is a cost effective, modular, reversible and dual-use solution to modify a standard vehicle to support CBRNe reconnaissance. The kit consists of three main parts, which have been adapted to simplify installation. With CRVK, it's possible to create an automatic reach back capability where remotely grouped specialists can control the sensors to support the frontline CBRNe team. Identification of substances can be performed to Presumptive and Field Confirmatory level. This creates an advanced and highly mobile CBRNe vehicle that can support the following missions: reconnaissance, survey, surveillance and monitoring.

On top of its CBRN solution, Saab also displayed on the Sherpa the following products: lightweight 3D radar Giraffe 1X, multispectral camouflage solutions from Saab Barracuda, both fixed and mobile, as well as some vetronics and laser detection technologies.

Saab and Arquus share common Swedish roots. Saab is a leading Swedish defense company, with activities all around the world, including France. Arquus is a French company, expert of land mobility, part of AB Volvo Group, Swedish leader of transport solutions.

News from Thales

France orders 21 more TALIOS optronic pods

The French defence procurement agency (DGA) has placed a firm order with Thales for 21 additional TALIOS pods. The new target designation pods will equip Rafale aircraft currently in service with the French Air and Space Force and the French Navy. This order for 21 additional pods underscores the continuing confidence of

the French forces, which have deployed TALIOS multiple times on expeditionary missions since the first pods were delivered in 2019. The new pods will be delivered between 2024 and 2025, straight after fulfilment of the initial order for 46 TALIOS systems.

PARADE drone countermeasures system

Thales and partners in France and Europe's defence industrial and technological base are developing the PARADE capability to provide deployable protection from drone threats. The contract was awarded after a European competitivetendering process launched by the DGA in 2021 to strengthen the drone countermeasures (counter-UAV) capabilities of the armed forces.

The first order calls for the acquisition of six PARADE drone countermeasures systems. With contributions from French SMEs such as CerbAir, Exavision and MC2 Technologies, as well as the Dutch company Robin, the PARADE system will provide decision support, analysis of complex situations and the capability to neutralise micro-drones and mini-drones. The contract also includes operator training and system and equipment maintenance and upgrades. The PARADE system provides permanent 360° site protection and is designed for easy transport from one site to another by road, air or sea, considerably increasing its scope of use and speed of deployment.

Thales completes acquisition of RUAG S&T

Thales has completed the acquisition of RUAG Simulation & Training including its 500 employees and with sales worth approximately €90 million in 2021. The consolidation will complement Thales's footprint

in the land market in particular, meanwhile sustaining its field-proven expertise in helicopters and military aircraft solutions. This acquisition will provide an opportunity to reinforce local footprint in priority geographies (France, Switzerland, Germany, and United Kingdom), while increasing presence in UAE and Australia.

Thales selected by Airbus for its new FMS

The new flight management system (FMS), which is based on the PureFlyt product and has been adapted to meet the specific needs of Airbus, will be developed by Thales to equip Airbus commercial airliners, and in particular the A320, A330 and A350, with service entry planned for the end of 2026. The new system will improve interoperability for airlines and pilots and optimise flight paths to help reduce the carbon footprint of airline operations.

ANG F-16 pilots for Scorpion HMD's

Thales has received an initial order to equip US Air National Guard F-16 pilots with Scorpion Helmet Mounted Displays (HMD) as part of a deal that will make the combat-proven system available to NATO forces. The contract will provide the Air National Guard with Scorpion retrofit kits to replace the current Joint Helmet Mounted Cueing System (JHMCS) for its fleet of F-16 block 40 and 50 aircraft. When complete, Scorpion will become the common HMD solution for the Air National Guard and US Air Force Reserve's entire fleet of F-16 block 30, 40 and 50 aircraft. Scorpion is already the HMD of choice for the A-10 in the Air National Guard and Air Force Reserve.

Boeing news

Boeing unveils 1st T-7A Red Hawk

Boeing has unveiled the first T-7A Red Hawk advanced trainer jet to be delivered to the US Air Force. The jet, one of 351 the US Air Force plans to order, was unveiled prior to official delivery. The fully digitally designed aircraft was built and tested using advanced manufacturing, agile software development and digital engineering technology significantly reducing the time from design to first flight. The aircraft also features open architecture software, providing growth and flexibility to meet future mission needs.

"We're excited and honoured to deliver this digitally advanced, next-generation trainer to the U.S. Air Force," stated Ted Colbert, president and CEO, Boeing Defense, Space & Security. "This aircraft is a tangible example of how Boeing, its suppliers and partners are leading the digital engineering revolution. T-7A will prepare pilots for future missions for decades to come."

The T-7A Red Hawk incorporates a red-tailed livery in honor of the Tuskegee Airmen of World War II. These airmen made up the first African American aviation unit to serve in the US military.

"The Tuskegee Airmen are one of the most celebrated units in our Air Force history, and the T-7A honours the bravery and skill of these trailblazers", stated Gen. Charles Q. Brown, Jr., Chief of Staff of the Air Force. "Like the Airmen they were named and painted to pay homage to, the T-7A Red Hawks break down the barriers of flight. These digitally-engineered aircraft will make it possible for a diverse cross section of future fighter and bomber pilots to be trained, and provide an advanced training system and capabilities that will meet the demands of today's and tomorrow's national security environment."

The aircraft will remain in St. Louis where it will undergo ground and flight tests before being delivered to the US Air Force. The T-7A programme resides at Boeing's St. Louis facility with the aft section of the trainer being built by Saab in Linkoping, Sweden. Saab will soon start producing that section at their new production facility in West Lafayette, Indiana.

E-7 as solution to replace the E-3 capability

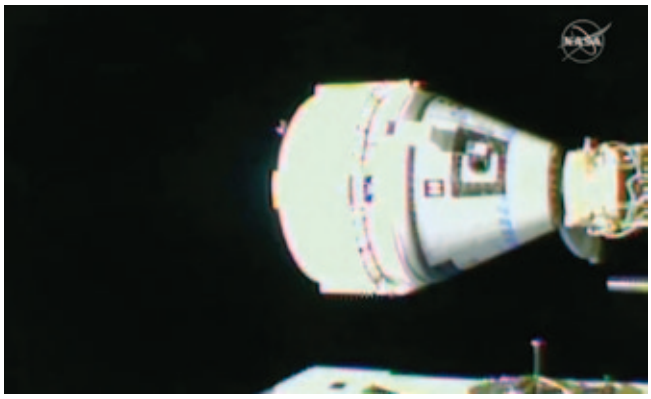
Based on market research, the Department of the Air Force has decided to replace a portion of the E-3 Sentry Airborne Warning and Control System fleet with the E-7 Wedgetail, which is produced by The Boeing Company. The Boeing E-7 is the only platform capable of meeting the requirements for the Defense Department's tactical battle management, command and control and moving target indication capabilities within the timeframe needed to replace the aging E-3.

A contract award is planned in fiscal year 2023. The FY23 President's Budget request includes $227 million in Research, Development, Test and Evaluation funds starting in FY23. These funds support the acquisition of a rapid prototype aircraft planned to deliver in FY27. The notional schedule plans for a second rapid prototype aircraft funded in FY24, and a production decision in FY25 to continue fielding aircraft. The FY23 PB proposes a partial divestment of the E-3 AWACS fleet, 15 of 31 aircraft, and redirects funding to procure and field its replacement.

The E-7 system was developed by Australia for the Australian Defence Forces.

Starliner completes docking to Space Station

Boeing's CST-100 Starliner spacecraft made its first connection to the International Space Station to complete a primary goal of the programmme's Orbital Flight Test-2 (OFT-2). With no astronauts on board, Starliner's autonomous systems and ground controllers in Houston guided the vehicle through a carefully choreographed series of maneuvers to steadily bring the Starliner closer to the orbiting laboratory before docking. Astronauts aboard the space station monitored Starliner throughout the flight and at times commanded the spacecraft to verify control capabilities.



Boeing, NASA complete 1st Starliner Space Station flight test

Boeing's CST-100 Starliner spacecraft landed at the US Army's White Sands Missile Range in New Mexico and with the safe return to Earth brings a close to the successful end-to-end uncrewed orbital flight test that was flown to demonstrate the quality and performance of the transportation system prior to crewed flights.

Egypt for 23 CH-47F Chinooks

Egypt has requested to buy twenty-three CH-47F Chinook helicopters; fifty-six T-55-GA-714A engines (46 installed, 10 spares); fifty-two Embedded Global Positioning System (GPS) Inertial Navigation Systems (INS) (EGI) (46 installed, 6 spares); twenty-nine AN/AAR-57 Common Missile Warning Systems (CMWS) (23 installed, 6 spares); and seventy-five (75) M-240 machine guns (69 installed, 6 spares) etc.

Germany's STH heavy-lift helicopter programme

The German Government announced that Boeing's CH-47F Chinook has been selected for its heavy-lift helicopter requirements (STH) for the German Bundeswehr. "Boeing is honoured the German government has selected the CH-47F Chinook for its STH heavy-lift helicopter requirements. With the Chinook, Germany will operate the most affordable, proven and NATO interoperable heavy-lift helicopter. We look forward to working with the US and German governments to finalise this sale under the Foreign Military Sales process. Together with our Chinook Deutschland Team --- AERO-Bildung, Airbus Helicopters, CAE, ESG, Honeywell, Lufthansa Technik and Rolls-Royce Deutschland --- we are committed to delivering maximum operational availability to the German Bundeswehr for decades to come."

Boeing teams with Canadian industry to offer P-8A Poseidon

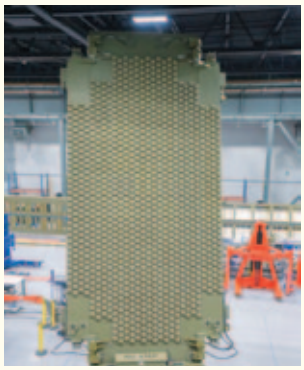
Boeing and several Canadian industry partners announced their intent to collaborate to provide the capability and sustainability of the proven P-8A Poseidon for the Canadian Multi-Mission Aircraft (CMMA) requirement. Team Poseidon, consisting of CAE, GE Aviation Canada, IMP Aerospace & Defence, KF Aerospace, Honeywell Aerospace Canada and Raytheon Canada, forms the cornerstone of a Canadian P-8 industrial footprint. The team builds on 81 Canadian suppliers to the platform and to more than 550 Canadian suppliers across all provinces contributing to Boeing's annual CAD $5.3 billion in economic benefit to Canada, supporting more than 20,000 Canadian jobs.

Updates from Lockheed Martin

Aerojet Rocketdyne selected by LM

Aerojet Rocketdyne has been selected by Lockheed Martin Missiles and Fire Control to build an advanced solid rocket motor booster for the second stage of a US Defense Advanced Research Projects Agency (DARPA) hypersonic weapon system, known as Operational Fires, or OpFires. OpFires aims to develop and demonstrate a ground-launched missile system, enabling hypersonic boost glide weapons to penetrate modern enemy air defences and rapidly and precisely engage critical time-sensitive targets from a highly mobile launch platform.

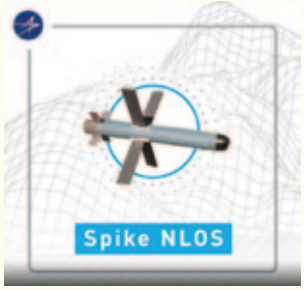
LM's 1st TPY-4 radar completes production



Lockheed Martin's first AN/TPY-4 radar, recently selected by the US Air Force for the Three Dimensional Expeditionary Long Range Radar (3DELRR) Rapid Prototyping programme, has completed production marking availability to the world.

LM delivers precision strike missile system on JLTVs

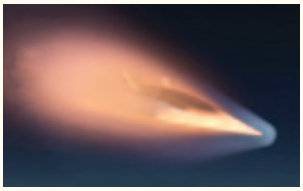
Lockheed Martin successfully delivered the Spike Non-Line-of-Sight (NLOS) missile system on the Oshkosh's Joint Light Tactical Vehicle (JLTV) to US Special Operations Command (USSOCOM). This integration demonstrates the versatility of the Spike NLOS weapon system. Spike NLOS is a multi-purpose, electro-optical/infrared missile system. Its rocket motor provides capability to reach ranges up to 32 kilometers. Users can integrate Spike NLOS with ground, aviation or maritime platforms while leveraging its stand-off capability to strike distant or geographically concealed targets without line-of-sight.



Contracts for Javelin anti-tank weapon systems

The US Army recently awarded the Javelin Joint Venture two production contracts for Javelin missiles and associated equipment and services with total value of $309 million. These contracts include more than 1300 Javelin missiles funded from the recent Ukraine Supplemental Appropriations Act and orders for several international customers including Norway, Albania, Latvia and Thailand. Javelin is developed and produced by the Javelin Joint Venture, a partnership of Raytheon Missiles & Defense and Lockheed Martin. The versatile anti-tank and multi-target guided missile system offers fire-and-forget capability over its full range up to 4 kilometers.

ARRW hypersonic boosted test flight



The US Air Force and Lockheed Martin successfully conducted a hypersonic-boosted flight test of the AGM-183A Air-launched Rapid Response Weapon (ARRW) from the service's B-52H Stratofortress. The successful flight demonstrates the weapon's ability to reach and withstand operational hypersonic speeds, collect crucial data for use in further flight tests, and validate safe separation from the aircraft to deliver the glide body and warhead to designated targets from significant standoff distances.

Rolls-Royce directed energy field tests for LM

Rolls-Royce has successfully demonstrated 'deep magazine' power capability for directed energy applications, powering multiple, extended laser field tests in collaboration with Lockheed Martin as part of the Layered Laser Defence (LLD) project. Powered by the Rolls-Royce system, Lockheed Martin's laser weapon system successfully shot down flying targets during the recent field tests conducted in partnership with the Office of Naval Research at the US Army's High Energy Laser Systems Test Facility at White Sands Missile Range in New Mexico.

Updates from Safran

Lower fuel consumption with Safran's SFCO2

Newly launched French airline Flying Green has signed a Memorandum of Understanding (MoU) with Safran Aircraft Engines for the use of its SFCO2 fuel optimisation service. As part of the agreement, the two companies will conduct collaborative research into the use of SFCO2 for the Orly-based airline's new fleet of Airbus A320 neo and A321neo aircraft, aimed at assessing savings in CO2 emissions and operating costs. The MoU also covers the rollout of SFCO2 at Flying Green's new academy for training its pilots in fuel saving techniques. In addition, Flying Green and Safran Aircraft Engines have signed a framework agreement to equip the airline's eight aircraft—due for entry into service between 2023 and 2027—with new-generation CFM International LEAP-1A engines.

Makila 2 engines powered by SAF

An Airbus H225 has performed the first ever helicopter flight with 100% sustainable aviation fuel (SAF) powering both Safran's Makila 2 engines. This flight, which follows the flight of an H225 with one SAF-powered Makila 2 engine in November 2021, is part of the flight campaign aimed at understanding the impact of SAF use on the helicopter's systems. Tests are expected to continue on other types of helicopters with different fuel and engine architectures with a view to certify the use of 100% SAF by 2030.

The use of SAF is one of Airbus Helicopters' levers to achieve its ambition of reducing CO2 emissions from its helicopters by 50% by 2030. One of the main benefits of using this new fuel is that it allows the aircraft to minimise its carbon footprint while maintaining the same flight performance. In June 2021, Airbus Helicopters launched the SAF User Group with the intention of bringing all stakeholders together to work on ways to accelerate the use of blended SAF kerosene and to pave the way toward 100% SAF flights for future fleets. All Airbus commercial aircraft and helicopters are certified to fly with up to a 50% blend of SAF.

Contract for French FURIOUS programme

The French defence procurement agency DGA (Direction Générale de l'Armement) has announced a new optional tranche contract awarded to Safran Electronics & Defense for FURIOUS (FUturs systèmes Robotiques Innovants en tant qu'OUtilS), a science and technology programme that aims to develop innovative robotic systems for mounted and dismounted warfighters. The DGA's announcement follows successful field trials of the FURIOUS robotic system, carried out by Safran in late 2021 at the French army's urban combat training center (Sissone military base) – a key advance culminating the firm contract phase.

During this phase participants focused on the modular architecture concept (hardware and software), designed to ensure the autonomous operation of any terrestrial platform, whether crewed or not. Safran Electronics & Defense was able to deploy this architecture on three very different types of platforms included in the FURIOUS system. The optional tranche announced today aims to optimize this architecture and make the autonomous functions developed more robust (tracking passage points, replaying trajectories, monitoring the leader, autonomous target homing, etc.) within more complex and even unstable environments.

SkyNaute to equip H160M Guepard's

Airbus Helicopters has selected Safran Electronics & Defense to supply SkyNaute navigation systems to equip future H160M helicopters, developed as part of the HIL joint light helicopter programme. This contract follows the order from the French Ministry of the Armed Forces for 169 "Guépard" helicopters in December 2021. SkyNaute is an ultra-compact hybrid inertial navigation system based on a disruptive Safran-patented technology: the HRG Crystal. This hemispherical resonator gyroscope offers a virtually unlimited service life, robust design for the most severe environments and ultra-high reliability.

With its combination of high integrity and precision, the SkyNaute navigation system guarantees a high level of performance, even when GNSS signals are absent or jammed. It will enable H160M crews to perform their missions in the most challenging theaters of operations.

Safran and ATR develop Smart Lander

Safran Landing Systems, the world leader in aircraft landing and braking systems, and ATR, world's leading regional aircraft manufacturer have developed Smart Lander, an innovative landing gear diagnostics service that uses state-of-the-art knowledge in data analysis to optimise the manufacturer's response times in the event of hard landings, and enable aircraft to be quickly returned to service.

This extremely innovative service, the first of its kind in the aviation industry, is based on machine learning technology. Based on hundreds of thousands of hard landing simulations, Smart Lander issues recommendations to operators on the maintenance actions to be taken according to the hardness of the landing and to the load level sustained by the landing gear. Aircraft can subsequently be

permitted to continue their commercial operations or alternatively, be sent to a maintenance base. This process takes less than an hour, compared to over a week previously.

New landing gear for next gen military aircraft

Safran Landing Systems Canada Inc. has been awarded a contract by Lockheed Martin to provide the design, development and qualification of a landing gear structure for a future aircraft. This new structure will include a clean sheet design of the nose and main landing gear.

