2021 AERO INDIA

SHOW DAILY

03 February 2021

VAYU Day 1

The (Aero India) Show Goes On!

In fact, Aero India 2021 will be the first international Air Show in a year. During 2020, there were none, the Singapore Air Show in February being narrowly held on edge of the lockdown, and then nothing for rest of the year: not the Royal International Air Tattoo nor the Farnborough International Air Show in the UK, nor the ILA in Berlin, nor LIMA in Malaysia, nor the China Air Show in Zhuhai ... and now in the New Year, the world's oldest and biggest international air show at Le Bourget in Paris, planned for June 2021, has been cancelled owing to the pandemic and rescheduled for 2023. The Russian Air Show (MAKS) will be the first in Europe, scheduled for late July 2021.

So, Aero India 2021 breaks the ice of the past year and *Vayu Aerospace & Defence Review,* as always leads with their Show Dailies!

Tejas LCA Mk.1A ordered!

Under Chairmanship of Prime Minister Narendra Modi, the Cabinet in January 2021 approved procurement of 73 Tejas LCA Mk.1A fighters and ten LCA Mk.1A two seaters at the cost of Rs 45,696 crore (US$ 6.3 billion) along with design & development of infrastructure worth Rs 1,202 crore ((US $ 165 million). This is the first 'Buy Indian-indigenously designed, developed and manufactured', category procurement of combat aircraft, having an indigenous content of 50% which will progressively reach 60% by end of the programme.

(cont'd on Page 3)

Airbus A320 selected as platform for AEW&C Mk.II

Acceptance of Necessity (AoN) for procurement of six Airborne Early Warning & Control Mk.II aircraft for the IAF, with associated equipment was cleared by the DAC on 17 December 2020 under 'Buy (Indian-IDDM)' category. Platform for the system is likely to be pre-owned Airbus A-319/321 aircraft ex-Air India. The mission system design and development as well as maintenance of the system will be carried out in India by DRDO's Centre for Airborne Systems (CABS).

LCA Tejas (photo: HAL)

GRIPEN

The choice of Independence

When India speaks, the world listens.

India strides the world's economy and politics as an emerging giant, changing the rules of engagement. It has matched its evolving economic and global stature with path-breaking achievements in building its own defence equipment.

Yet, at the core, there is still dependence on technologies sold to India over the years which have never provided a base for building capability. And, there are more offers for technologies, products and platforms that are past their prime and representative of the old ways of air combat.

As aerial warfare is increasingly defined by asymmetric threats, Beyond Visual Range (BVR) missiles and counter-stealth systems, countries seeking global supremacy will deny know-how of mission-critical electronic warfare systems.

Countries seeking strategic dominance will ensure that other air forces have aircraft with slower mission-critical electronic warfare and battlefield decision-making capabilities.

Today, India has a choice – the choice to acquire a smart fighter that has the leading edge in today's battlefield. More importantly, by virtue of Gripen's open avionics architecture and Saab's commitment to share and co-create future battlefield systems, an aircraft that will keep the Indian Air Force ahead of the curve.

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saab.com/region/india/gripen

SAAB

(from Page 1)

The LCA Mk.1A will have considerably enhanced operational capabilities including AESA radar, BVR missiles, EW suite and air-to-air refueling. Hindustan Aeronautics Limited (HAL) are presently completing the batch of LCA Mk.1 (FOC variant) which follows the earlier IOC batch. In stepping up series production, HAL have out sourced production of major assemblies and components to some 500 Indian companies including MSMEs.

LCA Tejas SP-21 (Photo: Deb Rana)

'Uttam' AESA radar progresses

Development of the *Uttam* AESA radar was formally launched in 2020 by the Electronics & Radar Development Establishment (LRDE) and is to be a key system on the LCA Mk.1A, having completed over

100 flight hours on a test aircraft. Development of the *Uttam* commenced in 2008, slated to be successor of the EL/M-2032 a hybrid PESA (passive electronically scanned array radar) that currently equips the LCA Mk.1. New systems include the IFF, electronic and communication support measures, C-band line-of-sight and Ku-band SATCOM datalinks, etc.

Cabinet approves export of Akash SAMs

The Akash SAM with a range of 25 kilometres was inducted by the IAF in 2014 and in 2015 by the Indian Army. The Cabinet has now approved its export to "friendly countries", the export version of the Akash being "different from system currently deployed with Indian Armed Forces. To provide faster approvals for export of such platforms, a Committee comprising of the Defence and External Affairs Ministers and National Security Advisor has been created". The GoI is to focus on exporting high value defence platforms to achieve target of $5 billion of defence exports and so "also improve strategic relations with friendly foreign countries".

The 'Avro replacement' project

What has also been pursued for several years is the 'Avro Replcement Project' for 56 aircraft to supplant the present fleet of HAL-built Avro (HS/BAE Systems) 748 medium transport aircraft. Some 89 of these aircraft were built by HAL's Kanpur Division and essentially operated by the Indian Air Force apart from some 19 aircraft given to the erstwhile Indian Airlines. The aircraft type had a controversial service life but the 56 aircraft remaining on the IAF's inventory are used for staff transportation, multi-engine conversion training, navigator/signal training as also for light logistics support.

The successor aircraft has been identified as the Airbus C-295 from Spain but is not to be built by the public sector undertaking HAL but Tatas, the private sector company which will assemble the subsequent 40 aircraft, with the first 16 being imported from Spain. The total project cost is given as Rs 11,929 crore.

More IAI Harops

Case for procurement of more IAI Harop (P-IV) and upgrade of other UAV systems "are at an advanced stage" with contracts likely to be signed in Q1 of 2021. As per reports, the IAF already has 110 of them and 54 more are likely.

Navy to acquire Sea Guardians

Following the lease of two GA-ASI Sea Guardian RPAs from General Atomics by the Indian Navy, the Service has moved a proposal to the MoD to procure possibly ten MQ-9B Sea Guardians in fast-track mode, for an estimated Rs 1,300 crore. This would greatly enhance maritime survaillance capabilities in the seas around the Indian peninsula.


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ALH folding tail boom demonstrated

Design and development of the ALH's tail boom & horizontal stabiliser folding feature for meeting ship borne helicopter stowage requirements was demonstrated on 7 November 2020 with an ALH Mk.III DWDM prototype helicopter. In combination with the existing two blade folding, the achieved stowage dimension of ALH "13.5 m length, 3.5 m width and 4.1 m height meets the Navy's NUH specification". Qualification and certification of the tail boom scheme is expected to be completed by February 2021. (photo from Aero India 2019).

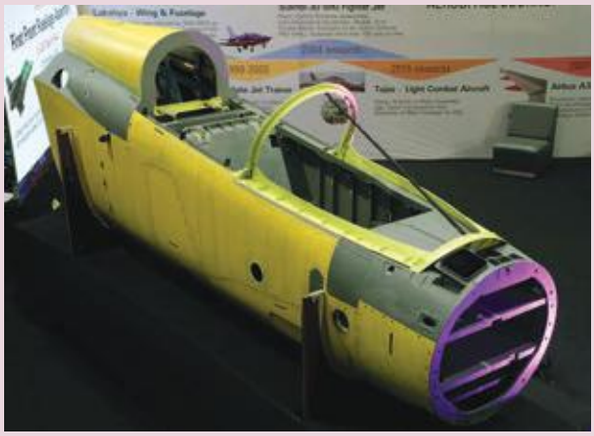
140th RD-33 Series-3 engine

HAL's Koraput Division has manufactured and delivered the cumulative 140th RD-33 Series-3 engine for the IAF's MiG-29 fleet. 'Completion Certificate' was handed over by MJ Vinod Kumar ADG, AQA (Koraput) to Asutosh Mallick, GM (Engine Division).

Upgraded ALH Mk III Civil variant

HAL's Helicopter Division has initiated the process of building an upgraded ALH Mk.III (Civil) wheeled variant and integrating seven major modules including the glass cockpit, automatic flight control system, integrated dynamic system, crashworthy structure etc., in coordination with the DGCA. Maiden ground run of this helicopter was carried out on 16 November 2020 prior to start of test flights and DGCA Civil Certification.

Dynamatic builds LCA (FOC) front fuselage ....



Dynamatic Technologies have built and delivered the first front fuselage for the Tejas LCA (FOC), the first time such a complex fuselage section has been built by an Indian private sector company. As HAL CMD Mr R Madhavan stated, "Dynamatic has done it again by delivering the first front fuselage of LCA Tejas. The LCA programme has a requirement of 20 aircraft sets per year and will grow with Mk.II and AMCA. Dynamatic is a known and reliable supplier for HAL, and we will also look for opportunities on trainer and UAV platforms."

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M88 - Rafale Engine

M53- Mirage 2000 Engine

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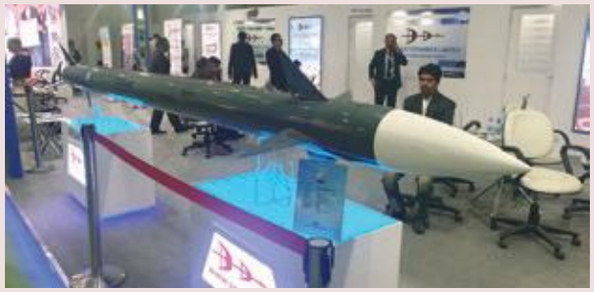
…. and Alpha Tocol delivers LCA rear fuselage

Alpha Tocol Pvt Ltd has rolled out the first 'Rear Fuselage Assembly' complete with bracketary activities with the approvals from DGAQA in FOC configuration. The scope of work included fabrication of main jig, ICY tools, machining of components, special process and structural assembly of rear fuselage.

Maiden launch of MRSAM (Army)

The Army Version of the Medium Range Surface-to-Air Missile (MRSAM), was launched by DRDO at the Integrated Test Range, Chandipur, off the Coast of Odisha. MRSAM (Army) weapon system comprises the Command post, Multi-Function Radar and Mobile Launcher system, the complete Fire Unit being in deliverable configuration. Army version of MRSAM is a surface to Air Missile developed jointly by DRDO, India and IAI, Israel.



Clearance for AESA radar

HAL's Avionics division, Hyderabad has received clearance for the first AESA Radar (CBU phase) to be fitted on the Jaguar DARIN III UPG aircraft, the first to be fitted on any platform in India. HAL Hyderabad is production agency for a total of 54 AESA radars under ToT from IAI, Elta Systems, Israel.

CARACAL International commitment to 'Make in India'

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

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

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HAL's 150th Dornier 228

(Photo: Angad Singh)

Achieving a major milestone, HAL has produced its 150th Dornier Do 228 light transport aircraft, this being IN 259 for the Indian Navy, which already operates six squadrons of this type in the Maritime Reconnaissance & Information Warfare role. HAL's Transport Aircraft Division at Kanpur has been manufacturing this light transport aircraft since the mid-1980s, with its engines and accessories being produced at HAL Divisions in Bangalore and Lucknow respectively.

DAC procurement proposals

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

LONGBOW FCR for Indian Army AH-64Es

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

500th AL-31FP overhauled engine for IAF

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

Controp's iSea-25HD for IN

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

Decade of Rolls-Royce R&D in India

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

The Dassault Rafale – for all Reasons (Part-I)


Photo: IAF

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

Some 14 years earlier, on 27 June 2006, Escadron de Chasse 1/ 7 *Provence*, at Saint-Dizier became the first French Air Force squadron to receive the Rafale, which 4.5 generation fighter, through constant upgradations, strives to reach "near fifth-generation" standard after progressive developments to robustly compete with emerging fifth-generation designs. Commentators have long felt that it is the French political reliability regarding Indo-French cooperation in the "nuclear arena", including operationalisation of the IAF's manned airborne nuclear deterrent in the form of modified Mirage 2000H/TH platforms (presently being upgraded to Mirage 2000I/TI standards), and cooperation of the French administration so as not to impose sanctions upon India after *Pokhran II* nuclear tests, which may well have proved (amongst others) to be the decisive factor in selection of the Rafale in the erstwhile MMRCA competition.