Anatolian Phoenix 2022

The Euro-Asian SOF helicopter exercise

The history of the north-east Mediterranean landscape, where Asia more or less connects to Europe, is one of centuries old. The battles of that time to control the area, are the proof of the strategic geographic situation, which is displayed in the numerous historic sites and tales that have remained. Especially, this ancient heritage makes Turkey a most attractive place for international tourist to visit and get connected with its long historic anecdotes.

NATO

Military aviation in Turkey has a long history which goes back to 1911 when the country had its first aviators attending training at the French Bleriot aviation school. Meanwhile, the Turkish military aviation has developed into a large and modern force, with numerous air bases spread all over the country. In 1952, Turkey joined the North Atlantic Treaty Organisation, NATO, and since then, it has been an active member. Its presence can be seen with involvement of Turkish aircraft in all kind of exercises throughout Europe. These are often large-scale exercises that are focus on training of common NATO procedures embedded in Combined Air Operations (COMAO) where countries integrate in various mission scenarios. Furthermore, the Türk Hava Kuvvetleri (Turkish Air Force) also regularly contributes to international missions such as the ongoing NATO Air Policing tasks in the Baltic and Balkan regions to provide Quick Reaction Alert (QRA) support to NATO members that are not well equipped to complete that task.

Next to its NATO commitments, you can see Turkey also investing in contacts with countries other than NATO. The country maintains many international relations and it continues building bridges with nations from Asia, Africa and the Middle East. Next to international trade partnerships, Turkey is also able to offer cooperation on military level driven by its domestic military industry. For that reason, Turkey offers the necessary training to operate the Turkish built military systems, which can also be extended to nations to participate in military exercises.

Anatolia

The main and probably best known annual Turkish Air Force international trainings samples are the Anatolian exercises. The focus for fixed wing operations is provided within the Anatolian Eagle exercises, while Anatolian Phoenix concentrates on helicopter operations. Both exercises are supervised by the Turkish Air Force Command and organised by the "Anatolian Eagle Training Centre Command" located at the 3rd Main Jet Base at Konya, which also acts as host base during the 2 week exercise.

Since 2008, the Anatolian Phoenix exercise which originally started as a national oriented exercise with only helicopters from Turkish defence units is now being organised at Konya twice a year. The branches of these units can be found, besides the Air Force, in the Turkish Army, Navy, Police and finally the Jandarma, a defence unit executing general police tasks. Till now, seven international editions of Anatolian Phoenix have been executed which saw participations from Qatar, Romania, Azerbaijan, Pakistan etc.

Phoenix

At Konya, we met Major Çağrı Önalan, Anatolian Phoenix Project Officer of the local based 135th PR&JTAC Filo (squadron) and he provided more details of the exercise. Anatolian Phoenix (AP) is a Combined Joint Task Force (CJTF) exercise for combat ready air crews who will be responsible for the tactical planning, briefing and execution of all missions. Major Önalan explained that the structure of the exercise is designed in such a way that the participating air crews have a maximum of freedom in order to solve the problems presented in the various tactical scenarios. "This structure provides us the opportunity to facilitate an exchange of ideas between all participants and therefore, improve the overall interoperability and of course the success of the mission", as Major Önalan summarises. "We furthermore train the participants and develop coordination

methods for the JTF components, such as C2 (Command & Control), Rescue Mission Commander, Rescue Escort, Rescue Helo, Parachute Jumping and Forward Air Control (FAC). In order to increase the participants overall combat readines, bi-and-unilateral training such as Formation Flight, Tactical Navigation, Close Air Support, Dynamic Targeting, Time Sensetive Target, Fast Rope, High Altitude Low Opening (HALO) parachuting, Mountain Recovery etc. are all elements embedded in the Anatolian Phoenix exercise" as Major Önalan explained.

Due the nature of the key components of the Anatolian Phoenix exercise, cooperation with other military units such as Special Operation Forces (SOF), Combat Search And Rescue (CSAR) and Joint Terminal Attack Control (JTAC) teams is essential. Next to the participation of a number of national teams from several Turkish defence branches, foreign units joined as well. Poland contributed with a CSAR and a JTAC team, while Azerbaijan had delegated 2 CSAR teams to the exercise. Aerial assets included AS-532 Cougars from Turkish Air Force and Army including an (unmarked) sample of the Turkish Republic of North Cyprus. Furthermore, Sikorsky S-70's from the Turkish AF, Jandarma and a SOF unit were included in the exercise. The rather new A-129B ATAK helicopters were also presented, as the Türk Kara Havacilik Komutanlığı (Turkish Army Aviation Command) deployed 2 of them to Konya. One ATAK helicopter, which are on delivery to Turkish defence since 2014 from manufacturer Turkish Aerospace Industries (TAI), came from the Izmir based aviation battalion and the other from a similar unit at Isparta. The T-129 is developed by Turkish Aerospace Industry (TAI) based in Ankara in partnership with Augusta Westland from Italy (now Leonardo) and based on the Agusta A-129 "Mangusta". Turkey has meanwhile 56 A-129 helicopters in service and an option to order another 35. While initial foreign deliveries of A-129's to the Philippine Air Force are pending, the international interest for this rotor powered attack platform is growing. The Anatolian Phoenix ramp at Konya was finally completed with a pair of Azerbaijan Air Force Mi-17s. At an earlier stage, some other countries cancelled their participation to the exercise due to changed priorities as a result of the Russian–Ukrainian war. Among the cancellations were Romanian IAR-330 Puma helicopters and supporting teams.

Azeri

Azerbaijan Air Force Mi-17 pilot Rosul Imanov provided some more details about their contribution to Anatolian Phoenix. "We joined the Anatolian Phoenix exercises last year by participating twice one time

with Mi-24 Hinds and second time, also like this year, with 2 or our Mi-17-1V helicopters. For this year's exercise, our team is participating with 90 members of air and ground crews". The Mi-17 helicopters belong to 3-cu Eskadrilya based at Qala Air Base, close to capitol Baku. Qala is the main helicopter base for the Azerbaijan AF, were you can find other based squadrons flying the Mi-24, Mi-35, Mi-8, Ka-32 and Bell 407 helicopters. "Our flight from Qala Air Base to Konya took about 7 hours and we had some planned stops to refuel", as pilot Imanov explained. With the positive experiences of the Azerbaijan helicopters participating in the Anatolian Phoenix exercises, the Azeri decided to contribute as well in the Anatolian Eagle exercise for fighter jets, initially with MiG-29s and Su-25s in 2021 and the same aircraft are expected to participate again in the Anatolian Eagle edition of 2022.

3rd Main Jet Base

In 2001, the Turkish 3rd Main Jet Base of Konya was appointed by the AF Command as host station for the Anatolian national and international exercises. Part of this decision was the nearby available airspace over the large salt plains in the vicinity of the air base, which provides an area of 200 by 150 nautical miles. The airspace above, which is available for the exercise from ground level up to 50,000ft, is equipped with various Surface-to- Air Missile (SAM) systems to simulate realistic threats during the complex mission scenarios. Additionally, a few miles south-east of Konya Air Base, one can find the LTD-9 firing range, which was actively used during the Anatolian Phoenix missions. The 3rd Main Jet Base Command, which is similar to a wing organisation, sees a variety of based aircraft. 131st Filo (squadron) "Ejder" is equipped with the E-7T Wedgetail, an Airborne Early Warning and Control (AEW&C) platform based on the Boeing 737 version. F-16C and D models from block 30 and 50 versions, are flown by 132nd Filo "Hançer".

This squadron is also home base of the "Solo Türk", the colourful F-16 performed single demonstration flights. Konya also hosts the famous "Turkish Stars" demonstration team, well-known for its national and international displays. The team, which forms 134th Filo "Türk Yildizlari", flies the red and white coloured NF-5A and NF-5B Freedom Fighters.

The last squadron to complete the wing of Konya is 135th Filo "Ates". This is the unit of Major Önalan who explained that they have a mix of aircraft and helicopters mainly due to the Personal Rescue and Joint Terminal Attack Control mission roles of the squadron. The fixed wing assets of the squadron consists out of the double propeller powered CN-235M-100's transporters and the fairly new Hürkus C, a light attack aircraft which is developed and manufactured by TIA. The AS-532UL Cougar and UH-1H helicopters complete the rotor element of 135th Filo. Because of the mission roles of the 135th Filo, the squadron is closely connected to the Anatolian Eagle Training Centre for the planning and organisation of the exercises. The last unit to complete the inhabitants of Konya Air Base, is the detachment of the E-3A Component from the NATO Airborne Early Warning & Control Force (NAEW&CF), based at Geilenkirchen, Germany. This unit, which flies the Boeing E-3A Sentry, uses Konya as one of its Forward Operating Bases (FOB) in Europe.

Map displaying the various training areas for Anatolian Phoenix, with in the centre Konya AB and (south-east) its nearby located "LTD-9" firing range.

DV day

In presence of the Turkish Combat Air Force and Air Missile Defence Commander, General Major Atilla Gülan and his Azerbaijan colleague, Deputy Minister of defence and Air Force Commander, Lieutenant General Ramiz Tahirov, a training mission was executed at the Konya firing range LTD-9 at the end of the Anatolian Phoenix exercise. Together with other distinguished visitors of the participating countries and international observers, several missions were executed. The displayed missions included a variety of elements like HALO parachuting, Close Air Support (CAS), Casualty Evacuation (CASEVAC), Medical Evacuation (MEDEVAC) and Combat Search and Rescue (CSAR). CAS was provided by F-16s from 132nd Filo dropping a number of GBU-34 and Mk82 live bombs at designated targets on the range under guidance of the Joint Terminal Attack Controllers. Special Operation Forces (SOF) were brought into theatre, either by para jumps from the CN-235, or by the helicopters including Fast Rope techniques, to clear and secure the area. Meanwhile the T-129B ATAK helicopters provided aerial protection against enemy forces by using their nose mounted three barrel rotary canon. Ground forces were infiltrated in and extracted from the landing zone by Turkish AS-532 and S-70 helicopters, together with the Azeri Mi-17's. Although not visible, an E-7T AEW&C aircraft and an Anka-S Unmanned Aerial Vehicle (UAV) flew at distance in support of the trainings mission.

Future

Since the start of the Anatolian exercises, they seem to be successful filling the need for regional requirements in international training. The possibility to fly in large scale formations in COMAO complex scenarios missions, acting to threats is hardly offered in the normal daily flight activities of pilots and aircrew and therefor such training is providing added value. The growing number of participants and international interest are some of the indicators of the success of the Anatolian exercises. This year, 11 observing nations took part in exercise. Delegates of Chad, Burnika Faso, South Africa, Northern Macedonia, Libya,

Lithuania, Nigeria, Uzbekistan, Senegal, Oman and Bulgaria were able to have a view at the planning, preparing and execution of trainings missions. Although it is not a given fact, some of the observing countries may take a next future step to participate in an Anatolian Phoenix exercise with their aerial assets and/or teams of ground forces in the years to come.

Text and photos by Peter ten Berg

Aeromedevac the Dutch way

‘We Care Anytime, Anywhere’

While the CH-47D Chinook crew flies patients towards a hospital as quickly as possible, the Aeromedical Evacuation Physician (AEP) and Aeromedical Evacuation Nurse (AEN) do everything they can to keep them alive. The helicopter acts as a flying ambulance in these cases. This is a typical scenario which can occur in a real-life situation during a deployment or as part of an evacuation of military servicemen. The annually held ORAC (Operational Readiness Aeromedevac Course) is preparing participants to train for these urgent situations.

During July 2021, this two and a half week training was organised in The Netherlands. ORAC is the Initial Rotary Wing Aeromedevac course of the Royal Netherlands Air Force (RNLAF) that is conducted by the Operational Health Department (Operationele Gezondheidszorg/OGZ). The OGZ is a part of the Centre for Men and Aviation (CML). The OGZ consists of soldiers with a (specialist) medical background. One of the main tasks of the OGZ consists primarily of providing Aeromedical Evacuation (AE) capacity (Air Transport for casualties). With AE, wounded soldiers and civilians are taken by helicopter to a hospital in the mission area (Forward AE) or flown back to the Netherlands by Airlift (Strategic AE). If large number of patients are to be returned to the Netherlands, they can be accommodated before the flight in a so-called Casualty Staging Unit (CSU). Supporting the ORAC course is 298 Squadron, stationed at Gilze-Rijen Airbase, of the Royal Netherlands Air Force/ Defense Helicopter Command (Koninklijke Luchtmacht/Defensie Helicopter Commando - DHC) operating the Chinook CH-47Ds and lately the new CH-47F MY CAAS version since 2021. Rotary Aeromedical Evacuation, participants start their training on the C-130 Hercules fixed wing platform explained Lt Col Johan Oele, Chief Aeromedical Evacuation Medical Director of the RNLAF. "We start the AE training with the support of Austria, United States and Canada. We buy training courses from these countries and this is because we have limited availability of our own C-130 Hercules fleet."

The ORAC course is a preparation for obtaining the Rotary Wing Aeromedevac Evacuation (AE) status by the participants. Like in the year 2020 the course of 2021 was also held in The Netherlands as travelling to the US brought big challenges due to COVID-19 situation. Normally the course takes place under the supervision of the RNLAF 302 Squadron stationed at Fort Hood (US Army Airbase), Texas. The training integrates knowledge on Aero-Medical Training, Trauma and other Emergency Medicine, into a good working concept supported by a Helicopter Platform. The ORAC course is supported by a highly experienced AE Instruction Group consisting of Aeromedical Evacuation Physicians (AEP), Aeromedical Evacuation Nurses (AEN) and medical specialists with both military operational (mission deployments to e.g., Bosnia, Iraq, Afghanistan, Mali) and civilian experience.

Since 2009 the Royal Netherlands Air Force organised the ORAC courses in three

different countries; The Netherlands (2017, 2020-21), The United States (Fort Hood, Texas 2018, 2019, 2022), Utah, Salt Lake City (2015), Wisconsin, Fort McCoy/ Volk Field (2009 t/m 2014, 2016) and Canada: Ontario, Petawawa (2018).

The 2021 edition was attended by 18 participants. The training consisted of both theory and practical lessons/exercises. Key attention areas are Physiology, Stress of flight and Crew Resource Management principles. The goal for the ORAC participants is to become more familiar with the equipment and materials used in the Aeromedical Evacuation role which are a vital component to be able to work in this environment.

Captain Gracia van Wieren was one of the participants of the ORAC 2021 course. It was her first experience flying a helicopter. "It gave some moments of stress and also I had to adapt to the flying circumstances like noise, vibration and tiredness" she explained. The personal goal for Gracia was to participate together with the military Flight Doctor during the helicopter flights and learning and adapting to the specific procedures during medevac flights. "You have to be sure that all is secured, and of course the safety of the patient during the transportation is priority number one. Also, the communication onboard of the Chinook with both the Loadmaster as the Pilot was a big challenge to me" Captain van Wieren continues. "Priority here is to get to the helicopter with the patient in safe conditions as soon as possible. The ORAC course gave us a great inside look and experience what to expect during a deployment, next steps will be training, training (including the FAMET - Forward Aero Medical Evacuation Training Course) and be ready to be deployed in the near future".

Sergeant Major Chris Halmans was one of the Instructors and Course Managers of the ORAC 2021 course. (The Course Manager coordinates all substantive matters during the course). "My personal satisfaction is to witness the personal growth of the participants during the course. Their emotions go from 100% concentration and tension with a big relief at the end of the flight. ORAC is a short and intense period of intensive cooperation. Participants often meet their personal boundaries; it is our job to lead them in the right direction. "My main goal is to convey my experience and the lessons learned to the participants. This should result in having everyone participating during the course prepared for the complex tasks, unfortunately this is not achievable for all," Sergeant Major Halmans adds. 'ORAC course is split in three basic parts; lectures, practical lessons and scenario Training" he underlines. "This course was

"We try to fly as stable as we can during the training to allow participants to conduct their training tasks smoothly during flight. We try to keep the communication to a minimum to allow the participants to work on the helicopters intercom during their evacuation training," according to Michiel, one of pilots of the RNLAF 298 Squadron involved in the course. "In general, the learning curve is clearly visible. Although we only get a superficial understanding of their actions, it is important that the participants provide updates to the aircrew during these flights. For example, the destination where they want us to go with the patient, any flight restrictions that the injury entails for the patient and all what is needed at the drop-off location (specialist teams and resources) must be communicated. In the beginning of the course, this is often forgotten, but after a few flights, we notice

my eleventh edition, having participated in both ORAC and FAMET.

"The ORAC course is one of the last parts of our operational readiness for the forward Aeromedical Evacuation" Sergeant Major Halmans informed. As a nurse or Physician, one must first undergo general military and medical training. "After placement at the OGZ, the following education and training courses must be completed; for example, OSEG KLU (Emergency Medical Royal Netherlands Air Force training) where participants learn how to take care of trauma patients as a team in an Air Force composition with Air Force equipment. BLS/ILS/ALS: B is Basic Life Support, I Immediate Life Support, A Advanced Life Support: Courses that provide a Standardised approach to Cardiopulmonary resuscitation in adults (among this are also CPR courses). Apart from these, other trainings are in the field of survival, safety and equipment" Sergeant Major Halmans added.

"A follow-up training to the ORAC is the FAMET (Forward Aeromedical Evacuation Training). This is a training in which elements are added to the final objectives of the ORAC. All this is simulated in order to offer a training that is as realistic as possible in which as many facets of the forward AE as possible are discussed". "We are currently overhauling the ORAC. This is to ensure that the course connects even better with the other courses and training in the future," Sergeant Major Halmans concluded.

the improvement in communication with us as flight crew" added Michiel.

"The most important part of the training is how to approach and work safely in an operational flying Helicopter. Participants learn how to be secure during the flight, they also have to move the patient, all equipment and the medical backpacks in the helicopter. Secondly, they have to learn how to communicate on board," according to Major Sven Jägers, A3 current OPS of Operational Health Department (Operationele Gezondheidszorg/OGZ).

Major Jägers further stated, "Flying is done with open windows and tail lift, so that you also have to deal with drafts and noise during the flight. In addition, tactical flying is regularly performed (depending on the type of "mission"). All this is done to mimic reality as much as possible. There is also a static night exercise in which you have to examine and stabilise a patient with very limited light options (Light Discipline). First, there is an introductory flight where you can get used to the helicopter and the behavior of the various equipment during flight movements (Tactical Flying). Subsequently, various "missions" flights take place in which you land at a point of injury (incident location), you briefly map the patients there and if necessary and possible, stabilise and prepare for Air Transport'. In the event of a "hot" landing zone, the medical team, including an Air Mobile Protection Team (AMPT) loaded patient immediately. The participants should make a clear plan where the patient should be transported to (nearest Medical Treatment Facility, Role 2 or Role 3) and answer questions such as how to fly towards the pilot (low and loud gives a lot of vibration and will be painful for a patient with fractures) and whether there is a height restriction (in a patient with, for example, a collapsed lung). When the helicopter returns, a sign from the loadmaster must be clearly observed to see if the helicopter can be approached, after which the patient is transported to the helicopter. The patient is then secured on the stretcher and connected to the monitor, after which he is taken to a Medical Treatment Facility (MTF). Because of the potential threat, it is often impracticable to stabilise the patient before transport and the first assessment and treatment of the patient often takes place in a flying helicopter with all conceivable stresses of flight," concluded Major Jägers.

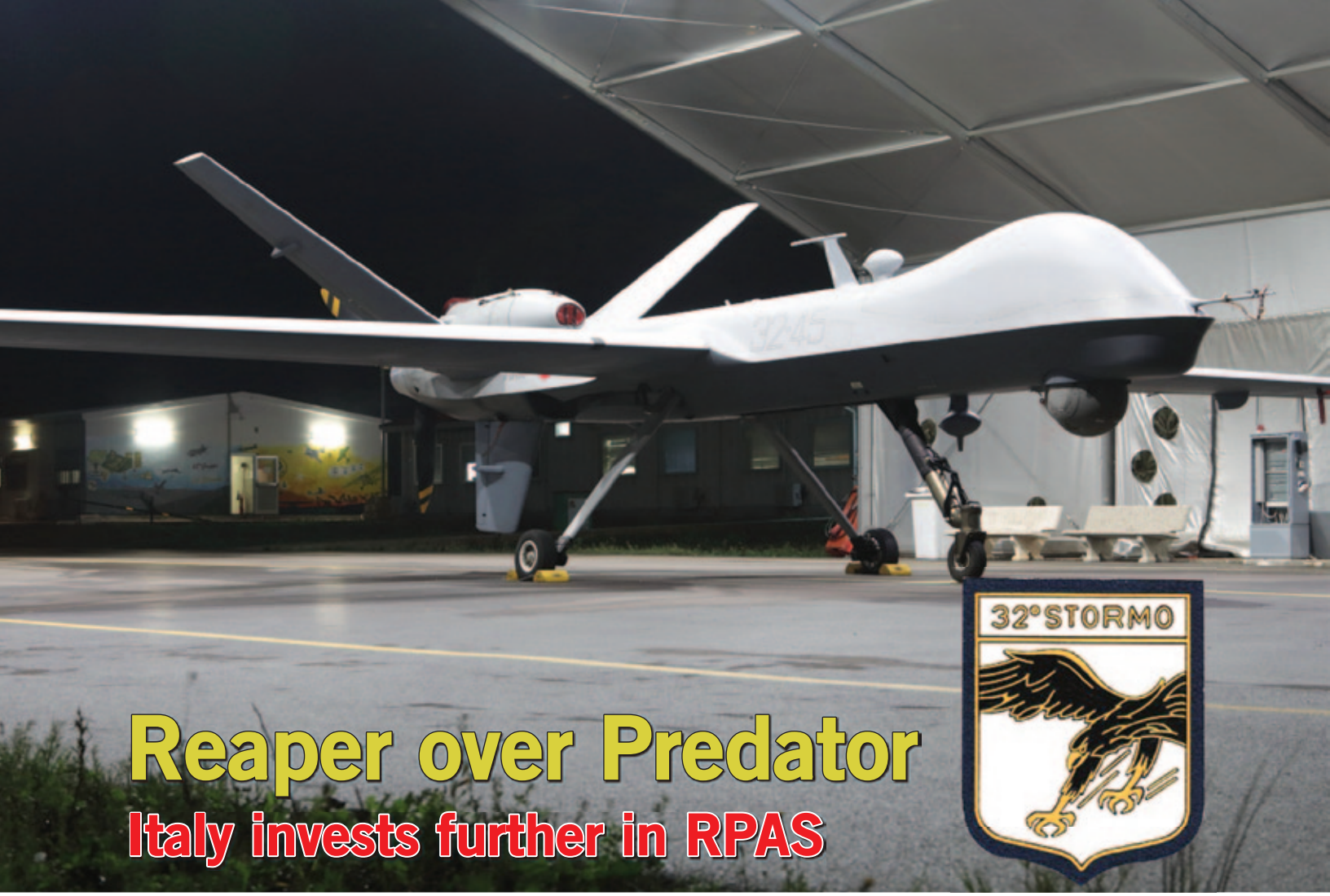
Each "mission" is assessed by two instructors (always a combination of a medical specialist, physician and a flight nurse instructor). This duo is cooperating first on the AE skills (safety, communication, situational awareness, collaboration as a team) and secondly, on medical content. At the end of each course day, the results of all participants are discussed and if necessary, areas for improvement identified by the instruction team explained Lt Col. Oele. The training course also concludes with a theory exam and at least five "missions performed" where the candidate is in the "lead" during multiple times. All missions flown are assessed and reviewed using a standard checklist and evaluation form.

Lt Col. Oele continued "ORAC training has been around for more than 10 years and is performed at least once a year. Belgian colleagues also participate in the ORAC. In 2018, at the request of Canadian Armed Forces, an ORAC was even provided (by a Dutch AE instruction team) towards Canadian Physician, nurses and medical technicians, to support them in their Operational Readiness, preparation for the Canadian Aeromedevac (UN) mission (2019) in Mali. During this collaboration, communication was in (medical) English. The AE instructors assessed and supervised the Canadian colleagues. The Canadian colleagues were very satisfied with this intensive way of cooperation, guidance and feedback. The ORAC is an excellent course in the field of aeromedical evacuation and is assessed as very valuable and evaluated very well in collaboration with the instruction team. However, additional, short, type-specific training (depending on which airframe is available) in the context of mission-oriented training remains necessary. Clinical experience should remain the guiding principle and annual internships are desirable. Making many flying hours and multidisciplinary cooperation increase the operational character. The ORAC course is seen by the participants as a good preparation for an actual deployment'.

Next step in the training syllabus is the FAMET (Forward Aero Medical Evacuation Training) which is an additional training to full operational status of the flight physician and nurses. The scenarios are more complex and include simulated hostile scenarios. Participants will continue with the FAMET course a year after finalising ORAC.

The following FAMET course will be held in the United States again during the first half of 2022 at Fort Hood, Texas.

Article and photos: Carlo Kuit & Paul Kievit/ Bronco Aviation



Reaper over Predator

Italy invests further in RPAS

Last year, it became clear that the Italian Defence had planned new investments for its Remotely Piloted Aerial Systems (RPAS). The countries' air force currently operates the MQ-1 Predator since 2004, while MQ-9 Reaper operations started around 2010. Both RPAS systems are assigned to 32 Stormo (wing) located at Amendola Air Force Base. We visited the base and spoke to Lt. Col. Claudio A., Commander of 28 Gruppo (squadron), the RPAS operating unit, to hear more about the units' Unmanned Aerial Vehicle (UAV) operations, the investments made and what it will mean for the future RPAS activities.

32 Stormo

The Italian Air Force Base of Amendola is located near the centre east coast in a sparsely populated area between the city of Foggia and the Adriatic Sea. This base is home of 32 Stormo which includes 2 squadrons, namely 13 Gruppo flying the F-35A and B "Lightning II's" and 28 Gruppo Volo (28th Flight Squadron) APR (Aerei a Pilotaggio Remoto = Remotely

Piloted Aircraft/RPA), commanded by Lt. Col. Claudio A. Commander Claudio A. has accumulated about 2000 flight hours on jets like the AMX and has meanwhile, logged another additional 1200 hours on the MQ-1 and MQ-9.

In fact, 32 Stormo has also a third squadron, namely 61 Gruppo Volo APR, but this squadron shifted to Sigonella Air Force Base at the island of Sicily. This squadron was raised around 2017 but originally, it is a detached unit from 28 Gruppo, but now it has become a regular Italian Air Force squadron.

"Here at Amendola, we fly the MQ-1B Predator and MQ-9A Reaper, while at Sigonella, the focus is on the MQ-1 Predator", stated Lt. Col. Claudio. The UAV Operational Conversion task is executed within 28 Gruppo at Amendola which is equipped for that purpose also with flight simulators. Here the Initial Qualification Training for new pilots and sensor operators takes place and also includes periodical recurrence crew qualifications, like on emergency procedures. While 28 Gruppo at Amendola is performing all training and operational duties, the UAV operations out of Sigonella concentrate on the Intelligence Surveillance and Reconnaissance (ISR) tasks only. With the Electro-Optical/Infrared (EO/IR) sensors, the UAV's deliver a real time view. The obtained images and videos can be shared with other mission participants such as chain of command for immediate decision making, or other aerial, land or sea-based assets to have an overall view of the by RPAS observed situation. The users of the video streams are not only Italian military but can include other governmental branches such as customs and international audiences. Samples include missions for the European Union border and coast guard agency FRONTEX, to monitor migrant routes from Africa towards Europe and furthermore, observing Mediterranean marine traffic for law enforcement purposes.

Investments and de-investments

In 2021, news was made to public, indicating that Italy had initiated new plans for their air forces RPAS systems. These initiatives coincided with the announced awarding of a contract to GA-ASI worth $30.5M to upgrade the Italian "MQ-9A Reaper B" Medium-Altitude Long-Endurance (MALE) UAVs from Block 1 to Block 5 standard. Details revealed by

the US Department of Defence (DoD) mentioned a Mid-Life Modernisation (MLM) contract, which was awarded under the US Foreign Military Sales (FMS) programme and included five systems Lot 1 MQ-9A UAVs and Block 30 mobile Ground Control Stations (GCS) currently in service with the Aeronautica Militare (AM) Italian Air Force. Originally, AM had acquired 6 Reapers. The manufacturer of the systems, GA-ASI, declared that the upgrade to the MQ-9s included the latest version of their AN/APY-8 Lynx multimode radar, which is an all-weather Synthetic Aperture Radar (SAR) and Raytheon's AN/DAS-1 MTS-B Multi-Spectral Targeting System. Furthermore, the system will have increased electrical power capabilities and an improved landing gear. The ongoing upgrade programme is scheduled to be completed in the next few years. Lt. Col. Claudio A. furthermore mentioned that the MQ-9 fleet will also receive an unspecified number of additional new airframes and accompanying GCS. Once the upgrade programme is completed, all MQ-9 assets and equipment will be equal and have the same standard.

The investments on upgrade and increase of the MQ-9 UAVs is not done without reason. The other flying RPA asset of 32 Stormo, the MQ-1C Predator A+, is meanwhile getting at the end of life, and after its withdrawn from use by main user USAF in 2018, it is expected to become more difficult to continue operations when there will be no support for new updates on this system. This made the Italian Air Force decide on future discontinuing of MQ-1

operations. Lt. Col. Claudio A. explained that the retirement of the Predator will be done by out phasing the system on base of remaining available flight hours per airframe. Although no clear term was stated, it can be expected that the final Italian MQ-1 flight will take place in few years. The upgraded and new MQ-9s will take over operations of 61 Gruppo at Sigonella phasing-in with the MQ-1.

Cooperation

The decision to reduce from 2 to 1 UAV system will certainly bring advantages on efficiency and logistics in operations. Additional benefits can be gained on international level, considering the cooperation with the US and NATO partners within Europe. AM maintains a close relation with the USAF and while working together, they able to learn from the valuable experiences gained by the US military over many years that they operate these UAV systems in various types of missions. The cooperation is mutual with AM personnel attending instruction courses in the USA, but also with an USAF exchange pilot and sensor operator in the UAV Operational Conversion Unit (OCU) at Amendola and an identical Italian exchange crew working in the US at the OCU at Holloman AFB, New Mexico. The exchange programme for UAV is now in place for 12 years and brings good lessons learned for the crews who can join a unit for 3 years, before relieved by another crew, according Lt. Col. Claudio A.

Other cooperation is embedded in a multinational Working Group of military UAV system users, the MQ-9 User Group. These users, come periodically together to share information. The exchanged information can be incorporated directly in other countries flight procedures and, with more and more partners operating the MQ-9, there might be more new options possible to explore. Lt. Col. Claudio A. mentioned that the architecture of the MQ-9 User Group could make future interfly-ability possible.

New future UAV operators have interest to see how AM, with its more than 15 years of operational experience, is working with their UAV systems. So did The Netherlands who had their new

MQ-9's delivered to 306 squadron in the beginning of 2022. A few years earlier, the Dutch Defense Secretary together with Chief of Staff, visited the 28° Gruppo at Amendola to learn more from the Italian experiences as a preparation, due to the engagement in the acquisition of MQ-9 systems and the Dutch future operations.

"In late 2021, we also had the European Union Aviation Safety Agency (EASA) visiting our base for a seminar on UAV use," stated Lt. Col. Claudio A. EASA is currently working on a common framework with regulations for RPAS use all over Europe. "In the civilian world, 99% of the attention is for RPAS flown in the proximity under visual line-of-sight conditions. Many of these, often small, commercial users are in business of goods delivery for short range. Long range RPAS operation is something particular and with our Beyond Line Of Sight (BLOS) flight experience, EASA came to us", as Lt. Col. Claudio A. explained.

Gruppo ops

An RPAS operational crew is composed out of a fully rated pilot and a non-commissioned officer, Sensor operator to be added with an intel officer when a mission requires. When a MQ-9 mission foresees the use of the Synthetic Aperture Radar, an optional imagery analyst joins the crew. "During our missions, we are always supported by a team of analysts watching the video feed from our UAV", as Lt. Col. Claudio A. further described. As the Predators and Reapers are technically capable for endurance flights for more than 20 hours, a regular mission requires several flight crews to cover the overall flight. In these endurance flights, a crew is relieved in the Ground Control Station (GCS) by another to continue the mission without any interruption.

Given the fact that UAV flying requires intense work on computer display, conditions inside the GCS are kept at a controlled optimum level. The GCS space has a stable air-conditioned temperature and is lit by dimmed light optimal for eye focus at terminals. After a shift, the crew does a partial mission de-brief, takes some time to rest and thereafter, go to the weather- and intel departments to prepare for the following shift. "We always have a fuel reserve for several hours near the end of a mission. When we return to our base, we might face foggy conditions or wind out of limits and with the fuel reserve we can decide to postpone our landing until conditions permit a safe touch down", as Lt. Col. Claudio A. informed. When back on base, there will be a collective mission de-brief in the operational environment which can contain a specific shift de-brief important for the overall mission, as well as aspects on Crew Resource Management (CRM). A mission can serve different customers and consequently having more than one target. The different customers will be part of the debrief, as well as units with other flying assets in conjunction with the mission.

Recently, 28 Gruppo was included in the security frame work which was set up for the G-20 meeting in Rome last October (2021), where the UAV overwatch was provided on a 24/7 base. "Every flight crew involved, de-briefed their shift and continuously we did an overall de-brief for the activity. At the end of the mission, we de-briefed the result to the overall security agency of the G-20. Here you see that we will customise our briefings to the type of duty we are asked to perform" as Lt. Col. Claudio A. explained the tailor made operation and continued, "this way of de-briefing is for some aspects different against the ones I had as a fighter pilot, where you brief, plan and de-brief within your formation".

Text and photos by Peter ten Berg

T129B Mk-I ATAK attack and reconnaissance helicopter

Another view and report on Anatolian Phoenix 2022

The Anatolian Phoenix exercise can be best described as one of the most complex Helicopter CSAR exercises of today's warfare. The exercise is organised twice a year since 2009 at the 3rd Main Jet Base located near Konya in Turkey. Since 2012, the exercise not only intended for Turkish units but there is also one international edition with foreign participants every year. So far there have been 18 national and 7 international editions. This year the International Anatolian Phoenix 2022-1 Combined Joint Task Force Exercise was conducted between 17-27 May 2022.

From an international point of view, Poland appeared in the exercise with ground teams only. Turkish Republic of Northern Cyprus and Azerbaijan both participated with ground teams and helicopters. But the main participant was the Turkish Armed Forces that send in teams of the Turkish Air Force, Turkish Army, Turkish Navy, Turkish Special Forces and the Turkish Gendarme.

Mission goals

The most important part of the exercise is the cooperation and integration between different countries and also the integration between all the different branches of the Turkish Armed Forces.

This is even more important and challenging when it becomes clear that not only helicopters but also fast jet aircraft, AEW&C, transport aircraft, UAV and ground-based personnel rescue teams are participating in the exercise.

During the exercise, 'Joint Personnel Rescue' methods are performed in an operational combat environment. These methods and procedures are being tested and developed with the aim to improve the Command and Control (C2) process, planning, personnel rescue, close air support, effectively dynamic time sensitive targeting, point-defence (defence of a limited area), casualty evacuation and parachute jumping. All of this within in the scope of joint and combined operations between the different participants. Interoperability within all different participants and these tasks is key for the exercise.

Participants

All branches of the Turkish Armed Forces took part in Anatolian Phoenix 2022-1. In terms of aircraft and personnel, most participants came from the Türk Hava Kuvvetleri (THK- Turkish Air Force) which

T129B Mk-I ATAK attack and reconnaissance helicopter

of T-129B Mk-I ATAK combat helicopters, one S-70 Blackhawk and a CSAR team. The Jandarma Genel Komutanlığı (Gendarmerie General Command) and Turkish Special Operations Force (TuSoF) both took part with a CSAR team and an S-70 utility helicopter each. Finally the Turkish Navy sent a CSAR team to the exercise.

Since the start of the 21st century, Turkey's bilateral relations with Azerbaijan have increasingly become closer. The Turkish government has been closely

AS532 of the Turkish Air Force

deployed more than 175 military personnel including 35 pilots, four CSAR teams and two JTAC (Joint Terminal Attack Controller) teams.

From the flying units headquartered at Konya, the 132 Filo "Hançerler" provided eight F-16C/Ds and the 131 Filo "Ejder" (Dragon) participated with one of its E-7Ts AEW&C. The 135th Liaison and SAR Squadron "Ateş" (Fire) provided the CSAR ground teams, a pair of AS 532AL Cougar helicopters and also a single CN-235. Also one Anka-S UAV from the THK took part in the exercise.