Photo: Dassault

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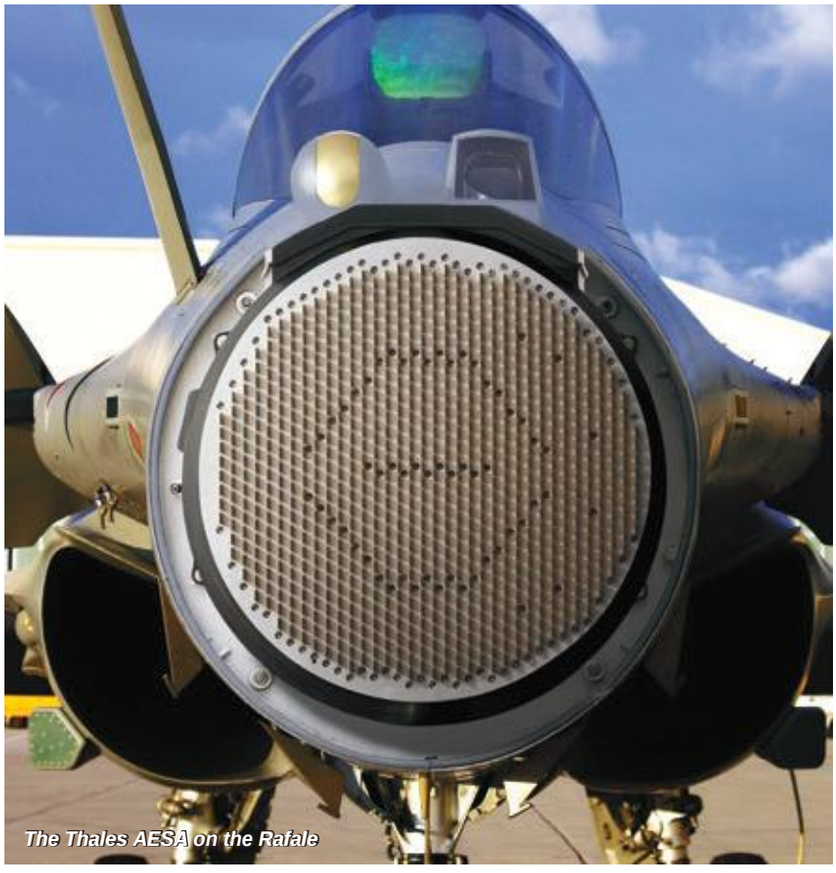
It is speculated that a significant proportion of the IAF Rafale force will be assigned the role of manned airborne nuclear deterrence under India's SFC (Strategic Forces Command), officially raised on January 2003 under a 'three-star commander' by the National Security Cabinet Committee (NSCC) when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

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

To execute successful nuclear strike and conventional attack missions, the Rafale with its manoeuvrability and high degree of cockpit automation has the advantage of terrain following and masking, including at night and in adverse weather conditions, flying a terrain/obstacle-avoidance profile at very low levels (down to 100 feet), guided by an Automatic Flight Control System (AFCS) which operates in either digital terrain following or radar terrain - following mode. With digital terrain following, the AFCS manoeuvres the Rafale based on a three dimensional map database which is pre-programmed into the AFCS software. The radar terrain following mode of the RBE-2 AESA radar scans the terrain ahead and securely guides the fighter over all obstructions before resuming nap-of-the-earth operations.

SCALP on the Rafale (photo: MBDA)



The Thales AESA on the Rafale

In these missions the Rafale's digital fly-by-wire (FBW) controls and canard-type fore-planes allow it to secure all the advantages of delta wing platform including high fuel storage, low drag, increased manoeuvrability with considerably more authority in pitch, fewer control surfaces and reduced Radar Cross-Section (RCS) while minimising most of the instabilities that arise when the aircraft carries significant external stores during low-altitude missions. The digital FBW controls empower the Rafale fleet with remarkable manoeuvrability at low altitudes as well as high resistance to g-bumps enabling them to fly very fast and very low, deliver ordnances on targets with a high degree of accuracy and still be capable of destroying opposing fighters with their formidable defensive weaponry and SPECTRA electronic warfare suite.

Sayan Majumdar

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Indian and US Defence Ministers in 2+2 meet

Indian Defence Minister Rajnath Singh had held a 2+2 meeting with his (then) United States counterpart Dr Mark T Esper in New Delhi on 26 October 2020. The two ministers reviewed bilateral defence cooperation spanning military to military cooperation, secure communication systems and information sharing, defence trade and industrial issues and also discussed ways to take bilateral cooperation forward. Mr Rajnath Singh reportedly discussed the initiatives under *Atmanirbhar Bharat* to encourage investments in the defence industry in India and invited US companies to avail the liberalised policies "and the favorable Defence Industry ecosystem" in India.

US and India sign BECA

During the last visit of US Secretary of State Michael Pompeo to India, the two countries signed the Basic Exchange and Cooperation Agreement for Geo-spatial Cooperation, BECA following the signing of LEMOA in 2016 and COMCASA in 2018. Mr Rajnath Singh also highlighted some major steps recently taken which include "Positioning a USN LO at IFC-IOR and Indian LO at NAVCENT, Bahrain; greater interaction and coordination with CENTCOM and AFRICOM; setting up of the COMSEC account and increasing the scope and complexities of our exercises. Now LO's at each other's establishments could be leveraged to enhance our information sharing architecture. To sum it up, our military to military cooperation is progressing well"!

300th ALH (Dhruv) produced

The 300th Advanced Light Helicopter (ALH) was 'rolled out' from HAL's production hangar at Bangalore on 29 September 2020. The relevant certificate was handed over to Mr. Bhaskar, CEO, Helicopter Complex by YK Sharma of the Directorate General of Aeronautical Quality Assurance (DGAQA). In the current phase, HAL is producing 73 ALHs contracted for the Army (41), Indian Navy (16) and Indian Coast Guard (16). Of these 38 ALHs have been produced with the remaining to be completed by 2022.


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Indian Army test fires BrahMos in A&N

The BrahMos supersonic cruise missile was fired by an Indian Army unit from the Andaman and Nicobar Islands, "the objective of the missile was on another island, which then hit its target." The Indian Army has a number of regiments equipped with the BrahMos supersonic missile whose strike range has been enhanced to over 400 km.

BrahMos test fired from INS *Chennai*

On 18 October 2020, a BrahMos supersonic cruise missile was test fired from the Indian Navy's built stealth destroyer INS *Chennai*, accurately impacting a target in the Arabian Sea. BrahMos as 'prime strike weapon' will ensure the warship's invincibility by engaging naval surface targets at long ranges, thus making the destroyer another lethal platform of Indian Navy. The highly versatile BrahMos has been jointly designed, developed and produced by India and Russia.

BrahMos with indigenous booster flight tested

On 30 September 2020, a BrahMos supersonic cruise missile having an indigenous booster and with many 'Made in India' sub-systems was successfully flight tested from ITR, Balasore in Odisha.

VAYU Interview with Mr. R. Madhavan, CMD Hindustan Aeronautics Ltd. (Part I)

VAYU : As we prepare for the forthcoming Aero India 2021, kindly give our readers an overview of HAL's participation at the Show and which aircraft types would be displayed and flight demonstrated.

CMD: The primary focus is to showcase HAL's prowess in the aerospace and defence arena to the world, with display of indigenously-designed and developed fixed and rotary wing platforms, technologies covering power plants, avionics, etc.