The Türk Kara Kuvvetleri (TKK - Turkish Army) participated with a couple

Azerbaijan Mi-17 hovering over the range

Special operations S-70 Blackhawk preparing for fast rope insertion

Colourful scheme of the Gendarme S-70 Blackhawk

Anka-S UAV from the THK

cooperating on defence and security with the country signing several military agreements including exports of Turkish military equipment like Bayraktar TB2 drones and military training exchange programmes. Nowadays, Azerbaijan is one of Turkey's closest allies in the region and their presence at Konya with personnel and helicopters is not a big surprise. The Azerbaijani Air and Air Defence Force (Azərbaycan Hərbi Hava Qüvvələri) sent 90 servicemen most of which made up for two CSAR teams with a pair of Mi-17 multirole helicopters coming from Qala Air Base.

A small contingent came from the Turkish Republic of Northern Cyprus (TRNC) which sent a single AS 532UL Cougar along with a CSAR team counting in total 18 personnel.

Poland participated with one CSAR and one JTAC team and besides that, they send 3 pilots but without any helicopters; in total making up for 13 personnel.

Probably due to situation in Ukraine, the Romanian participation was cancelled this year (a single CSAR team and two IAR-330 were originally scheduled).

In addition, 11 observing nations took part in exercise. These are Chad, Burnika Faso, South Africa, Northern Macedonia, Libya, Lithuania, Nigeria, Uzbekistan, Senegal, Oman and Bulgaria. Contrary to many European exercises, it is striking that the list of participants and observers does hardly contain the standard NATO countries. This makes Turkey's special position outside of Europe and in the rest of the world visible.

S-70A-26E Blackhawk of the Turkish Army

Exercise

The exercise was conducted under the supervision of the Anatolian Eagle Training Centre (AKEM) which has also hosted the various editions of the Anatolian Eagle, Turaz Hawk, Anatolian Falcon and Pençe exercises since its establishment at Konya's 3rd Main Jet Base in 2001.

Various types of missions were conducted during daytime hours and on 26 May, a night mission was also conducted. The exercise took advantage of the AKEM's large training areas including the large firing range approximately 45 minutes away from Konya's 3rd Main Jet Base allowing for tactical training flying without any restrictions.

On the first day, the participants arrived in Konya and it was a non-flying day devoted to the preparation process including a detailed briefing on the planning of the exercise. The second day was spent on familiarisation flights and integration of radio communications. From 17 to 26 May, aircraft and personnel were assigned to perform a wide variety of missions

F-16C-50-CF from 132 filo in take-off

including SAR/CSAR, Close Air Support (CAS), Medical Evacuation (MEDEVAC), High Value Target (HVT), Infiltration and Exfiltration, parachute jump, convoy protection, dynamic aiming, rescue escort and fast rope insertion. Most of these missions were conducted in the Konya Mountains. The last day of the exercise (27 May) was dedicated to evaluation the closing ceremony and the start of the redeployment.

Demonstrations

A Media Day was organised on 25 May while regular operational activity continued and thus giving the press an opportunity to get a closer look at the exercise. In the morning, the helicopters could be photographed up close at Konya Airbase. After lunch, the Media Briefing took place after which the media team was transported by bus to the shooting range which is just 45 minutes away. Meanwhile, the VIPs, including the Commander of the Turkish Air Forces - Atilla Gülan and Deputy Minister of Defence of the Republic of Azerbaijan and Commander of the Air Force - Lieutenant General Ramiz Tahirov, arrived at the shooting range with two AS 532AL Cougar helicopters.

According to the planned scenario of the military exercise, a border post was attacked and a decision was made to evacuate four military staff injured in the attack from the region.

For a rapid deployment to the region, a Personnel Rescue Team arrived at the border post with a HALO jump and responded to the injured staff.

As a result of the ongoing attack to the border post, Close Air Support (CAS) was demanded. Within this scope, the targets identified by the ANKA-S UAV were successfully destroyed with the GPS guided GBU-38 JDAM ammunition launched from two F-16C aircraft belonging to the 132nd Squadron Command.

The four injured staff at the border post were evacuated with two AS532 helicopters and a single Mi-17 helicopter of the Azerbaijani Air Forces in line with the CASEVAC training scenario.

Two T129B Mk-I ATAK attack and reconnaissance helicopters provided close air support to the evacuation of the injured staff with impressive 20mm artillery shooting.

After the evacuation, in accordance with the scenario PR/CSAR Operations were launched in order to rescue a falling F-16 pilot. Within the scope of the operation, initially the PR Teams were deployed in the region with two S-70 helicopters and one single Mi-17 helicopter of the Azerbaijani Air Force.

The teams first maintained the security of the region and then successfully accomplished the evacuation of the pilot. In order to ensure the safety of the PR Teams, all the time two T129B Mk-I ATAK helicopters conducted flights over the region.

During the evacuation, the hostile targets identified by the JTAC team positioned at the border post were attacked with GPS guided GBU-38 JDAM ammunition launched from two F-16C aircraft belonging to the 132nd Squadron Command.

At the end of the military exercise, the paratroopers jumping out of the CN-235 transport aircraft opened the flags of the participant countries in the air. The event ended as all the participating helicopters, CN-235 and participating F-16's attending the exercise saluted the VIP and press observers with a low level fly-by of the observation platform.

Photos and article: JOHAN FRANKEN and FRANK VAN DER AVOORT

Turkish Air Force E-7Ts AEW&C

Frisian Flag returns!

CF-188s taxiing

After two years of absence because of Covid, this year saw another edition of Dutch exercise Frisian Flag, the biggest of its kind in Europe. Although this year too it was unsure for a while whether the exercise could go on, not because of a pandemic but because of the Russian invasion of the Ukraine followed by the ongoing war between two nations. Because of this, the Polish air force had to cancel their participation with MiG-29s and F-16s, and the German Luftwaffe decided not to move a dozen EF.2000s

Flightline with four Hornets getting ready

"Have a good one!"

to Leeuwarden but fly only few missions from home. This caused some doubt whether the remaining participants would be enough for the exercise to qualify as a 'Flag' exercise. However, NATO deemed the exercise as very important, especially with the situation in the Ukraine, so Italy arranged some last minute participants as a replacement, the Dutch freed up two more F-16s and the British Royal Air Force assigned some Typhoons to participate from their homebase as well.

Next to the more regular participants this year's edition saw the Royal Canadian Air Force participate for the first time. 433 squadron from Baggotville based 3 Wing sent 6 CF-188 Hornets to The Netherlands. Squadron commander Lt.Col McLeod

Landing Hornet with AH-64 Apaches in the background

Supporting Canadian C-17

explained, "The Dutch air force invited the RCAF a few times already, but it was always too difficult to match the exercise with other operational obligations. A lot of resources are needed to support an exercise like this. However, this time the exercise perfectly fit within the strategic training objectives and HQ approved our participation."

Obviously, the situation in the Ukraine not only forced some participants to change their plans, it also gave the exercise a completely different atmosphere. It made everybody realise again that despite a relatively peaceful period of some decades in Europe, you can't take peace for granted unfortunately. When asked about this Commander of airbase Leeuwarden Johan van Deventer stated, "It makes us realise again how important it is to be well-trained and how important it is to be one as NATO, and to be able to smoothly operate together." He continued, "Russia invaded the Ukraine around 5 AM [Dutch time], and around 10 AM the first F-35s took off here to fly combat air patrol over Eastern Poland. That's how quick we can react. But that means you must be trained very well, to be deployed that quickly."

The basic aim of the Flag exercises is to give young pilots real time experience of their first combat missions, to improve their chances of survival in case of real

Dutch F-35s participating for the first time

war. “To get back to that [after the Covid period] is critically important” McLeod said. “It has been a huge eye opener for my pilots. Missions involved a number of aircraft they don’t usually see and there are some challenging scenarios.” Not only the younger pilots learn a lot from this exercise but many experienced pilots get to be mission commander for a day and this enhances their leadership skills. Van Deventer added, “Aim of this exercise is to be able to practise large, complex missions, with many aircraft at the same time. That is also what we would have to do during wartime. Normally, we fly with 4 or 6 aircraft, now we exercise with 30.”

Usually, Frisian Flag is combined with the European Air Refuelling Training (EART) exercise, which provides air-to-air refuelling. Because of the situation in the Ukraine, this year EART was cancelled. However, a single A.330MRTT of the Eindhoven based Multinational MRTT Unit (MMU) assisted during multiple missions and not only the situation in the Ukraine influenced the exercise, the weather added salt to the injury. Where all participants arrived at Leeuwarden in glorious summer weather, this quickly turned into autumn and even winter with rain, hail and snow as well. However, it was the wind that really caused problems, with

F-35 landing on Leeuwarden AB

Dutch F-16 taking part for the last time in Frisian Flag

Italian Tornado with full afterburner

American F-16 in the new Have Glass V colour scheme

one mission scaled down because of gales and four missions cancelled altogether. Luckily enough missions had been planned (two every day) to give all participating crews enough opportunities to fly and learn.

Major 'Banger', one of the more experienced Canadian pilots, explained about lessons learned, "First, there is deployment of the whole squadron overseas, with all logistics. Then the missions are flown with fighters of different nations and generations. Integrating all this effectively is the biggest challenge. Furthermore, you learn not to assume every aircraft you fly has the same capabilities." The Dutch air force

French Mirage 2000 taking off

Three Mirage 2000s creating a lot of noise

participated with the F-35 for the first time, which was considered a great benefit for all participating parties as they can learn the capabilities of this 5th generation fighter. The aircraft turned out to be an information sponge, as one of the participants called it. Biggest challenge turned out exchanging all this information.

Another first for this edition was the local presence of Control and Reporting Centre (CRC) 'Bandbox'. Normally based at Nieuw-Milligen, they moved a deployable fighter control centre unit to Leeuwarden. This proved to be a great success. From their unit, they covered parts of the Dutch, German and even Danish air space. As the exercise progressed, more and more pilots and ground crew visited Bandbox during missions as spectators, to learn how air battle management is done. This resulted in much more understanding of each other. Bandbox acted as eyes and ears of the exercise, through which they closely cooperated with both French and NATO E-3 AWACS. These aircraft operated from their home bases Avord and Geilenkirchen.

Every edition, something new is tried regarding participants, and this year Dutch AH-64D Apaches and an AS.532 Cougar were added. Major 'Joker' who was in charge of the organisation explained, "This year, we wanted to try inclusion of helicopters in the scenarios. The Apaches performed Combat Air Support [CAS] with the Dutch army and navy. They were based at Leeuwarden for a few days, but also operated from forward operating bases [FOB]. The helicopters themselves were protected by the aircraft of the Blue forces." When asked about future developments, Joker stated, "In the near future, we will add simulators. So, there will be pilots in the air and in simulators at the same time and all will be connected to participate in the same mission."

French Navy Rafale with special anniversary tail

The exercise lasted two weeks, and after the conclusion of the exercise, all participants went home apart from the Canadians. Originally, it was planned that the Canadian delegation would stay at Leeuwarden for another week to fly some local missions with Dutch F-35s, the fighter jet that will probably replace the Canadian CF-188s in due course. However, the war in Eastern Europe prevented this. McLeod explained "We depend on the timing of available airlift. Obviously, humanitarian aid and other operational obligations go first." In the end, all six Hornets started their journey back to Canada after doing a last flight over The Netherlands.

Text and photos by
Patrick Dirksen & Frank Mink

French Navy Rafale with special tiger tail

The Fire Blade 2022

The Fire Blade 2022 (FB22) is the 16th helicopter exercise organised under the European Defense Agency's (EDA) Helicopter Exercise Programme. This exercise was held between 7 and 24 June 2022 at Papa AB in Hungary. The participating forces deployed at Papa airbase in Hungary (ICAO code: LHPA) and the missions were planned south of the airbase in two large exercise areas close to lake Balaton; taking care of the concern of reducing their impact on the environment and population.

Participating helicopters and aircraft flew diverse day and night COMAO (Composite Air Operations, large missions with various types of numerous aircraft/helicopters) missions such as Air Assault; Special Operations Aviation (e.g. fast rope techniques; insertion/extraction and air-to-surface firing); Combat Service Support; Close Air Support; Convoy/helicopter escorts; Reconnaissance and Surveillance; Combat Search and Rescue; Personnel Recovery and Medical Evacuation and Casualty Evacuation.

A total of 25 flying assets (20 helicopters + 5 fixed wing) and some 550 military personnel from five participating countries – Austria, Belgium, Slovenia, Slovakia and organiser Hungary participated in this exercise hosted by the Hungarian Air Force. The exercise's main focus was to allow crews to practice operations in various environments during day and night sorties, replicating the challenging conditions that participant forces are expected to encounter when deploying to different theaters of operation.

Distinguished Visitors Day

A Distinguished Visitors Day (DVD) was held on 21 June 2022 when representatives from EDA participating Member States attended and observed a live training session at the exercise area 'RUIN-CITY', 40 kilometers south of the Papa airbase. The Joint Air Power Competence Centre (JAPCC), the NATO Special Operations Headquarters (NSHQ) and the European Air Group (EAG) also marked their presence at the DVD.

Background

The Helicopter Exercise Programme (HEP) is part of EDA's wider helicopter portfolio aimed at providing Member States with a joint European framework to develop, consolidate and share best practices to meet the challenges of flying helicopters in a modern operational environment. Other components of this portfolio are the Helicopter Tactics Course (HTC) programme, the Helicopter Tactics Instructor Course (HTIC) programme and the future Multinational Helicopter Training Centre (MHTC).

Media visit 20 and 21 June 2022

A media visit was organised for 2 days, on 20 and 21 June 2022. On 20 June, a Hungarian Mi-24 HIND flight was organised during the morning, to participate in one of the national trainings. The local flight was a training flight for Hungarian Special Forces (SOF) sniper exercise onboard the Mi-24. The helicopter boarded the snipers and flew to the training area close to Lake Balaton, where the snipers trained to shoot from an unstable helicopter in the air, compensating for the downdraft of the rotor blades.

During the afternoon, a Hungarian Mi-17 HIP flight was organised with a Hungarian SOF unit that was deployed to the ground in a training area close to Lake Balaton. There the unit observed enemy positions. And because enemy forces wounded a SOF colleague, a Belgian A109 had to fly a MEDEVAC mission to get the wounded soldier out of the area. After the operation, the SOF unit was recovered by a Belgian NH90 and a Hungarian Mi-17. In the background, two Hungarian H145s performed gunnery exercises at the nearby firing range.

On 21 June, another media flight onboard a Hungarian Mi-24 was organised to photograph the rehearsal of the COMAO demonstration for the Distinguished Visitor Day in the "Ruin City", at the Újdörögd training area. That area was specially prepared to exercise urban warfare with helicopters. During the afternoon, the actual COAMO demonstration for the Distinguished Visitor Day was performed from the ground. After the demonstration, many helicopters landed in the streets of "Ruin City" for photos and interviews.

Observers to this exercise were present from Italy, France, Bulgaria, the Netherlands, Greece, Switzerland, Czechia.

Participating aircraft and helicopters

Country	Type
Hungary	Mi-17 Hip Mi-24 Hind Airbus H145 Saab Gripen JAS-39 (flying from their homebase Kecskemét (ICAO:LHKE))
Belgium	Agusta A109 NHIndustries NH90
Slovakia	Sikorsky UH-60
Austria	Pilatus PC7 Bell OH-58 Kiowa Agusta-Bell AB212
Slovenia	Eurocopter AS-532

We interviewed the exercise director Colonel Zoltan Rolko of the Hungarian Air Force. Colonel Rolko (callsign 'ROKA') joined the Hungarian Air Force in 1986 and he stated that the Fire Blade exercise

was the only major helicopter exercise in Europe, where helicopters could exercise in large COMAO formations. The Fire Blade exercise started with familiarisation flights and during the weeks the exercises became more and more difficult and complex. The Rules of Engagements (ROE) were tightened, thread levels were increased, Electronic Warfare increased and more 'surprises' were added to the exercise. "Fire Blade is the best choice for multinational tactical helicopter training in Europe, because it focuses on tactical speciality to be in a multinational environment", he further stated.

Article and photos:
Joris van Boven and Alex van Noije

First F-35s at Volkel and 313 Squadron

On 30 June 2022, the Royal Dutch Air Force (Koninklijke Luchtmacht) celebrated three big changes in the organisation at Volkel Airbase: the arrival of the F-35, the resurrection of 313 squadron and the organisational change into the "Air Combat Command."

The Dutch Air Force consists of two operational fighter bases: Leeuwarden Airbase (ICAO: EHLW) in the north and Volkel Airbase (ICAO: EHVK) in the south. Plus the fighter control centre AOCS (Air Operations Control Station) based at Nieuw-Milligen, located in the centre of the Netherlands. All three organisations ceased to exist as separate entities on 30 June and they were combined into one command "Air Combat Command", under the command of Commodore Johan van Deventer. The Dutch Air Force commander luitenant-generaal Dennis Luyt, handed over the new "Air Combat Command" banner to the new AAC commander Commodore van Deventer.

The 313 squadron is the Dutch Tiger squadron present at many NATO Tiger Meets throughout the years. On 18 December 2020, the 313 squadron was temporarily disbanded and stopped flying the Lockheed Martin F-16. With a formation flyby, this moment was celebrated. Then the pilots and the crews converted to the Lockheed Martin F-35 at Leeuwarden Airbase. Then on 30 June 2022, the 313 squadron was resurrected as an F-35 squadron at its homebase Volkel.

Lieutenant-Colonel Niels Hussen flew the F-35 in the formation of four F-35s and taxied after landing to the ceremonial place with his F-35 (coded F-024). There he held

a speech to celebrate the resurrection of 313 squadron.

With the official arrival of the Lockheed Martin F-35, Volkel Airbase now has two squadrons with two jet fighter types. 312 squadron flying the Lockheed Martin F-16 and 313 squadron flying the F-35. For the next two years, 312 squadron will keep on flying the F-16 and then they will convert to the F-35 after the retirement of their F-16s.

The history of the no 313 Squadron started in 1952. It started when a number of T-33 T-Birds arrived at Volkel Air Base. The unit used these aircraft until 1 January 1959. The no 313 Squadron was then abandoned. It would take until 1972 before another activity took place under the flag of the no 313 Squadron. The unit was re-established at Twenthe Air Base on 12 October 1972. The squadron was at that moment equipped with the Northrop NF-5 Freedom Fighter. The unit would fly for almost 18 years with this type of airplane. The no 313 Squadron was one of the 4 NF-5 squadrons in the Netherlands. The other units which flew this type, were; the no 314 Squadron at Eindhoven Air Base, the no 315 Squadron at Twenthe Air Base and the no 316 Squadron at Gilze-Rijen Air Base. The no 313 Squadron started the transition to the F-16 Fighting Falcon between 1988 and 1990. The squadron markings were a yellow bird in a blue circle at that moment. The badge was replaced by the tiger badge during the introduction of the F-16. The slogan of the unit became "Scherpgetand" which means "With Sharp Teeth". The tiger on the badge of the no 313 Squadron symbolises determination, strength and speed during action which belongs to the unit characteristics.

The no 313 Squadron had when they received the F-16 Fighting Falcon the same operational tasks as the no 311 Squadron and the no 312 Squadron. The F-16s were used for both air defence tasks and air support tasks according to the so-called swing-role principle. This means the unit can switch quickly between these two basic tasks. The no 313 Squadron received a new task with the introduction of the F-16s at the beginning of the 90s. This task was the operational conversion task. The task of the unit was to introduce the new pilots in the busy European airspace in the early 90s. This task was taken over in 1992 by the no 316 Squadron which was moved to Eindhoven Air Base. The no 313 Squadron received again the normal operational task. The no 313 Squadron received the training job back after the disbandment of the no 316 Squadron at Eindhoven in 1994.

The Dutch government announced in 2003 that the air force had to shrink drastically. They decided to close Twenthe Air Base to reduce the costs of the air force. The no 315 Squadron was disbanded at the beginning of 2005. The F-16s of this unit came for sale, because the F-16 fleet was downsized due to the cuts in funds. The no 313 Squadron would move to Volkel Air Base. The first F-16s moved from Twenthe Air Base to Volkel Air Base at the end of 2005. The first F-16s of the no 313 Squadron moved to their new home at Volkel on November 17, 2005. This was the last phase of the end of Twenthe Air Base. Only 100 people moved with the no 313 Squadron to Volkel. The no 313 Squadron became fully operational at Volkel Air Base from the beginning of 2006. The unit returned to the base where it was founded in 1952. There were 3 units present at Volkel in that period, namely; the no 311 Squadron, the no 312 Squadron and the no 313 Squadron. The no 306 Photo Reconnaissance Squadron has now moved from Volkel to the United States. This unit became the new training unit for new Dutch F-16 pilots in the USA. The tiger of the no 313 squadron remained operational at its new home base Volkel at that time.

At the end of December 2020, the 313 Squadron at Volkel Air Base ceased its current activities with the F-16 Fighting Falcon. After a period of 32 years, the 313 Squadron stopped flying the legendary F-16 Fighting Falcon. The unit received its first F-16s in 1988, when the unit was still based at Twenthe Air Base. The unit is released from operational duty to begin its conversion to the F-35A Lightning II. The conversion started in early 2021. The pilots left to the United States to Luke Air Force Base in the state of Arizona. At this American airbase, the Royal Netherlands Air Force currently has eight F-35As that are used for the training of the pilots. The pilots will be trained in the course of the year that followed. The ex F-16 pilots no longer

status as a squadron. The 313 Squadron will be relocated to Volkel Air Base in June/July 2022. About 25 F-16s are currently based on Volkel. The remaining airframes of the 313 squadron with the fewest flight hours on the clock will be transferred to the 312 Squadron. Now that the 313 Squadron was about to start its conversion to the F-35A, from January 2021, the 312 Squadron will be the only operational unit on the F-16 left in the Netherlands. A few F-16s were still flying at Leeuwarden every day, but those operations also disappeared in 2021 during the Leeuwarden F-16 Fly Out, making Leeuwarden the first airbase in the Netherlands to be fully operational on the F-35A.

Photos and text: Joris van Boven and Alex van Noije

have to go through the entire programme, because they are, after all, already qualified fighter pilots. This is therefore only a conversion training on the Lockheed-Martin F-35A Lightning II. The fact that the pilots already have experience on the F-16 is a plus, but that does not mean that the conversion training was immediately an easy training, because the F-35A is an advanced aircraft and cannot be compared with the F-16.

The ground crew received the necessary training at the American Eglin Air Force Base in the state of Florida. All American ground personnel for the F-35 are also trained at this American airbase. The Dutch personnel here only receive the necessary basic lessons on the new fighter type of air force. They would follow the real "on the job" training at Leeuwarden Air Base later in 2021. Here they will learn the job by learning from more experienced colleagues from the 322 Squadron. This unit of the Royal Netherlands Air Force has been using the F-35A since October 2019. People learn from experienced colleagues and will take this knowledge back to Volkel Air Base later in 2022.

Once the first pilots had completed their conversion training in America, the members of the future 313 Squadron would temporarily reside at Leeuwarden Air Base in the second half of 2021. Here, too, the main goal was that the pilots of the 313 Squadron will learn from their experienced colleagues from the 322 Squadron. At Leeuwarden, the 313 Squadron would therefore start its road to initial operational

Volkel Air Base and 312 Squadron

Volkel Air Base was built in 1940-1941 by the German Army, as a so called Nachtlandeplatz for aircraft of the Luftwaffe. In 1942 Fliegerhorst Volkel became operational. Originally grass runways were used, but as a result of the soggy surface two crossing hardened stone runways were built, with an additional third grass runway. During 1943 and 1944 several units used Fliegerhorst Volkel, flying the Messerschmitt Bf 109, Junkers Ju88, Messerschmitt 262 and Arado 234. Allied bombardments on August 15 and September 3 1944 caused severe damage to the infrastructure of the Fliegerhorst, ending the operational use of the airfield for the Luftwaffe.

After the war Volkel became homebase to allied bombers and tactical fighters, after which it was used as training centre for personnel of the Royal Netherlands Navy and Marine Corps from 1946 to 1951. The airfield was used for carrier-deck exercises for the Fireflies of HrMs Karel-Doorman, the Royal Netherlands Navy aircraft carrier. On 1 April 1950 the airfield officially became Volkel Airbase for the Netherlands Air Force (which became Royal Netherlands Air Force in 1953). The first occupants were Gloster Meteors of 327 and 328 squadron. In 1952, the 1st Tactical Fighter Group was founded, existing of 311 and 312 squadron. In 1953 313 squadron was founded at Volkel. The task of 313 squadron was to train new pilots for European navigation and weather conditions. Since 1958 313 squadron moved to Woensdrecht. Since 1960 the strike task was added to the air defence, ground-attack and ground-troop support tasks, followed by a 24/7 QRA task since 1962.

In 1964 311 squadron was the first Volkel based unit to receive the first supersonic aircraft of the Royal Netherlands Air Force, the F-104 Starfighter, followed by 312 squadron in 1965. In 1969 hardened aircraft shelters were built at the air base. In that same year 306 squadron moved from Twente Air Base to Volkel. The squadron, which used the RF-104G since 1962, flew its exercises from de Peel Air Base, close to Volkel.

In 1982 the first F-16 entered service with 311 squadron, followed by 306 squadron in 1983 and 312 squadron in 1984. In 2005, 313 squadron, now

equipped with the F-16, returned to Volkel as an operational fighter squadron. The training task of the squadron was transferred from 313 squadron to 306 squadron in 2001. In 2007, 306 squadron moved to Springfield, Ohio, to act as a training unit for future F-16 pilots. The unit was disbanded in 2010. In September 2012, 311 squadron was disbanded, due to budget cuts.

Present and future users of Volkel Air Base are 312 squadron and 313 squadron. At the time of writing of this article, 313 squadron is transitioning to the F-35A, leaving 312 squadron as the sole F-16 operator at Volkel Air Base and the Royal Netherlands Air Force.

312 squadron, Sons of Bonzo.

The squadron introduces itself to the public as: "We deliver worldwide airpower at discretion of the Dutch government. We are dedicated to strike hard when needed using the latest available tactics and capabilities. We now operate the F-16A MLU (Mid Life Update), which is constantly updated to enable international integration and to keep up with modern threats and demands."

The motto of 312 squadron is Audax Cum Consilio: Bold and Discreet. The nickname of the squadron is Bonzo, derived from the name of the dog of the commander of 327 squadron, the first Netherlands Air Force squadron which had Volkel as its homebase. The name was chosen by the first commander of 312 squadron, Captain van de Akker.

The squadron logo is two crossed golden swords interlaced with a red lightning strike. The markings consist of a red and white checkered tailband with the squadron's logo in the middle of the tail. The only difference in this format is the absence of the tailband or the toned-down version of this scheme.

Squadron commander Lt. Col. Patrick "Naish" Vreeburg

The commander of 312 squadron is Lt. Col. Patrick "Naish" Vreeburg. He is married, has two daughters and is an experienced F-16 pilot and active in the Royal Netherlands Air Force since 1995. In that year he started his career at the Koninklijke Miltaire Academy (KMA, Royal Military Academy). After completing these four years he went to Woensdrecht Air Base for the Elementary Flying Course, followed by the Euro-NATO Joint Jet Pilot Training at Sheppard Air Force Base from 1999 to 2001. He graduated as a member of class 00-08 and earned his wings after completing the training. He moved on to Tucson in Arizona to have his F-16 training, after which he returned to the Netherlands to be stationed at Twente Air Base. After moving to Volkel Air Base he was flightcommander at 312 squadron from May 2010 to June 2013. In this period he followed the Instituut Defensie Leergangen Middelbare Defensie Vorming, an education preparing officers for functions in policy preparating and policy executing functions.

In July 2013 he started Project Officer Replacement F-16, followed by the function of Project Officer CLSK F-35 Transition Team, both in Breda at the headquarters of the Royal Netherlands Air Force. The next step in his career was made when he became Director of Operations with 313 squadron at Volkel Air Base in July 2015. Starting in August 2017 he was assigned to the Ministry of Defence in Breda, as student Advanced Command and Staff Course. The following two years he was Chief Air C2 Cell Commando Luchtstrijdkrachten (Air Force Command). Since December 2020 "Naish" is commander of 312 squadron at Volkel Air Base.

Numbers

Over the years the F-16 fleet in the Netherlands was strongly reduced. In total 213 aircraft were received, to be based at Leeuwarden, Gilze-Rijen, Twente, Eindhoven and Volkel. In 1994, 316 squadron was disbanded resulting in 18 aircraft taken out of the inventory. In 1995 314 squadron was disbanded, followed by 315 squadron in 2004, 306 squadron in 2010 and 311 squadron in 2012. This left only 322 and 323 squadron at Leeuwarden Air Base and 312 and 313 squadron at

Volkel Air Base. All together a total of 61 airframes were allocated for use with these three squadrons. Surplus airframes were sold to Chile and Jordan. Chile received a total of 36 aircraft, of which 29 were F-16AMs and 7 F-16BMs. Jordan received a total of 21 F-16, consisting of 13 F-16AMs and 8 F-16BMs.

Hours on the clock

The F-16 fleet is over 40 years old and with the current task (securing the east flank of NATO), will the remaining flying hours, which they have left, be reached sooner than the expected life time? "The flights we make for our current task are long, but as the pandemic forced us to reduce the flight hours for the last two years, over all the life expectancy of the airframes will be as planned." During our visit to Volkel Air Base a total number of 35 F-16s were operational. This number will be decreased over the coming years. As "Naish" stated, the last F-16 will leave the Royal Netherlands Air Force around October 2024.

Decision making

Is the F-35 the aircraft wished for by the air force or would an upgraded version of the F-16 have been an option? "I was a member of the team responsible for research of the F-16 successor in 2013-2015. The choice was made, assessing the threat in the world and which tasks NATO and our government wanted us to perform. Based on these data several aircraft were compared, and finally only one aircraft could be selected being able to perform these tasks, which is the F-35. It is capable to perform in a heavy threat environment with advanced aircraft systems, like the Russians and the Chinese have. It was said that we would only like to have the F-35, but we assured that, based on the demands and capabilities of the other possible aircraft to replace the F-16, only one aircraft was right for the job. Diminishing the tasks could have led to a less advanced and capable aircraft, but that was no option. An advanced version of the F-16 would have given us more capabilities in some ways in comparison to our current F-16, but the design of a fifth generation fighter like the F-35 is, being able to perform in a threat environment like we have now, cannot be solved by modifications to a fighter like the F-16, even equipped with more and more advanced sensors and other electronic modifications. Stealth capabilities like the F-35 has, is one of the functions that cannot be solved with an upgrade to the F-16."

Is the decision to choose the F-35 based on political issue or did the air force decided they wanted to have the F-35? "We did not decide, but we advised. But one cannot argue with facts. Of course politics is an issue, like the choice for the F-16 in which Fokker had a part in manufacturing, or the Cougar and NH-90, in which politics played a part. In these examples other factors than only mission capability were also an issue in the decision making."

The commanders future

Do requirements for fighter pilots differ as the F-35 is entering service? "Fighter pilots now in service with the air force are in principle capable to transition to the F-35. In the decision making which pilots go to the F-35, there is one issue, being age. In my case, I also have to make my own plans and find out how I see the rest of my career. I am very much interested in the organisational part of my job, so my future for now is unclear. I still love flying, but when I do not transition to the F-35 it will be hard to find a seat. Time will tell."

"Oscar"

Even if 312 Squadron is the last RNLAF F-16 unit, the aircrews are relatively young, with many having only recently joined the ranks after the graduation from the B-Course in Tucson, Arizona. 1st Luitenant "Oscar" is one of the young pilots in the squadron. He joined the Royal Netherlands Air Force in 2015, starting the short military training at the Koninklijke Militaire Academie in Breda. After completing this, he started basic flight training at Woensdrecht Air Base, as a student of the

Elementaire Vlieger Opleiding (EMVO, Elementary Flying Training). In this stage student pilots learn the basic of flight in the PC-7 basic trainer. As "Oscar" says, "This part of the training results in less students have to leave the flying course in the United States, as the skills needed for pilots are tested and trained here. Students who don't have the basic skills fail here, and those who pass make a much better chance to complete the following course. The PC-7 is a rather fast aircraft to start with. From the beginning it is difficult to keep up with it. I had some glider experience, but that is just a very small advantage" The next stage of the training is at Euro NATO Joint Jet Pilot Training at Sheppard Air Force Base in Texas, USA for 1.5 years. Here the students fly the Beechcraft T-6 Texan II. "The Texan is more powerful than the PC-7, it has a more digital cockpit and an ejection seat and makes you work harder, as things happen faster. The first period is in fact a repeat of the EMVO. After the basic flying, the first steps in formation flying are made and a beginning is made with low-flying training at 500ft. More speed and faster decision making comes when the students go to the next step of pilot training, the twin-jet powered T-38 Talon, also at Sheppard Air Force Base for a year. Now things really speed up. Introduction to Fighter Fundamentals. In this stage we start using radar for navigation, and learn to use the aircraft for military purposes. After completing this part, I received my wings and went on to the next step, F-16 training at Tucson. The fourth flight in the F-16 is already a solo flight. This seams fast, but the F-16 is less difficult to fly than the T-38, because of the usage of fly-by-wire. Also new in this stage is the usage of radar, which the T-38 doesn't have. Also live ammunition is used for the first time". After returning to the Netherlands the F-16 pilots have additional training for the period of one year. When this year is completed, the pilot is combat ready. "Oscar" flew with 322 squadron at Leeuwarden AB for one year, and after this he joined 312 squadron at Volkel AB and is now still full in the learning curve.

70 Years 312 squadron

312 squadron was formed on 1 December 1951 and on 1 December 2021 the squadron celebrated its 70th anniversary, but due to the Covid-pandemic a proper celebration could not be organised. However, F-16AM J-197 received a special tail, marking 70 years of 312 squadron. As things are planned now, the official celebration will be held at Volkel AB on 20 May 2022.

The F-35 era

The successor of the F-16 at 312 squadron, the Lockheed Martin F-35A, will arrive at Volkel Air Base in June 2022. The first 6 aircraft will be transferred from Leeuwarden Air Base, where the aircraft will be delivered to from the factory in Italy. The first batch of 15 aircraft will be placed at 313 squadron. After completing deliveries to 313 squadron, the first F-35 will be delivered to 312 squadron. As the order is now, 312 squadron will receive 9 aircraft. Goal is to extend this number to 16 aircraft.

The tasks of the squadrons within the Royal Netherlands Air Force will remain equal to the current tasks. "Naish" explains: "QRA, the Quick Reaction Alert duties to secure the skies and to intercept incoming unidentified or hostile aircraft is and will be a task for all squadrons. 322 squadron at Leeuwarden and 313 squadron at Volkel will be the first to perform QRA duties, while 313 squadron will be responsible for the strike role. When 3ZZ, which will most likely be 312 squadron, is fully equipped and operational with the F-35, I expect that the strike task will be placed with 312 squadron."

We would like to thank Lt. Col. Patrick "Naish" Vreeburg, 1st Lt. "Oscar" and Adjutant Piet van Dijk for their hospitality and for making this visit possible.

Peter de Vos
Lowpass Aviation.com

First Flight 105th anniversary 1 Sqdn Belgian Air Force

This is the newest livery for the 1 Sqdn 2 Wing in Florennes (FA-57) for their 105th anniversary in 2022 revealed on 13 May 2022.

On 1 October 1917, during the First World War, the pilots of the first fighter squadron, belonging to the "Compagnie des Aviateurs", decided to adopt one squadron insignia. It was André De Meulemeester that choose the Scottish Thistle. As from that day, the thistle remains the squadron insignia.

Today, during the release of FA-57 with the special 105th anniversary livery of the 1st "Stingers" squadron, the Scottish Thistle is still shining bright on the F-16 MLU fighter aircraft of the Belgian Air Force!

A la première!!!!