- With central theme of the **India Pavilion** being rotary wing capability in India, HAL's rotary platform Light Utility Helicopter (LUH) will be centrepiece of the display with scaled models of the IMRH, ALH, LUH, LCH and the Indian helicopter manufacturing ecosystem/supply chain partners arrayed around it.
- The HAL Stall in Hall 'E' will display our capability and contribution in line with HAL's central theme "Conceive-Indigenise-Collaborate". Future generation combat capable airborne solutions will be displayed here.
- The Outdoor display adjacent to HAL stall will feature rotary wing products namely the LCH, ALH Mk IV Rudra and ALH Civil variant.
- Display of the range of indigenous HAL platforms participating in static and flying display are included as part of *Aatmanirbhar Formation* flight. Both fixed-wing and rotary-wing aircraft including the Su-30, Do 228, Hawk-i, HTT-40, ALH, LCH, LUH will be in the flying display. In the static display are HTT-40, LUH, ALH Mk. III and Dornier 228. Customer demo flights will be offered to select customers, on need basis.
- HAL plans to sign MoUs/Agreements with global aerospace majors/associates both foreign and Indian looking for capacity and capability to address the requirements of Indian Defence and global markets. HAL has planned to sign various MoUs/Agreements.
- Product Launch/handing over/major announcements on reaching key milestones are also planned, including handing over of first hardware of Semi-Cryo development project of the ISRO.

VAYU : HAL's Helicopter Complex continues to develop variants of ALH, including the Mk. III wheeled version for the Coast Guard. Has the Service cleared its induction for deployment on board Coast Guard OPVs? What is status of the ALH variant offered to the Indian Navy, with folding rotor blades?

CMD: The newly-built ALH Mk.III wheeled variant for the Indian Coast Guard is integrated with nineteen additional equipment/sensors/systems for coastal security roles. All the trials needed towards certification of the new systems were completed during November 2020 at Goa. As required by the contract, final certification of the helicopters with 19 new systems by RCMA/ CEMILAC is at the final stages. After completing the certification by RCMA/ CEMILAC and SOC by RDAQA, the helicopters will be cleared for deployment on board Coast Guard OPVs. By design, the helicopters are cleared for ship borne operations.

HAL has two orders for ALH Mk.III wheeled variant which includes 16 helicopters for Indian Coast Guard and 16 for the Indian Navy. The Navy and CG variants of ALH Mk.III are built with capability for manual folding of rotor blades, meeting the contract requirement of dimensions and time.

VAYU : Series production of the Tejas LCA Mk. I (FOC) commenced last year with the first such aircraft handed over to the Air Force on 27 May 2020. When would the balance aircraft of this series be handed over?

CMD: We have orders for delivering 16 FOC block fighters to the IAF, out of which, first FOC LCA aircraft has joined 18 Squadron of the IAF in May 2020. Flight testing has started for two more aircraft and another six aircraft are in the advanced stages of system integration and testing. The structural assembly manufacturing is underway for the remaining seven aircraft from the FOC batch. We are steering to conclude FOC fighter production by 2022.

VAYU: HAL is now responsible for development of the LCA Mk.1A and the Air Chief has reiterated that formal orders will be placed on HAL for this type during the current FY. What are the timelines for completing integration of the chosen new systems and by when would certification be received?

CMD: LCA Mk.1A is an advanced variant of its predecessor variants. It comes fitted with AESA radar, Self-Protection Jammer (SPJ) pod, BVR (Beyond Visual Range) missile firing capabilities, advance EW (Electronic Warfare) suite as well as Radio Transmission with SDR link. The avionics of LCA Mk.1A is equipped with smart MFDs and thus will elevate the Human Machine Interface. It is a much more maintenance friendly aircraft developed to reduce the turn-around time (TAT) of LCA fleet and thus enhance the combat readiness of IAF squadrons. It has superior combat edge and enhanced aerodynamic capabilities over LCA Mk.1 aircraft, which are currently in operation. The certification of these systems call for rigorous flight testing and performance demonstration for all the newly integrated systems. All these systems are planned to be integrated progressively and LCA Mk.1A Certification is planned to be obtained within the stipulated time to ensure delivery as per the contract.

(Photo: Phil Camp)

VAYU: HAL's Avionics Division at Hyderabad have received clearance for the first AESA Radar (CBU phase) to be fitted on the Jaguar DARIN III UPG aircraft. This is very creditable and would this success be reflected in the eventual fitment of such radar on the LCA Mk.1A?

CMD: AESA radar configuration finalised on LCA Mk.1A is different from the AESA radar fitted on Jaguar Darin III Aircraft. Both the radars will be manufactured at the Avionics Division Hyderabad under Transfer of Technology. However, the indigenous *Uttam* radar, developed by LRDE, DRDO is also under trials with the LCA.

VAYU: HAL have been producing the Sukhoi Su-30MKI at its Nashik Division for several decades and the licence manufacturing programme could be extended with the IAF's order for 12 more such aircraft. What is status of the type's upgrade programme?

CMD: HAL, with its rich experience and technology base is best capable of leading this indigenous upgrade. Indigenous upgrade will arm the nation with capability to carryout technology upgradation of the aircraft in future independently to address operational enhancements, obsolescence, reliability and maintainability to ensure a seamless life cycle support.

HAL has proposed an Indigenous Upgrade Programme for the Su-30MKI aircraft to the Indian Air Force and has been pursuing with Air HQ for the project 'Go-Ahead'.

Scope of Su-30MKI upgrade envisaged by HAL encompasses development of avionics architecture with integration of HAL Mission Computer, state-of-the-art sensors and systems like the AESA radar, advanced EW Suite, and improvement in maintainability, reliability, addressing obsolescence and integration of existing/ modern weapon systems. This indigenous effort will align and synergise with the country's long term vision of Self Reliance through "Make in India" and *Aatmanirbhar Bharat*.

VAYU: The Air Chief has recently reviewed the Light Combat Helicopter (LCH) programme and you have stated that the Company is geared up for productionisation of the LCH to meet all requirements of the IAF. When are the first series production LCHs to be handed over?

CMD: Initial Operational Clearance (IOC) of LCH-LSP for Air Force and Army versions was accorded on 24 August 2017 and 15 February 2019 respectively. HAL has proactively taken up production of the LCH anticipating orders, in absence of firm orders.

However, we have pursued with Air Force and Army to give us a Letter of Intent (LoI) so that few helicopters can be offered to them for early exploitation pending.

(Photo: Phil Camp)

(The Interview will be continued tomorrow in our Show Daily Day 2, 4th February)

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VAYU Interview with Boaz Levy

IAI President and CEO (Part-I)

VAYU: How is IAI expanding its collaboration with Indian firms in integrating strategic state-of-the-art systems for the Indian MOD?

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

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

In 2021 IAI is expected to keep the same policy and expand our collaborations with local Indian Defence companies to be significant and important partners.

VAYU: What information can you share regarding the Heron TP?