Michael Balter
MBAviation Images PHOTOGRAPHY

Anatolian Eagle 2022
"Train as you fight"

The art of winning a war is to know the enemy. It is vital to be aware of the enemy's moves, expertise, and capabilities while increasing one's own strengths and overcoming the weaknesses. Military exercises are a key component of sharing knowledge, abilities, expertise and enhancing the training level for joint operations between the militaries of two or more countries. Various countries in the world conduct joint military exercises regularly as part of their military cooperation with one another. The Turkish military exercise "Anatolian Eagle" is an international military exercise that is held every year in Turkey. It is aimed at improving the capabilities of mutual support between forces through various tactics and techniques in a real combat environment. The Turkish Air Force (THK) hosted the Anatolian Eagle multinational exercise at the 3rd Main Jet Base in Konya between 20 June and 1 July 2022.

A RAF Typhoon FGR4 takes off with full afterburner at the beginning of its mission

Anatolian Eagle 2022 participants

Besides the usual presence and numerous aircraft from the host nation, Anatolian Eagle 2022 witnessed the participation of United Kingdom, Jordan, Azerbaijani and Pakistan Air Forces.

The Azerbaijan Air Force participated for the second time with fighter jets, sending a pair of Su-25s from Kürdəmir air base. Absent this year were two MiG-29s which were supposed to participate. Returning to Anatolian Eagle, six Pakistan Air Force F-16A/B MLUs, from 11 Squadron "Arrows" based at Shahbaz air base. The Royal Jordanian Air Force participated with three F-16AM/BMs from Shaheed Muwaffaq Al-Salti air base. Joining from the United Kingdom were four Eurofighter Typhoons from Coningsby.

Although not directly linked as participants, the local CN-235s flew several missions during AE in support of the exercise

A mini elephant walk of 132 Filo F-16s after their Red Air mission to attack the enemy

A very weathered Jordanian F-16 taxies out for a new mission. This is an ex Belgian Air Force F-16 that has been flying in Jordan for over 12 years

A PAF 11 squadron F-16B taxies out for a morning mission. This was the 11th time Pakistan participated in Anatolian Eagle

The large Turkish component making up the Blue Force in the exercise consisted of around 30 F-16C/D from different squadrons, a pair of F-4E from 111 Filo and support aircraft, including one KC-135R tanker from 101 Filo (operating from its home base) and one Bayraktar Akinci UCAV. A single E-7T AEW&C of the 131 Filo provided the battlefield situational awareness (along with the NATO E-3A Sentry). The Turkish Air Force also acted as Red Air with surface-to-air assets along

Azerbaijan Air Force Su-25 taxies off the main Anatolian Eagle platform for an early morning mission

with F-16C/Ds of 132 Filo which are locally based at Konya. The Turkish Naval Forces also participated with two frigates and two fast attack craft operating off Turkey's southern Mediterranean coast.

The Exercise

The training scenario consisted of two imaginary nations: Blue (democratic, with a strong military power and allied with world-leading countries) opposed to Red (a poor country but with a good military power and growing as regional power, governed by military after a coup). Under the control of AETC operational command, the Blue forces conducted Combined Air Operations (COMAO), SEAD/DEAD, air superiority, CAP (Combat Air Patrol), CAS (Close Air Support) and CSAR (Combat SAR) operations against targets located within the Red country's borders, heavily defended by different types of weapons from advanced SAM systems to 4-4.5 generation combat aircraft. The exercise was designed to provide training opportunities for combat ready aircrews to increase proficiency and exchange experiences with allied and partner nations. The airspace east of Konya, above the Anatolian Plateau, is perfectly suited for the execution of air operations such as Composite Air Operations, Dynamic Targeting, Close Air Support, Anti Surface Warfare, Air to Air refuelling and more.

The objectives of the exercise were to prepare pilots and air defence personnel by working in an operational scenario that is as realistic as possible, developing joined and combined operational procedures, keeping attrition to a minimum and increasing mission effectiveness by giving the opportunity to the fighter pilots to execute their planned tactics in large aerial packages. Finally, by training the participants as they fight the exercise is a useful forum to exchange ideas and lessons learned. With training aids such as the Air Combat Maneuvering Instrumentation (ACMI) System and the Post-Mission Analysis System, which are used to evaluate the training performance simultaneously or in a very short time, Anatolian Eagle provides an advanced joint training environment to the participating elements to increase their combat readiness level.

The main goals in the Anatolian Eagle exercises included: to systematically test and evaluate the fighters' combat readiness status; manage tactical training progress;

Four Eurofighter Typhoon FGR4s participated during Anatolian Eagle 2022

In support of the Pakistani participants, this PAF IL-78 arrived on the last day of the exercise to accompany the F-16's back home

The Bayraktar Akinci B is one of the latest versions of the UCAS

build a background and knowledge base in order to research tactical aeronautics; conduct research to allow fighter elements of the Turkish Air Force Command to reach the military goals in the shortest time and with minimum resource and effort; support the definition of operational requirements, supply and research and development activities and finally to allocate a training environment in order to fulfil the requirements of the Turkish Air Force Command.

Text and photos:
Erik Bruijns and Lex de Kort

The Bayraktar Akinci was heavily used during the exercise to test its abilities

The Su-25 has been used heavily in the war in Ukraine. Having such an asset in the exercise can bring interesting knowledge to the participants

The F-4E is still flying in Turkey. With the F-35A programme being cancelled, the question is how long these will continue to fly

The Turkish Air Force F-16 fleet provided the majority of fighter planes during Anatolian Eagle. They brought all their variants for the exercise

NATO Tiger Meet 2022

On 20 May, the NATO Tiger Meet 2022 (NTM22) was completed, which was started on 9 May, at Araxos, Greece, home of the hosting 335 Squadron "Tiger" of the Hellenic Air Force. This was the first Tiger Meet on Hellenic soil, since 335 Sq was accepted as a NATO Tiger Member in 1972.

Around forty foreign aircraft and helicopters together with Hellenic Air Force assets participated this year.

COUNTRY	NUMBER & TYPE(S)	UNIT	REMARKS
Hellenic Air Force	All Types	All Units	Operating from Araxos AB and their respective air bases
Belgian Armed Forces Air Component	6x F-16AM	31 Sq	
Czech Air Force	2x Mi-35	221.vrl	
French Air Force	2x Rafale B 5x Rafale C	ECE 1/30 EC 3/30	
French Navy	1x E-2C 5x Rafale M	Flottille 4F Flottille 11F	
Italian Air Force	6x Eurofighter	XII Gruppo CI	
Spanish Air Force	5x EF-18AM 1x EF-18BM	Ala 15	
Swiss Air Force	5x F/A-18A	Fliegerstaffel 11	Only during first week
NATO	1x E-3A	-	Operating from Aktio FOB

NATO Tiger Meet 2022 participating air forces

Hellenic Army and Naval Forces participated together with observers from Austria, Germany, the Netherlands, Portugal, Poland and the USA. This Tiger Meet was the last event of the Mi-35 of the Czech Air Force. During this summer, the Mi-35 will be retired, and the unit will await the arrival of the first Bell AH-1Z and UH-1Y.

During the NTM22, complex air missions were carried out, covering a wide range of scenarios of modern Air Warfare (Defence/Offensive Air Operations, Air Isolation, Dynamic Targeting, Operations to Suppress/Destroy Enemy Air Defence, Maritime Operations, Combat Search and Rescue Missions, etc.). This year special focus was on Maritime Operations and night missions. In total, more than 600 sorties were flown across the whole Athens' Flight Information Region (FIR).

On a typical NTM day, local missions and DACT missions take place in the morning, while COMAO missions take place in the afternoon. Smaller CAS/CSAR missions are being integrated into these COMAO missions. The annual NATO

Tiger Meets promote interoperability and synergy among participants and contribute to a greater understanding and coordination between the Air Force, Army, Navy and Special Operations Forces. It does this by conducting complex advanced operations in a realistic context using a variety of weapon systems to create a highly challenging training environment and increase the trainee readiness and combat capability. Not to be forgotten are the so-called "Tiger Games" at the weekend, which play a large part in this. This strengthens the social bond between all the units involved. At the end of the exercise, there is the traditional farewell ceremony where various prizes are awarded, the most important being the Silver Tiger Trophy.

In his message to the participants, the Chief of the Hellenic National Defence General Staff, General Konstantinos Floros, noted the growing cooperation of the Hellenic Armed Forces with allies and partners, both bilaterally and multilaterally, aiming to address a variety of complex challenges and promote peace and stability across the region.

The NATO Tiger Meet 2023 will take place in Italy, at Gioia del Colle in Apulia.

Text: Marcus Valianos
Pictures: Philipp Vallianos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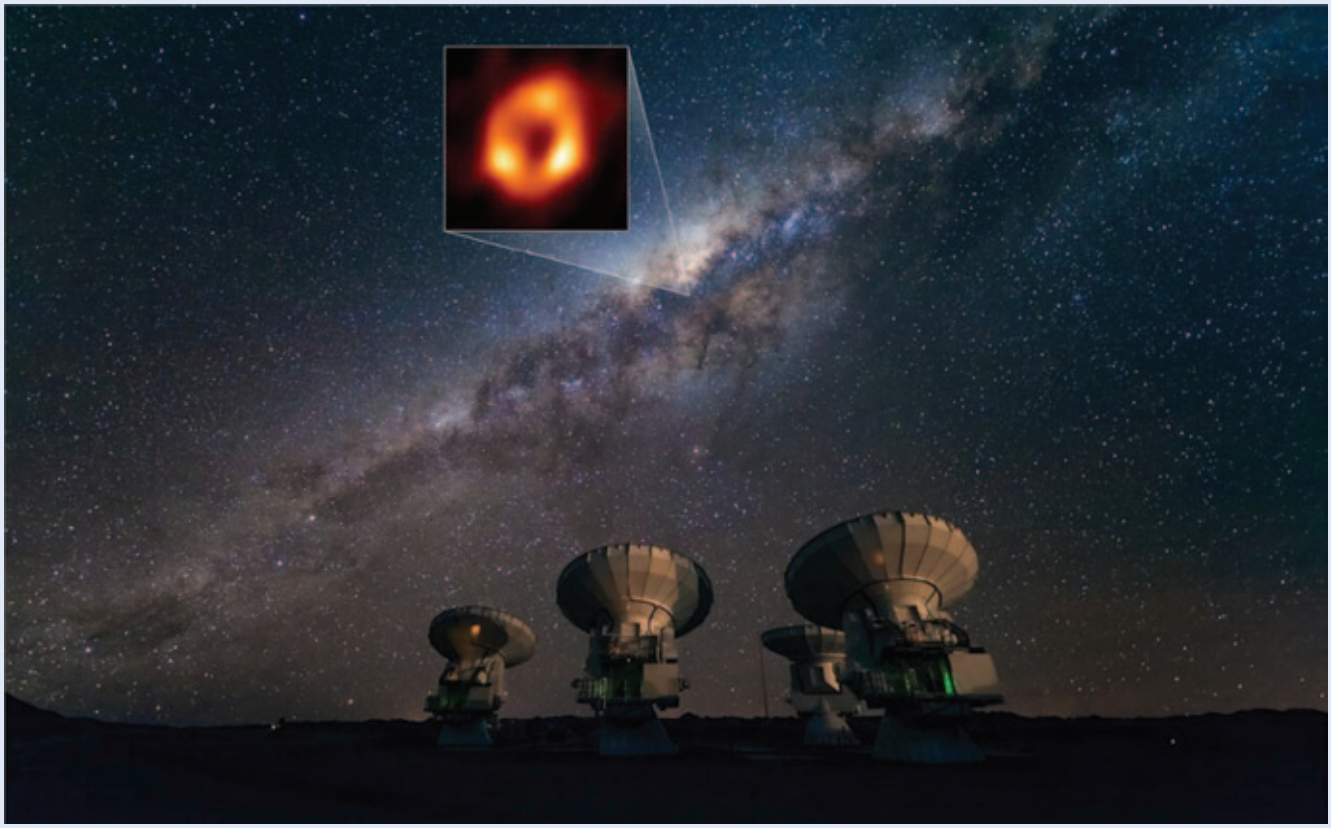
1st image of Black Hole at heart of our galaxy



At simultaneous press conferences around the world in May 2022, including at the European Southern Observatory (ESO) headquarters in Germany, astronomers unveiled the first image of the supermassive black hole at the centre of our own Milky Way galaxy. This result provides overwhelming evidence that the object is indeed a black hole and yields valuable clues about the workings of such giants, which are thought to reside at the centre of most galaxies. The image was produced by a global research team called the Event Horizon Telescope (EHT) Collaboration, using observations from a worldwide network of radio telescopes.

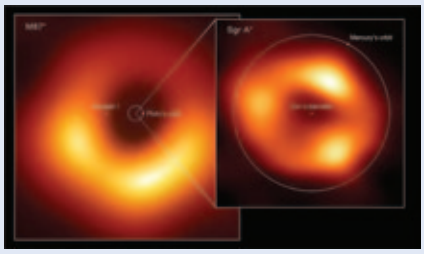
The image is a long-anticipated look at the massive object that sits at the very centre of our galaxy. Scientists had previously seen stars orbiting around something invisible, compact, and very massive at the centre of the Milky Way. This strongly suggested that this object — known as Sagittarius A* (Sgr A*, pronounced "A Star") — is a black hole, and this image provides the first direct visual evidence of it.

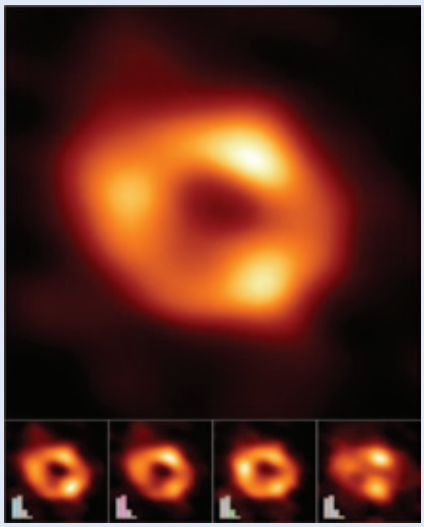
Although we cannot see the black hole itself, because it is completely dark, glowing gas around it reveals a telltale signature: a dark central region (called a shadow) surrounded by a bright ring-like structure. The new view captures light bent by the powerful gravity of the black hole, which is four million times more massive than our Sun.

"We were stunned by how well the size of the ring agreed with predictions from Einstein's Theory of General Relativity," said EHT Project Scientist Geoffrey Bower from the Institute of Astronomy and Astrophysics, Academia Sinica, Taipei. "These unprecedented observations have greatly improved our understanding of what happens at the very centre of our galaxy, and offer new insights on how these giant black holes interact with their surroundings." The EHT team's results are being published today in a special issue of The Astrophysical Journal Letters.

Because the black hole is about 27,000 light-years away from Earth, it appears to us to have about the same size in the sky as a doughnut on the Moon. To image it, the team created the powerful EHT, which linked together eight existing radio observatories across the planet to form a single "Earth-sized" virtual telescope. The EHT observed Sgr A* on multiple nights in 2017, collecting data for many hours in a row, similar to using a long exposure time on a camera.

In addition to other facilities, the EHT network of radio observatories includes the Atacama Large Millimeter/submillimeter Array (ALMA) and the Atacama Pathfinder EXperiment (APEX) in the Atacama Desert





in Chile, co-owned and co-operated by ESO on behalf of its member states in Europe. Europe also contributes to the EHT observations with other radio observatories — the IRAM 30-meter telescope in Spain and, since 2018, the NOrthern Extended Millimeter Array (NOEMA) in France — as well as a supercomputer to combine EHT data hosted by the Max Planck Institute for Radio Astronomy in Germany. Moreover, Europe contributed with funding to the EHT consortium project through grants by the European Research Council and by the Max Planck Society in Germany.

"It is very exciting for ESO to have been playing such an important role in unravelling the mysteries of black holes, and of Sgr A* in particular, over so many years," commented ESO Director General Xavier Barcons. "ESO not only contributed to the EHT observations through the ALMA and APEX facilities but also enabled, with its other observatories in Chile, some of the previous breakthrough observations of the Galactic centre."

The EHT achievement follows the collaboration's 2019 release of the first image of a black hole, called M87*, at the centre of the more distant Messier 87 galaxy.

The two black holes look remarkably similar, even though our galaxy's black hole is more than a thousand times smaller and less massive than M87*. "We have two completely different types of galaxies and two very different black hole masses, but close to the edge of these black holes they look amazingly similar," says Sera Markoff, Co-Chair of the EHT Science Council and a professor of theoretical astrophysics at the University of Amsterdam, the Netherlands. "This tells us that General Relativity governs these objects up close, and any differences we see further away must be due to differences in the material that surrounds the black holes."

This achievement was considerably more difficult than for M87*, even though Sgr A* is much closer to us. EHT scientist Chi-kwan ('CK') Chan, from Steward Observatory and Department of Astronomy and the Data Science Institute of the University of Arizona, USA, explains: "The gas in the vicinity of the black holes moves at the same speed — nearly as fast as light — around both Sgr A* and M87*. But where gas takes days to weeks to orbit the larger M87*, in the much smaller Sgr A* it completes an orbit in mere minutes. This means the brightness and pattern of the gas around Sgr A* were changing rapidly as the EHT Collaboration was observing it — a bit like trying to take a clear picture of a puppy quickly chasing its tail."

The researchers had to develop sophisticated new tools that accounted for the gas movement around Sgr A*. While M87* was an easier, steadier target, with nearly all images looking the same, that was not the case for Sgr A*. The image of the Sgr A* black hole is an average of the different images the team extracted, finally revealing the giant lurking at the centre of our galaxy for the first time.

The effort was made possible through the ingenuity of more than 300 researchers from 80 institutes around the world that together make up the EHT Collaboration. In addition to developing complex tools to overcome the challenges of imaging Sgr A*, the team worked rigorously for five years, using supercomputers to combine and analyse their data, all while compiling an unprecedented library of simulated black holes to compare with the observations.

Scientists are particularly excited to finally have images of two black holes of very different sizes, which offers the opportunity to understand how they compare and contrast. They have also begun to use the new data to test theories and models of how gas behaves around supermassive black holes. This process is not yet fully understood but is thought to play a key role in shaping the formation and evolution of galaxies.

"Now we can study the differences between these two supermassive black holes to gain valuable new clues about how this important process works," said EHT scientist Keiichi Asada from the Institute of Astronomy and Astrophysics, Academia Sinica, Taipei. "We have images for two black holes — one at the large end and one at the small end of supermassive black holes in the Universe — so we can go a lot further in testing how gravity behaves in these extreme environments than ever before."

Progress on the EHT continues: a major observation campaign in March 2022 included more telescopes than ever before. The ongoing expansion of the EHT network and significant technological upgrades will allow scientists to share even more impressive images as well as movies of black holes in the near future.

Source: **European Southern Observatory (ESO)**

Air Marshal (R) Harish Masand says...

I Learnt More than Flying from Them: Denzil Keelor

Air Marshal (Retd) Denzil Keelor: Then and now! (Images from Twitter)

In early March 1978, I reached TACDE AF in Jamnagar from 101 Squadron, then based in Adampur, to undergo the 12 FCL Course. I was a senior Flight Lieutenant by then and had been on MiG-21M/Type 96 from September 1975 when I had joined 17 Squadron in Halwara as an instructor from Air Force Academy, Dindigul for conversion on MiG-21s. In December 1976, just after attaining operational status on MiG-21Ms, I was posted to 101 Squadron for instructional duties on the aircraft since 101 had been designated as a type training squadron and we got regular batches of young pilots for conversion training on type. By March 1978, I had about 330 hours on MiG-21Ms. As a matter of fact, I had been detailed for the 11 FCL starting in December 1977 but had been removed from this course due to a rather mundane reason due to a problem in the co-located 1 Squadron for a short conversion to the MiG-21FL/Type 77. Quite naturally, I was pretty upset with this turn of events on a minor issue and submitted a long application for redress and resignation since I had not even been given a hearing or an opportunity to explain the alleged lapse. Long story short, when my CO, then Wg Cdr VM "Rondy" Raina, came back from leave a few days later, he heard the whole story, went to the AOC, and asked me to go on annual leave to cool off and then decide on my future course of action. I describe this incident in brief to give the reader a background on my first ever meeting with then Group Captain Denzil Keelor of the 1965 fame as the Sabre-Slayer.

I took Rondy Sir's counsel and left on six week's annual leave to cool off, as advised. While passing through Delhi on my way to Indore, I bumped in to then Group Captain Dilip S Jog, under whose command I had converted onto Su-7s in 1972 in Bareilly when he was commanding 221 Squadron there. Dilip Sir asked me to come a have a drink with him the next evening in Central Vista Mess where he was staying. At the given time the next evening, when I landed up in his room I found a stranger, that I had never seen before but obviously a senior officer, with him talking animatedly and pacing up and down. Dilip Sir indicated to me with a wave of his hand to sit down and asked the other senior officer if he knew who I was by way of introduction. All this stranger senior officer said in reply was, "Must be Harish Masand". I was kind of surprised and dumbstruck as to how he knew me or about me, kept absolutely quiet and sat down in a chair in the far corner next to the door. Dilip Sir and this senior officer kept talking about some stuff that did not concern me, and did not pay attention to, while sitting there trying to make myself invisible. After about 10-15 minutes, this senior officer left and while passing me by the door just said, "See you in March". Dilip Sir then told me that that was Group Captain Denzil Keelor, then Commandant of TACDE. I had heard of the Keelor brothers of 1965 War fame, with both brothers having been awarded a Vir Chakra for shooting down a Sabre each. I had also briefly met the elder brother, Trevor, when he was in Bagdogra and I was in 37 Squadron next door in Hasimara but had never crossed Group Captain Denzil Keelor's path before. Dilip Sir and I talked for a while over a drink about various things including how I had got into trouble about the FCL course. He obviously knew about the issue and had probably told Denzil Sir about it but I didn't ask and he didn't clarify.

Close to March 1978 and this time Command attached me to 3 Squadron in Pathankot to do my short conversion on Type 77s. Everyone there including the CO, then Wing Commander DR Nadkarni whom I knew from before, wondered why I had come to Pathankot when we had a Type 77 squadron right there in Adampur. Most just smiled while some made fun of this issue when they got the opportunity. However, one benefit of going to Pathankot was that I met then Squadron Leader Phillip Rajkumar in 3 Squadron who was also coming for the same course though way senior to me and we struck up a good friendship which has lasted till date. In a way, the delay in going for the course helped me because

after being heavily involved in training and instructional sorties for young pilots, I used this break and my time to make out a notebook on each exercise of group combat with my briefing guide and all variations in the evolving combat that I could think of with pictorial situational drawings for understanding and recapitulation at a glance. These came in very handy when we did the course and my notebooks were frequently borrowed by all course mates when preparing for the briefings on those exercises. When we reached TACDE in Jamnagar for the course in early March 1978, I found that most of the other course mates were known and we formed a great group with lots of team work during the course. The other course mates that I knew from before included BM "Manoj" Bali whom I knew from Su-7 days, "Vicky" Bhatia, and "Goofy" Gupte who had done the instructors' course with me in FIS Tambaram in 1974, Rajan Wahi who was with Goofy and me in Air Force Academy, Dindigul in 1974-75, RP Singh from 108 Squadron, our sister Squadron in Adampur and only KP "Buddy" Srikant whom I had not met earlier. Unfortunately, RP Singh met with a scooter accident before he even commenced flying and left the course while Rajan Wahi was soon suspended from the course. A course photograph of the remaining is attached.

Due to the team spirit and cooperation amongst each other, all of us, except Rajan who had left us early, passed out having done reasonably well. Apart from the professional front, we were also one team socially and used to have some great parties, sometimes teaching the staff pilots and their wives some latest group dances, like Slosh etc, that I had picked up from my wife, Malini, who was pretty good at such stuff. Soon, the whole lot in TACDE used to get into such group dances enthusiastically in parties, including Groupie Keelor and Mrs Marie Keelor, with everyone having a lot of fun. We were just like one big family and the course passed off so quickly that we didn't even realise we had finished the 10-11 weeks together.

However, personally I had a strange feeling all through the course of being watched all the time with eyes boring into my back. About 10 days to go for the passing out and graduation dinner, 'Groupie' , as he was called by all, caught me somewhere and asked where Malini was. I told him that she was with her parents in Darjeeling at that time. Those familiar with Groupie would recall the way he spoke and he almost ordered me to get Malini across to Jamnagar for the graduation. I politely declined saying that Darjeeling was a long way off, almost across the country from the East to the West, and involved three flights from Bagdogra to Calcutta to Bombay to Jamnagar. Groupie retorted with "Get her across, we will pay the fare". I very politely thanked him for the offer but stuck to my stand saying that it was not a question of money but that it did not make any sense to come all the way just for a couple of days and the graduation dinner.

During the graduation dinner, after I received the Jam Sattaji Sword of Honour for topping the course, Groupie told me that he had been asked to raise a special report on me. I kept quiet since there was not much I could say about this issue. However, it did confirm my suspicion that I was being watched all the time for such a report. Groupie then said, "I am going to write just one line, I want you back on the staff and soon". Well, that called for a good drink and I had more than one good one that evening. The next day, a little later in the morning that I had planned, I rode out a very happy man on my younger brother's bike to Ahmedabad and then headed back to Adampur after meeting up with Malini in Delhi.

I was soon posted back on the staff, as ordained by Groupie Denzil Keelor, and reported to TACDE on 4 September 1978. Still a Flight Lieutenant, this was a prestigious posting while being a highly enriching one since, more than teaching and assessing the course officers, I personally learnt a lot from the highly professional and capable staff in TACDE. Most of the staff in the unit were essentially the same when I had done the course just a few months before as shown in the course photograph, the only addition being of Squadron Leader Jeff and Betty D'Souza and subtraction of Wing Commander Tushar Sen, the latter having been posted out to command 1 Squadron. Just to recapitulate, there were Mike & Linda McMahon, Teju & Kiran Asthana, MS "Melly" & Minna Grewal, KC "Philly"

With Jam Saheb TACDE Sword of Honour June 1978

& Radha Phillipose, MS "Count" & Sat Brar, CD & Meena Chandrasekhar, DDS & Suhail Kumar, "Prabs" & Renu Prabhakaran, MP "Sammy" & Kunda Samant and "Nana" & Amu Menon with "Damu" & Gurdip Damodaran. Damu was the stalwart Senior Technical Officer who kept the overstressed machines of the unit in flying condition with a lot of hard work and innovation. I would qualify overstressed by just one example when Melly Grewal came back with his pitot head bent in a Su-7 after a combat sortie without having been in physical contact with any other aircraft or obstruction. It was just the "g" he hauled that sortie. Those who have flown the Su-7 and know how strong it is would know how much we are talking of. When I converted on the Su-7 in mid-1972 in Bareilly, Hemu Khatu, a course mate of Melly gave us a walk around and did a chin-up on the nose pitot tube to demonstrate how strongly built the Su-7 was.

When I reported to Groupie the very first day, he told me to quickly settle down in the two-room accommodation allotted to me in "Honeymoon Quarters" since Malini and I had no children by then and also gen-up on the Su-7 since I would be mostly flying the Su-7 despite the fact that I barely had a 100 hours on type of 1972-73 vintage. Mike Sir gave me a quick dual check and after a single handling sortie and a 1 Vs 1 against a Type -77, I was flying as the staff with the ongoing FCL course. Flying a Su-7 with such a short familiarisation after a break of almost five years, apart from many other things that Groupie asked me to do as I would describe later, did wonders to my self-confidence and I actually enjoyed flying the Su-7 against the MiG-21s in combat through my tenure in TACDE. Soon, Groupie asked me to convert more of the staff on the Su-7 once we lost some of the Su-7 staff on different assignments. Nana Menon left with Ajit and Prabs for Iraq in a couple of months around November, Sammy also left soon and Mike left for Jaguars in early 1978 along with "Goofy" Gupte who had joined us for a brief while. Before leaving, Mike gave me a few rear cockpit checks and cleared me as a trainer captain with barely 150 hours on type. Groupie himself converted on the Su-7 and started flying it for various exercises. I still remember a naval exercise when we had to fly really low to evade detection by ship radars almost a 100 km into the sea. Quite frankly, as the lead for a couple of these missions with Groupie flying the Su-7, I was amazed at the way he flew the Su-7 at those ultra low levels with so little experience on type.

TACDE was really like one big family and though I was the junior most in the hierarchy except for Goofy for a brief while, they all treated Malini and me like the youngest in the family. Professionally, there was no quarter given but on the social front everyone was an equal and treated in that manner, including the course pilots who joined in regularly in all the fun and merry-making after working hours. To be honest, Mike made a jocular comment one day with tongue in cheek that Groupie and him were the only two unfit for TACDE since both of them were non-drinkers while the rest would let their hair down particularly over the weekends. Groupie himself, despite being a non-drinker, never hesitated in entertaining us in his house with the bar open to everyone. As a matter of fact, I think he enjoyed seeing his flock loosening up and speaking freely, under the

12 FCL

influence sometime, to get a true feedback on how things were and the problems, if any. Certainly, TACDE parties were the noisiest in Jamnagar and lasted till late into the night on weekends. In those evenings, Malini earned the sobriquet of 'Ma Baker' from Groupie.

TACDE graduation with Mascy and Deshu

While Groupie kept us hard at work, sometime late in the evenings, for the debriefs and all the other work required to keep the courses going on schedule while also refining and improving tactics, he himself donned the mantle of the administrator and the father figure to keep our hearth burning and organising the needs of the families. As just one example, one day I finished work a little earlier than usual, perhaps it was the weekend approaching, and got home at about 1500h, had a quick bite that Malini had been waiting for and dozed off, dead tired as I was. At about 1530h, there was loud banging on the door and when I opened the door, I found Groupie there, with me looking all bleary-eyed from the short nap I had taken. In his typical rapid-fire manner, Groupie asked, "sleeping?" I mumbled some incoherent stuff but he cut me short by saying, "this is no time to sleep, come on, let's go for a gad". I put on my clothes in a jiffy while he chatted with Malini and got into his car while he drove. He took me to the market in the city to buy meat and vegetables for all the families hinting that this way, he could extract more work from us while he looked after our home needs. Thereafter, whenever he went out like this, Malini and I were ready and waiting to go with him and even drove him so that he would not have to drive us around. Every time Groupie came back from Delhi or wherever, he had a whole load of frozen stuff, which was not available in Jamnagar markets, in a huge container like a camper with ice for preservation. Groupie's reputation in and around Jamnagar was such that even Indian Airlines never charged him for the extra cabin baggage since he was a well-known war hero and because of his charming ways with everyone. He would then go around distributing the stuff to each house himself, depending on what had been asked for by the wives and sometimes giving them some good stuff even when they had not asked for anything.

Air Marshal (Retd) Denzil Keelor (Image Twitter)

At work, I must admit that the team of that period was excellent, largely due to Groupie's leadership and example and we all worked in a very harmonious manner doing whatever was required to conduct the courses as also review the tactics being taught with a view to develop them further to keep pace with technological advances. Here I must mention people like Teju Asthana, Jeff DeSouza and Mike McMahon who were the thinkers of our little family and who encouraged everyone to try out new stuff. We also let the course students try their own new tactics that they may have thought of and developed and looked at all these with an open mind to test them theoretically on the ground by changing the attackers' methods as well as in the air by actually flying such missions. I still recall one particular incident when a visiting ex-TACDE senior officer attempted to ridicule some of the profiles and missions we were flying, without actually having the equipment on our old MiGs and Su-7s. As a junior staff, I was sitting in the back itching to respond but before I could open my mouth, Groupie beautifully put the whole argument and monologue of almost 30 minutes at rest in one short sentence by saying that equipment would come in its own time once Air HQ and Plans branch can procure it. TACDE's job was to recommend it after assessing its requirement and value but, in the meantime, we had to keep flying those profiles and missions simulating the equipment so that the art was not lost till the equipment came. The meaning was clear including that while technology was essential, we had to think beyond mere technology and keep finding ways to employ it more effectively. That shut the argument right there and then.

Groupie and the entire team also encouraged building of confidence in individuals without going overboard with over-confidence. I have already mentioned how quickly I was made a trainer captain on the Su-7 and asked to convert other seniors onto the aircraft including himself. As just another example, when night flying was planned in dark phase after I commenced flying in TACDE, I was programmed for a handling sortie on the Su-7 since I had not done any night flying on type and had come with just Day Ops status. Just before we were about to proceed to our aircraft, Groupie came by for his own authorisation, saw the programme and scratched out handling and put low-level navigation in its place after telling me that I was wasting flying effort. Because of such trust placed in us, all of us made extra efforts to make sure we didn't let the unit and Groupie down by doing something silly. Quite obviously, I took about half an hour planning the route and checking all obstructions around and then flew the sortie, fortunately without any mishap, and really enjoyed the challenge and the thrill of flying my first low-level navigation sortie by night on any aircraft. Delegation was routine at all levels in the unit, following Groupie's example, and I am glad to say that everyone took the responsibility seriously and performed par excellence.

On another personal note about Groupie handling his staff, soon after I arrived, there were some holidays for Dusserha/Diwali in October or November that year. I had applied for a couple of days casual leave

Air Marshal (Retd) Denzil Keelor seen here in September 2015 (Photo: From the Vayu archives)

and combined it with a long weekend so that I could go across and visit my youngest brother, Mahesh, for a few days in Ahmedabad. Those days, Groupie and Mrs Keelor used to pick Malini and me up for the Sunday morning English movie in town. Groupie normally used to drive the car himself with Malini and me in the back. That Sunday, while driving to town, Groupie, in his usual brusque manner, asked me where I intended to go in this period knowing fully well that I had given an Ahmedabad address on the leave application. He then asked who I had in Ahmedabad. When I told him about my brother, he suddenly said, "Okay, we will also come with you." My immediate thoughts went to the small bachelor's tenement that my brother was staying in and how we had planned to spend the nights sleeping on the floor together. On top of that, as a Flight Lieutenant, I was wondering how we would manage with a Group Captain and Commandant of the unit. Due to all these thoughts running through my mind, there was a pause before I could respond. Immediately, Groupie said, "You don't want us to come". I naturally muttered a reply that it was nothing like that and that I was just trying to figure out the logistics and accommodation due to my brother's student status and bare accommodation. Groupie then said, "Don't worry about accommodation, we will stay in the MES Bungalow. The only requirement for Marie is that she likes to take a nap in the afternoons". I then told him that if we were going together and would move around together, it would be cumbersome if we were far apart in different accommodation. As it is, Malini also liked her afternoon snooze and we hadn't planned on running around Ahmedabad from morning to night without a break. Groupie had obviously already booked two rooms in the MES Bungalow because he immediately responded that then we would all stay in the MES Bungalow. Groupie then asked me how we were planning to go. I told him we had planned to drive down in our good old Ambassador. He retorted by saying that we would take his service car. I firmly refused explaining that I didn't want to hear later that we were involved in any misuse of the service car. Groupie then said, "Okay, we will go in your car but I will keep the accounts and we would split the expenses". I couldn't argue with that logic. So, it came to be that the four of us drove to Ahmedabad together with me driving. All my initial reservations disappeared in the first few miles because Groupie and Mrs Keelor behaved like young people on a vacation, doing all the crazy things that youngsters do on the road like stopping at Dhabas for snacks and tea, finding bushes and culverts to relieve ourselves since those days there were few decent toilets for public use on the way. Throughout the trip, they never behaved like a senior officer and wife or the Commandant and we went to all kinds of places including fashion shows, discos and different restaurants for meals. Even Mahesh, whenever he joined us from his college commitments, was amazed at how the Keelors were so much at ease the whole time. Next time, Mahesh came to Jamnagar, he was specially invited by the Keelors and even cooked some dishes for them since he was a great cook and a master chef in his own rights without a formal 'Cordon Bleu'. We also caught Groupie in some funny situations in this trip and took pictures and he always said in his peculiar funny way, "I am the Commandant, don't make fun of me" which only got Mrs Keelor and Malini more into splits. He would also regularly 'order' Malini to behave like a good Hindu wife as per 'parampara'. His Hindi got us into splits even more. Unfortunately, we lost a lot of those photographs to white ants while our stuff was packed and we were on different assignments for many long years. All in all, we had a wonderful time and I learned a lot from the Keelors on how to be at ease with younger folks and subordinates and to put them at ease while evoking their loyalty to do everything in the best possible manner.