IAI: The Heron TP is IAI's largest unmanned platform. The UAV can carry a wide range of payloads weighing up to a ton, fly at an altitude of up to 45,000 feet, boasts enhanced satellite communication capabilities and can undertake long range stand-off missions in difficult regions and under extreme weather conditions. The UAV has completely automatic, long runner takeoff and landing capabilities, which gives it additional flexibility and operational headroom beyond the long range at which it can operate. The system provides a solution for all types of missions- land and sea.

German Heron TP

VAYU: What upgrades are being offered by IAI for existing UAVs?

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

VAYU: Please provide an update on the MRSAM air defence system, in both its maritime and land-based versions?

IAI: MRSAM is an advanced, technology air – and missile-defence system, jointly developed by IAI and DRDO for the Indian Armed Forces. During development, IAI collaborated with Israeli and Indian industries, including Rafael, Tata, BEL, L&T, BDL and many private companies. The system provides the ultimate protection against a variety of aerial platforms, and is used by the Indian Air Force, the Indian Armed Forces, Indian Navy, Air force and the Israeli Defence Force. The system incorporates an advanced phased array radar (MF-STAR

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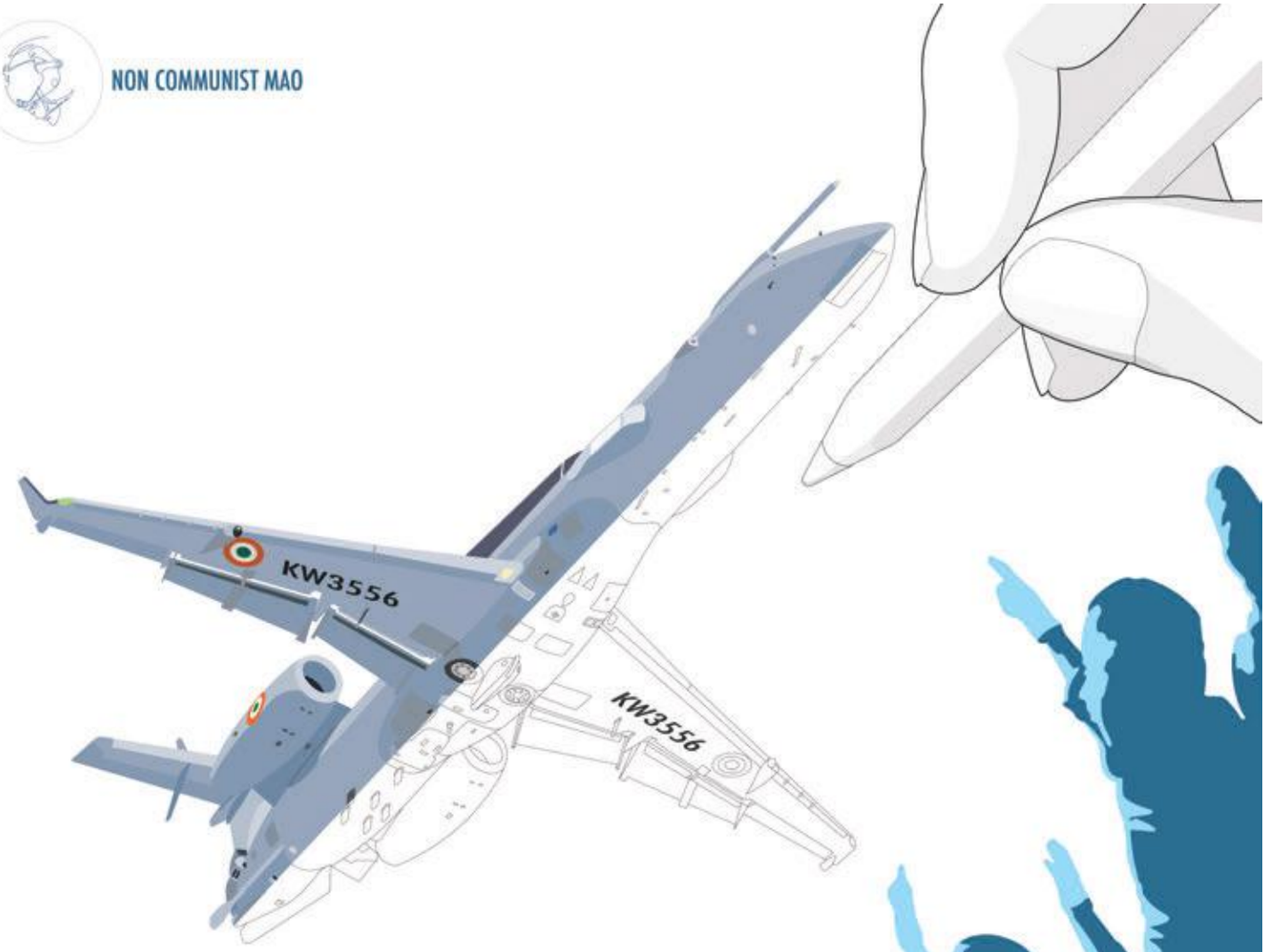

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MRSAM trials

or digital MMR), a command and control centre, mobile launchers and interceptors and an advanced RF seeker.

IAI and the DRDO have recently concluded successful tests of the system at a test range in India. The flight test demonstrated several extreme reference scenarios, validating the system's capabilities. As part of the test, the MRSAM interceptor was launched from a land-based mobile launcher and successfully hit its threats. The scenario began with the system's digital MMR radar zeroing in on the threat and then launching the MRSAM interceptor toward its operational trajectory. The interceptor acquired the target and successfully intercepted it. All the system's elements met their test goals successfully. Conducting the test under COVID-19 limitations was yet another testimony to the strong partnership between IAI and India. We are continually working with our Indian partners to bring the best operational outcome to meet the needs and requirements of the Indian Army, Navy, and Air Force. The MRSAM programme is progressing according to plan.

VAYU: Please elaborate on IAI's options in the loitering-munition category?

IAI: With more than 35 years' experience in developing combat-proven loitering munitions systems, IAI offers a wide range of these systems. Our solutions are uniquely capable of searching, identifying and neutralising targets effectively and with precision. Employing various guidance systems and capabilities, IAI's loitering systems provide solutions for a wide array of battle scenarios. In this category IAI offers the following systems:

HAROP: This is a remotely operated stand-in loitering attack weapons system designed to locate and precisely strike targets. The HAROP loitering munition (LM) is an electro-optically guided attack platform. HAROP LMs are launched from ground- or sea-based launchers and can be controlled via a two-way data link for full man-in-the-loop operation. HAROP is used to strike high-value targets and boasts full mission capabilities, from acquiring targets to striking them to conducting battle damage assessment. Combining the characteristics of a missile and a UAV, HAROP enables the effective execution of missions without relying on any additional external system for targeting and mission intelligence. HAROP is a fully combat-proven system and has demonstrated its capability around the world.

HARPY is an all-weather, day/night, 'fire and forget' autonomous weapon, launched from a ground vehicle away from the battle zone. Programmed before launch to fly autonomously to a pre-defined 'Loitering Area', the system then searches for targets with a radiation footprint. The HARPY loitering munition (LM) detects, strikes and destroys enemy radar emitters, hitting them with high precision ordnance. HARPY effectively suppresses hostile SAM and radar sites for long durations, loitering above enemy territory for hours.

The *Mini Harpy* is a unique tactical system designed for field or marine units. It can be launched from land, naval, and helicopter-borne platforms, providing complete independence in intelligence collection for an updated situational picture and for low-cost acquisition and annihilation of targets. Based on unique IAI developments and technology, the *Mini Harpy* combines the capabilities of IAI's two flagship loitering missiles, the Harop and the Harpy, offering the detection of radiation-emitting systems as well as having electro-optical capabilities. The system was introduced only few months ago and since then, IAI has seen interest in the system grow among existing customers as well as new ones. The *Mini Harpy* is an ideal weapon for armies looking for a cutting-edge tactical solution in the age of symmetrical or asymmetrical warfare.

The ROTEM Aerial System (AS) is a tactical, loitering munitions (LM) system based on a light, multi-rotor platform that delivers excellent capabilities against enemy systems in complex environments and with small footprints. This lightweight and compact LM can be assembled in seconds and operated by a single soldier. The LM is capable of lethal precision strikes on stationary and mobile targets with abort/safe capability and is recoverable. ROTEM is an extremely versatile platform. It can perform squad-level ISR and attack missions with minimal planning and operational focus from the operator. The system includes a tactical kit of two LMs with all peripherals packed in one backpack and allows operational units to use it organically as part of their standard gear. The system's exceptional capability to hover allows the VTOL platform to acquire targets and engage them within seconds, which makes the ROTEM a game-changer for its operators. ROTEM is also a full combat-proven system and has recently won a major global tender.

(all photos: IAI)

(To be continued tomorrow in Show Daily Day 2, 4th February)

Mini-Harpy

Gripen E's missile edge for the Indian Air Force

The Gripen E offer for India builds upon the Gripen E family of aircraft. Gripen E is the most modern fighter in the competition and together with the weaponry, including the Meteor Beyond Visual Range missile, Gripen E will give India an edge against its adversaries. The latest high performance sensors such as AESA radar, IRST system, advanced datalinks and AI-enabled decision support gives the pilot superior situational awareness and ability to see first-act first.

Weapons flexibility of customer´s choice

With its combat performance and power projection capability, Gripen E will provide the IAF with deterrence power in the region. Even more important, Gripen E can be armed with Indian-developed missiles or missiles of any provenance, unlike any other aircraft.

"Any weapon of Indian choice can be integrated to the Gripen fighter,'' says Mats Palmberg, Head of Gripen India Campaign. "Gripen can also be equipped with Israeli, European, American weapons, giving it an edge in the ongoing MRFA (Multirole Fighter Aircraft) competition. We are of course also prepared to integrate Indian weapons'' he adds.

Gripen E can carry nine missiles and 16 bombs as well as a large suit of other weapons and payloads. In addition, its inherent design enables easy integration of new weapon systems stores for all types of missions, from air-to-air missiles to reconnaissance and heavy air-to ground armament. A specific feature of the aircraft is that it is programmed to deploy systems with different weights, centre of gravity and shapes with different aerodynamic features. Furthermore, its split avionics allows weapon integration and tactical system software updates or changes can be made without the need to re-certify the flight critical software. These unique features, together with standardised interfaces and open architecture orientation, results in faster and easier integration of new weapons on the fighter.

In its offering to India Saab maintains an all-inclusive fighter package that will meet the IAF's requirements at a fraction of the cost. "Besides Meteor, IRIS-T, A-Darter, and AIM-120 AMRAAM (Advanced Medium Range Air-to-Air Missile), other missiles like the Astra, Python 4/5, Derby, AIM-9X Sidewinder, ASRAAM and others can also be easily integrated to Gripen," says Palmberg. A wide range of guided/unguided bombs, reconnaissance pods, cruise missiles and anti-ship armaments is of course also offered.

The Meteor BVR Edge

Beyond Visual Range (BVR) combat with 'See First – Shoot First' capability is one of the most important features of modern fighter aircraft. The Meteor has changed the dynamics of BVR combat and taken it to a new level, providing unmatched air-to-air capability.

With an operational range of over 100 km, a BVRAAM Meteor missile can travel at speeds of over Mach 4, over four times the speed of sound. The missile can accelerate mid-way, leaving very little chance of the target to escape.

The Meteor is capable of engaging targets ranging from agile jets and UAVs (Unmanned Aerial Vehicles) to cruise missiles, simultaneously and autonomously in any weather condition.

"Meteor is an indispensable part of the Gripen for India offer. But we are also open to discuss other weapons and armaments that the Indian Air Force is interested in integrating to Gripen,'' Palmberg adds.

What Meteor capability means for India

Accurate strike capability against both fast moving targets and small unmanned vehicles, that is MBDA-

developed Meteor long range missile for you! The missile will be considered a game-changer for the Indian Air Force for a long time to come. Known as the best missile of its type, Meteor has become an indispensable part of the ongoing Indian Multi-role Fighter Programme (MRFA) and continues to generate interest around the world.

The Meteor BVRAAM (Beyond Visual Range Air to Air Missile) currently has the largest 'No-escape Zone' (NEZ) of any air-to-air missile which means that the missile leaves very little chance for any agile target to escape once tracked.

The Meteor has supersonic ramjet as opposed to rocket engines seen in heavy weight missiles such as the Phoenix, R-33 and AMRAAM. The unique ramjet system allows the engine to be throttled back in order to save fuel, while the missile glides at the speed of up to Mach 4.

Unlike rocket-powered-engine missiles, the Meteor saves up enough energy to make its critical attack while at its highest energy state giving it an edge while engaging highly agile targets. Furthermore, the two-way data link capability of the Meteor integration on Gripen, a feature not all fighters with Meteor offer, allows the fighter to target and re-target the missile even after it has been launched, making it almost impossible for the pilot to miss the target.

Meteor on the Gripen fighter

The advantages of Meteor can only be obtained if properly integrated and operated by a platform that can fully exploit its potential. The unique combination of Meteor and the integration with Gripen´s sensor and net centric warfare capabilities is at the core of what revolutionises air combat.