Everyone in TACDE, in the AF Station and even those who came in contact with him from the Army/Navy units around simply worshipped Groupie. The airmen just adored him because of the humane way he treated everyone. While I can continue in this vein about almost everyone, this loyalty and commitment came to fore when three of us, Teju, Melly Grewal and self were soon selected to go on deputation to Iraq. The signal came on 23 April 1979, I remember the date clearly because it was my birthday, with a scheduled departure from Delhi in early-July. Groupie advised all of us, perhaps to test us, to take our annual leave, visit our parents/families and stop flying just in case there was even a minor incident and the resultant inquiry stopped us from going. All of us refused to do so since the FCL course was mid-way and the extra load would have come on the remaining staff including Groupie himself. Our reply was similar in that if we had to have an accident/incident or worried about such things, we would have stopped flying a long time ago. We flew with the course till its end reporting to Air HQ almost on the last possible day for briefings, clearances and departure. I don't think any of us went home to see our parents or anything like that; such was the loyalty and dedication to the unit run by an extremely able commander and manned by a great team. My only regret was that I got to spend so little time in TACDE in

which we learned as much as the student pilots perhaps did from us, apart from learning so much on human relations from Groupie. I had actually told Groupie that I did not want to go to Iraq at that time since I wanted to spend more time in the unit and was also preparing for staff college entrance examination. I leave it to your imagination how Groupie 'eased' me out of his office and told me to quietly go to Iraq.

I next met 'Groupie' in 1984 when I was Flt Cdr 1 Sqn in Gorakhpur and he was the AOC Gwalior preparing the base to receive the new Mirages for the IAF. I was sent there in a Canberra in late April 1984 to assess whether we could operate from there for an Army Co-Op exercise since the runway shoulders and undershoots/overruns were dug up and a lot of work was going on all over. 'Groupie" was on the tarmac to receive me when we switched off and motioned for me to get in to his Jeep. When I tried to put the sleeping bag, that I had carried for the return journey by train to Gorakhpur, he looked at it distastefully and just threw it on the tarmac with an expression indicating that I should've known better than to bring a sleeping bag to Gwalior. Sure enough, without a word being said on this issue, he put me in an AOP helicopter for the return journey to Gorakhpur the next day. In his office, he had called all three branch heads and told them to meet 1 Sqn's requirements by hook or crook and told me to go with them to check out the facilities. I told him that that we would operate from Gwalior regardless since he was there but, for formality's sake, I went and spent the next couple of hours with his staff. He then took me home in town for lunch. After lunch, he asked me to take a nap while he went back to the base to sort out a few things for the Mirages. I refused the offer of the afternoon nap and insisted I went back with him to learn how such inductions were organised. Groupie took me around the whole base that afternoon showing me all the works in progress and talking to the engineers/labour/men at work while I soaked in the way he handled such varied people. Across the runway, Groupie also had a meeting with the villagers who had parted with their land to accommodate the Mirage requirements. The meeting was truly eye-opening for me. All he villagers addressed Groupie as 'Raja Saheb" and obviously adored him. I later found out that he had not only got them good compensation for their land but also employed one member of each family somewhere on the Station. As we started back from this meeting, in one of the small nallahs, his Jeep had a flat. I offered to change the wheel for him but the Jeep neither had a spare wheel nor the tools. With no communication with anyone, we trudged back to his office, a distance of about 2-3 km in the Gwalior heat with the temperature close to 48 Celsius. What a sight Groupie made, receiving salutes from the DSC guards along the way closer to the runway in his dusty and sweaty overall and what a laugh we had once we made it to his air-conditioned office. During the subsequent detachment of about 10 days in May 1984, Groupie looked after us all so well that even the youngsters from the squadron started adoring him and Mrs Keelor. Fortunately also, we didn't have a single incident of any kind to mar the detachment's performance despite all the dug-up areas close to the operating surfaces.

Groupie was ACAS (Ops) at Air HQ when I converted on to the MiG-29. I had the honour and pleasure of familiarising him the 29 in two trainer rides in June 1988. He also looked after us when we took the MiG-29s for displays in Delhi. I recall how well he organised the events and the after-display parties in his house for all the participants. Once again, the care, warmth and hospitality of the Keelors' stole everyone's heart. I can go on and on about 'Groupie' in further senior ranks and his style of command and leadership that I learnt so much from. His reputation in Gwalior and, later, in DGCA and in special olympics, is talked of by the civil pilots that I know and is now being written about even by a senior bureaucrat who came across Denzil Keelor. While I tried to imbibe as much as I could, the fact remains that nobody can ever truly emulate or replace Denzil Keelor who always had a positive outlook on life and a smile. It's always a pleasure to spend time with him and the last time was when I spent a lovely winter morning with him in Gurgaon in December 2021. That is one small way I try and pay the huge debt I owe them for all that the Keelors taught me.

The author of this piece and series, Air Marshal (R) Harish Masand, seen here at Aero India 2009, Yelahanka, Bangalore (left and centre) and (right) at the Vayu Aerospace Review office in September 2015. (Photos: From the Vayu archives)

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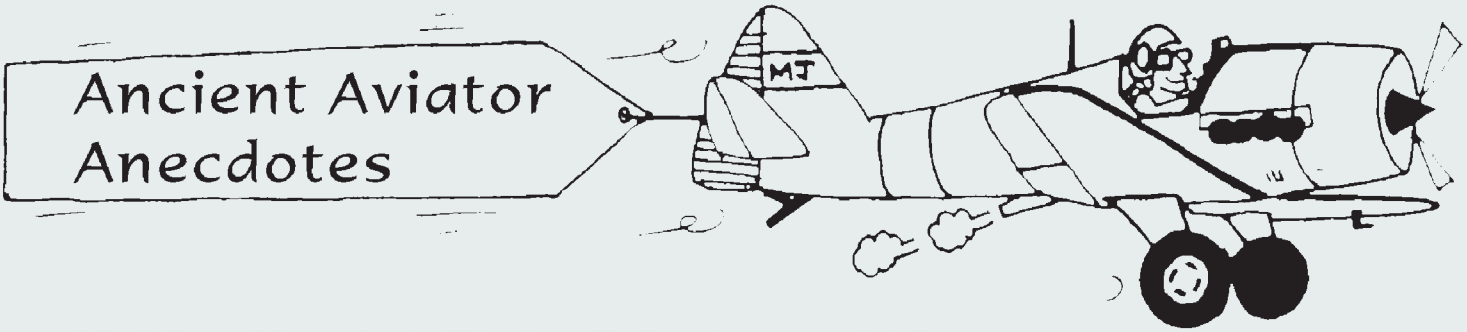


Air Vice Marshal (R) Cecil Parker and his.....

TWENTY TWENTY – TWO

For this writer, born in 1932, calendar year 2022 has four personal milestone dates, one anniversary of which has already been commemorated, while three more are looked forward to.

On 14.02.2022 my wife and I marked our 66th wedding anniversary with a small covid-controlled gathering of friends. We shared memories of the 23 year old flying officer of the IAF marrying a 20 year old teacher at St. Georges Grammar School Hyderabad, after courting her for five years! Twenty nomadic years later we were able to build our retirement home at the AFOCHS Vayupuri Secunderabad and 66 years later continue to live comfortably in the same house. The marriage has been blessed and the family has grown with the addition of two children, six grandchildren and two great grandchildren now spread all the way from India to the UK in the west and to New Zealand in the east.

On 30.08.2022 the 58th Pilots Course will mark its 70th anniversary. Seventy years ago, thirty young pilot officers won their wings and were commissioned into our air force by (then AVM) Subroto Mukherjee at No. 1 AFA Begumpet. Of these 30 (as on date) there are eight surviving members, four of whom are nonagenarians and the other four will join them in Club 90 in a few months. For the record, they are: SL Tandon, SC Saxena, RL Badhwar, DE Satur (NCR/NOIDA), MK Rudra, CV Parker (Secunderabad) and RC Mariano, MW Tilak (Australia). Unlike our riotous course reunions in the past ('Bees Saal Baad 'et al) geography and age will at best restrict this get-together to a 'Zoom Meeting'. One remembers the 22 coursemates that have gone ahead, some of them were close friends and whose families continue to remain in touch.

28.10.2022 will mark 70 years since a teenaged pilot officer had to bale out from a Tempest aircraft while undergoing fighter conversion at CTU Hakimpet. I survived that somewhat traumatic beginning to my flying career and continued to enjoy my flying on various aircraft types for the next 34 years. I have always been grateful for that lucky escape and becoming only one of two Indian pilots to have successfully baled out from the Tempest IIA aircraft which served our air force 1946-54. This mark had a Centaurus engine whose frequent con-rod failures took many young lives including a pioneer naval aviator from my pilots course. As a fighter pilot I have had my share of emergencies in the air but none of them compared with my experience on 28.10.1952.

Finally, on 22.11.2022 (provided I am destined to reach that date), I will join the nonagenarian club. 90 will be a milestone that marks our ongoing happy family life, a rewarding professional life (both in the air and on the ground) and a fulfilling retirement. This fortunate writer is grateful for having reached 2022…… and life goes on.

Representative image of the Tempest (Drawing: wall.alphacoders.com)

No. 58 PILOTS COURSE: PLATINUM JUBILEE

Dear Coursemates,

On 30 August 2022 our pilots course will mark its 70th anniversary. Unlike past years, owing to distance and age, we seven survivors (as on date) will not be able to get-together in person to celebrate. On that date however, I am certain our memories will go back to March 1951 when 51 of us young lads met up in No 1 Air Force Academy Ambala to form No 58 Pilots Course and learned to manage on a stipend of Rs 40 per month (from home) for the next 18 months! Barely had we commenced flying training when we were all sent home for a month while the academy relocated to Begumpet in Hyderabad. We spent nine months in the rear cockpit of the Tiger Moth followed by another nine months in the front cockpit of the Harvard. Standards were high and on 30 August 1952, only 30 of us (plus the naval aviator) won our wings and were commissioned by (then AVM) Subroto Mukherjee and allotted permanent service numbers from 4331 to 4360 (see picture).

17 of our coursemates went off to TTW Agra to convert on to the Dakota and thereafter flew the Devon, Liberator, Canberra, Avro, Viscount, IL-14, AN-12 and Chetak helicopters 13 of us, along with the naval aviator, reported to CTU Hakimpet for our fighter conversion on Spitfire and Tempest aircraft and thereafter flew the Vampire, Toofani, Mystere, Hunter, Gnat, Mig and Jaguars. As QFIs we instructed on HT-2, Prentice, T6-G, Iskra and Kiran trainers. We participated actively in the 1965 and 1971 Indo-Pak wars and, from our course came two test pilots, 15 commanding officers, 11 QFIs, one air attaché, one MVC gallantry awardee and four air officers.

Our PC joined the IAF in its formative years and was instrumental in the transition of our air force from pistons to jets, subsonics to supersonic, single/twin engines to multi-engine and fixed wing to rotary wing before the last of our coursemates to retire, did so in 1988. Including the loss of our naval colleague we lost seven coursemates in flying accidents from 1952 to 1988. As on date a total of 23 coursemates have preceded us, some of them were close personal friends whose families continue to remain in touch. All seven of us surviving coursemates (average age 91 years) are now on short finals to the last touchdown at an unknown runway. We have served the country and our air force with distinction and dedication. Who knows (?) our next lives may well commence with a celestial reunion of No 58 Pilots Course! Greetings, warm regards and best wishes on 30 August 2022 to you all from ceeveepee.

Ancient Aviator Anecdote (AAA-100)

Observant readers would have noted that this anecdote makes a century – a nice round figure to now close these series. I have had immense pleasure in re-living memories of people and events and deeply appreciate the readers responses. Finally, my thanks to Dolly whose excellent computer expertise more than compensated for this ancient writer' digital deficiencies!

Cecil Parker

Top Row L - R : YP Mehta VBR Misra S Bhat SC Saxena DE Satur OP Gupta TK De JP Gupta VK Singh RL Badhwar
Centre L - R : HN Koul RG Mariano MW Tilak KD Hoon RP Vashisht RN Kaul KK Malik Jagannath Rao S Sen PK Chitnavis
Bottom L – R : CV Parker MS Rane AJ Maitland MK Rudra GS Iyer SL Tandan MK Khanna BK Dhiman Hari Singh
(Missing : MN Singh & Lt Jayachandra, IN)

25 Years Back

From Vayu Aerospace Review Issue IV/1997

Private Airlines Revival Plans

The JVG Group has reportedly received a no-objection certificate (NOC) from the directorate-general of civil aviation (DGCA) to operate a private airline with an initial fleet of three Boeing 737-300 or Boeing 737-400 aircraft. Another application has been made by VIF Airways for reviving the private airline which had a single Dornier 328 aircraft in service but now plans to induct six Dornier 228s and Dornier 328s. To begin with VIF will have three aircraft and add three more at a later date.

Move On IA, AI Merger Revived

The earlier proposal for merger of Indian Airlines and Air India has been revived with the common board of directors for the two companies noting that the move would be beneficial for both public sector airlines. At the IA board meeting on 30 July, the issue was discussed at length and members expressed the feeling that steps for closer coordination between the two companies should be initiated immediately.

Pawan Hans Receives Mi-172s

Pawan Hans has taken delivery of its first two 26-seat Russian-built Mil Mi-172 helicopters at its Western Regional Base in Bombay (Juhu airport). The operator has been without a large transport helicopter since the 22-seater Westland W30s were permanently grounded in 1991 after a spate of accidents. At present, the company has 20 Eurocopter SA365N Dauphins, three Bell 206L4 Long Rangers and two Robinson R22s as well as the newly-delivered Mi-172s.

LCA First Flight Postponed

Dr. Kota Harinarayana, LCA Project Director at the Aeronautical Development Agency, stated on 26 July that first flight of the LCA prototype will now take place "only by the beginning of 1998". He said that although the technology demonstrator (TD-1) is in the "advanced stages of testing", the first flight has been postponed to early next year. Dr. Kota Harinarayana had, on 20 September 1996 announced that both Technology Demonstrators (TD-1 and TD-2) would fly in mid-1997 but qualified the statement then by stating that "Vesting of the electricals and avionics will begin shortly and then we will move on to the flight control system. The critical thing is to prove beyond doubt that the aircraft is safe".

Latest disclosures

Even as the first Su-30s are in process of induction into the IAF, there have been a number of 'informed' or 'leaked' reports in the media (international, Indian and Russian) about the possible pitfalls in this, India's most expensive defence deal in history. The main point being made refers to the uncertainties of Russia's defence and aerospace industry itself, the drying up of resources, the legal and contractual wrangling within Russian companies and so on. The latest `disclosure' in the media was made on 15 July 1997 by the Director General of Rosvoorouzhenie, Igor Korotchenko himself who claimed that the United States had tried, and virtually succeeded in, sabotaging the $1.8 billion deal for sale of 40 Su-30s to India.

HAL Doors For A320

Hindustan Aeronautics Ltd. has produced its 50th pair of passenger doors for the A320, and will shortly deliver them to Europe. The doors, which are produced to the highest aeronautical standards, are fitted into new A320s being assembled in Toulouse (France). HAL has a contract to provide 600 sets of the doors, and also makes parts for the A320 nose undercarriage, the work representing more than $50 million worth of business. The contract for this work was the first from a foreign airline manufacturer, and is the largest of its kind that HAL has to date.

Russian Military Aviation

There is to be a radical shake up in Russia's military aviation, with the air-defence forces (PVO) to be merged with the air force (VVS) in 1998, while elements of the PVO missile-defence units will be allocated to Russia's strategic missile forces. The move, announced by General Igor Sergeyev, will also mean a reduction in VVS/ PVO personnel by at least 120,000. The combined strength of the air force and the air-defence forces is presently around 400,000.

64 Additional Gripens Ordered

The Swedish Defence Materiel Administration (FMV) has ordered an additional 64 Gripen multi-role fighters, exactly five years after the ordering of the second batch. The new order comprises 50 single-seat and 14 two-seat Gripens to be delivered between 2003 and 2007, bringing the total number of Gripen aircraft ordered for the Swedish Air Force to 204.

First F/A-18 Hornets For Malaysia

Four McDonnell Douglas-built F/A-18 Hornets arrived at the Royal Malaysian Air Force (RMAF) base in Butterworth, Malaysia, on 26 May. The 8,228-mile flight originated at St. Louis' Lambert International Airport. The F/A-18Ds are the first four of eight two-seat model Hornets ordered by the RMAF, the remaining four aircraft scheduled for delivery in august 1997.

Tale Spin

'Star Wars' is with us to stay forever!

German NH90 goes full 'Star Wars' on May the Fourth. "If the Luftwaffe still needs a flying pedestal for Star Wars Day, @HelispotterMv have prepared something. It's not called 'spaceship' for nothing"!

A brief timeline of human progress

Learning to fly on earth and now on Mars! Truly breathtaking.

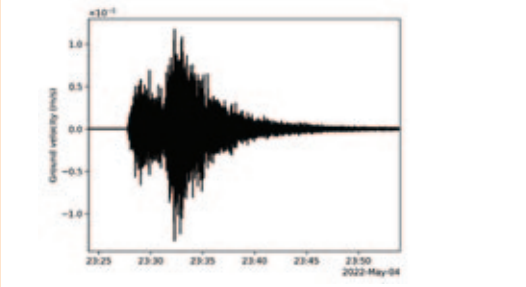
And more fantastic stuff continues...

NASA's Ingenuity helicopter has now (end June 2022) flown an incredible 28 times across the Martian surface! (Image NASA)

The crisis throws up merchandise

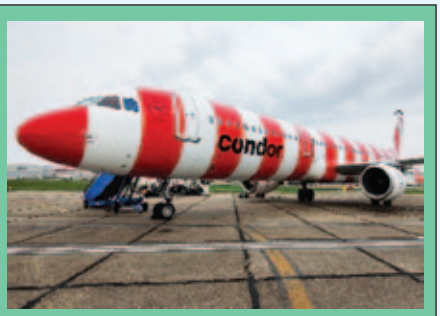
One for aeromodellers-1/72 scale 'Ghost of Kyiv' MiG-29 kit from Ukrainian model company ICM (with 50% of sales donated to UkrAF).

Yet more Mars news: NASA detects a "marsquake"



According to NASA, after more than three years of listening to the soft rumbles of Mars, their rover and its instruments felt by far the biggest "marsquake" yet (looking like about magnitude 5). However, the graph has a similar resemblance to the Sukhoi Su-30! Perhaps…?

Candy in the skies!



The question is: White stripes painted over an originally coloured frame or coloured stripes painted over an originally white frame? Condor's recent rebrand by MAAS has grabbed the attention of the aviation industry with its bold striped liveries.

Afterburner

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