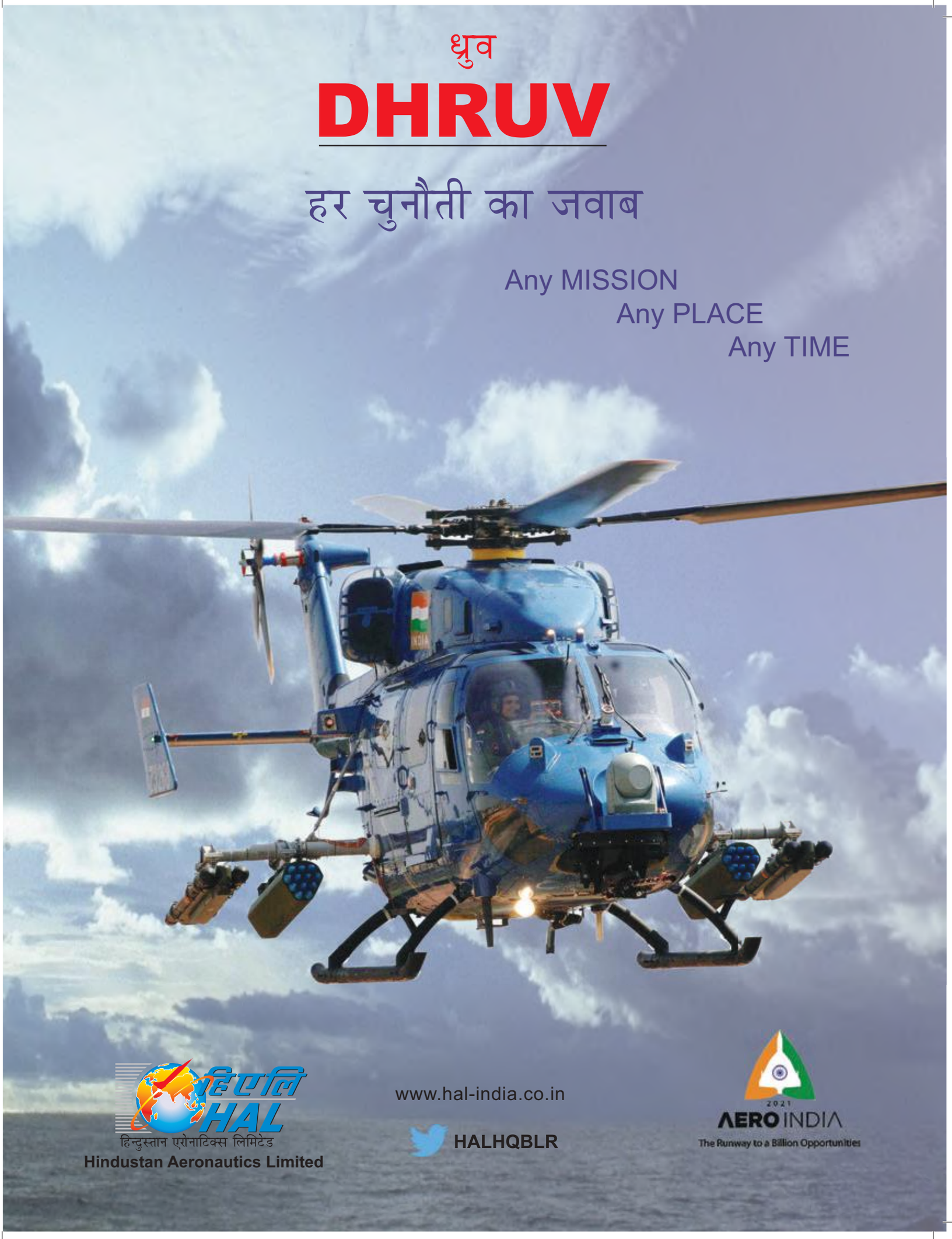
Gripen was the first test bed aircraft for the Meteor and as such, considered "the perfect aircraft" for missiles of its calibre to be tested on. In 2018, Saab successfully completed a test flight for the Meteor on Gripen E (designated 39-8) for the first time, five years after the missile was first tested on a Gripen C platform. 80 percent of Meteor firing tests have taken place on the Gripen ever since.

The Gripen is designed to multiply the fleet´s combat capability through the networked operations capability where all connected assets are tightly co-ordinated and synchronised. All resources are shared and optimised to maximise the operational effect. Fusion of both on-board sensors such as the AESA radar, passive IRST and AESA EW, and off-board sensors from other air, land and sea assets acquired through advanced data links, give the pilots a coherent tactical picture and accurate target acquisition data, even against very low signature threats.

The aircraft integration fully exploits the Meteor´s operational kinematic range capability, as the Gripen's radar system performance, in terms of range and field of view, and data fusion capabilities for superior situational awareness and target acquisition take full advantage of the performance envelope of the missile. These features together with the two-way data-link makes revolutionary new tactics possible, thereby maximising the probability of mission success.

As the former Swedish Air Force chief Maj Gen Mats Helgesson has said, "Meteor on Gripen is a game-changer"!

Mats Palmberg,
Head of Gripen India Campaign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Thales reinforces its 'Make in India' commitment


The STARStreak system

Led by its commitment to the 'Make in India' policy of the Government of India, Thales is participating at the 13th edition of Aero India, providing visitors a chance to witness the latest cutting-edge technologies across civil and defence aerospace as well as land and naval defence along with a special feature on its efforts towards 'Make in India'.

Thales is showcasing its airborne optronic capability the targeting and reconnaissance pod TALIOS that combines targeting and tactical reconnaissance capabilities in a single pod which will be able to embed artificial intelligence in the future, and also a range of rockets for fixed and rotary wing military aircraft.

Thales is also exhibiting the latest addition to its family of airborne surveillance radars, the AirMaster C, which is an optimised surveillance solution for a broader array of platform types and operators, ensuring they benefit from the highest levels of mission performance as they face the new challenges ahead.

Among other systems for the armed forces are SYNAPS software defined radios, armament, small arms, counter-UAV measures and air defence solutions such as STARStreak for which a teaming agreement has been recently signed between Thales and Bharat Dynamics limited is on centre stage.

Some other highlights at Aero India 2021 include military and civil avionics, Air Traffic Management Systems that support growing domestic and international travel requirements, among others.

"Driven by the purpose to build a future everyone can trust, we remain resolute in our commitment to the 'Make in India' vision of the Government of India. Since inception of our operations in the country, we are proudly supporting the modernisation efforts of the Indian armed forces and helping them to prepare, achieve and maintain tactical superiority over any form of threat. Aero India 2021 provides us with an opportunity to present our latest and advanced technologies that serve the needs of the country's defence forces, and strengthen our local partnerships. We are excited to be part of it," stated Emmanuel de Roquefeuil, Vice-President and Country Director, Thales in India.

Backed by the rich legacy of close to seven decades in India, Thales continues to innovate and accelerate digital transformation to serve the needs of the Indian market – as well as globally.

VAYU Interview with Mrs Anandi Ramalingam, Director Marketing, BEL (Part-I)

Mrs Anandi Ramalingam, Director Marketing

VAYU: What are your plans on increasing BEL's exports? How do you plan to increase your global presence?

BEL: BEL are fast expanding its global presence, putting its best foot forward to give a thrust to exports worldwide. All-out efforts are being made to tap new markets across the globe. In a bid to develop new markets in the Indian Ocean Region (IOR), BEL has operationalised overseas marketing offices in Oman, Vietnam, Sri Lanka and Myanmar. BEL has also expanded its Singapore and New York Regional Offices to handle marketing activities. BEL is also thinking of establishing similar offices in Nigeria, Brazil, Armenia and Kazakhstan.

The Government is encouraging defence exports through many policy initiatives and has set a target of Rs.35,000 Crs by 2024-25. BEL has identified Exports and Offsets as one of its thrust areas and has drawn up plans to offer its select products and systems to various export markets. The Company has put in efforts for increasing its business opportunities in South East Asia, Europe, Middle East, Africa and North America through constant engagement with customers and is also working closely with other Indian companies and local partners in the respective countries as part of maximising its geo-strategic reach and increase its global footprint.

VAYU: What are the products that you export and to which all countries do you export?

BEL: BEL has been exporting products such as Communication Systems, Coastal Surveillance System, Missile Systems, Radars, Electronic Warfare Systems, Electro Optic Systems and Electro Optic Fire Control Systems, Radar Finger Printing System, Naval Systems, Radar Warning Receivers, Electronic Voting Machines and various other equipment to USA, UK, Russia, Italy, Brazil, Germany, France, Israel, Indonesia, Honduras, Malaysia, Maldives, Mauritius, Myanmar, Namibia, Seychelles, South Africa and many other friendly countries. BEL achieved Export sales of US$ 48.59 million during FY 2019-20.

Some of the other products and systems which are being promoted for exports include Homeland Security solutions, Smart City solutions, Border Protection systems and Coastal Surveillance System. Having established a Coastal Surveillance System (CSS) for a few neighbouring countries, BEL is interacting with Ministry of External Affairs for supply of CSS to other friendly countries.

Recently, the Government approved the export of the indigenously developed Akash Missile System to friendly foreign countries.

VAYU: How do you plan to tap the Offset clause for exports?

BEL: BEL is also focusing on offsets as a potential avenue for revenue generation. BEL is interacting with many foreign OEMs to meet offset obligations in various RFPs of the MoD, on account of the offset policy incorporated in the Defence Procurement Procedure. BEL has identified contract manufacturing *(build to print and build to spec)* for foreign OEMs and partnerships in the form of Transfer of Technology of the latest systems and solutions as areas of emerging export opportunities. Efforts are also on to establish long term supply chain relationship with global players.

VAYU: How is your company gearing up to realise the Government's Atmanirbhar initiative?

BEL: Defence has been identified as a core sector to boost the *Make in India* vision of achieving $5 billion Exports. Major initiatives by BEL towards *Make in India/ Atmanirbhar Bharat* include strong thrust on R&D, Collaborative R&D, Defence Innovation Organisation

Anti-Drone Guard System

incorporated by BEL and HAL to create an ecosystem to foster innovation, and technology development in Defence by engaging R&D institutes, academia, industries, start-ups and individual innovators. To promote the Make in India initiative, BEL has established *Make in India* Display Cells, appointed Nodal Officers for Outsourcing & Vendor Development in all its Units and updated its policies and procedures. BEL has implemented the Make-II Policy of GoI and issued several EoIs to Indian vendors. The Company has been putting in efforts to create a strong vendor base in India and has currently more than 21,000 vendors including domestic vendors and MSMEs. BEL is extending its Test facilities for use to private industries.

Air Defence Fire Control Radar (ADFCR)

BEL is pursing development/ production opportunities with DRDO under DcPP model for various indigenous development/production programmes. The Company has entered into partnerships / strategic alliances with foreign OEMs as well as major Indian industries to address large and strategic programme requirements, leveraging its complimentary capabilities and assuming the role of a Lead integrator / Tier-1 partner for indigenous manufacturing. BEL is constantly exploring possibilities of forging JV Partnerships.

BEL successfully rolled out 30,000 ICU ventilators within a record time for treating Covid-19 patients and make India self-reliant in high-end medical equipment. The project involved substantial import substitution within a short period of time. Post COVID, A separate vertical called Medical Electronics Division has been opened to focus on networked and remotely operated solutions with latest technologies like IoT, AI, Cloud-based services, e-diagnostics and online healthcare services.

(To be continued tomorrow in our Show Daily Day 2, 4th February)

Akash SAM

P&W's Next-Gen engines for India's Defence modernisation

The Airbus C295 transport aircraft is powered by PW127G engines

As makers of the world's first operational fifth-generation engine, the F119 for the F-22 Raptor and the world's most advanced fighter engine, the F135 which powers the F-35, Pratt & Whitney's history and expertise with advanced propulsion systems is unmatched. With more than 7,000 military engines in service with 34 armed forces around the world, P&W understand that engine performance, reliability and versatility are critical components of advancing a nation's aerospace and warfighter ambitions.

Both the Indian Air Force and the Indian Navy are on a modernisation path with some key programmes in the running. For example, the Indian Air Force may acquire 56 Airbus C295 transport aircraft that are powered by PW127G engines. The PW100 family of engines represents a diverse set of customers, across regional, cargo, firefighting, emergency services and defence. It has delivered on reliability as well as versatility, flying in any environment, effectively and efficiently. The engine's latest materials, design and advanced engine control deliver impressive dispatch reliability, as well as easy operations and maintenance, making it uniquely suited to IAF's varied mission needs.

Meanwhile, the Indian Navy is looking to select a new Naval Utility Helicopter and the Sikorsky S-76D is one of the contenders. The S-76D is powered by the PW210 engine, which has been instrumental in shaping a new generation of helicopters worldwide. With its game-changing performance, improved fuel burn, power-to-weight ratio and operating economics, we are confident that if selected, the PW210 will deliver for the Indian Navy as it protects India's maritime borders.

When it comes to advanced fighters, there is the closely watched procurement of 114 Medium Multi-Role Combat Aircraft for the Air Force and Boeing's F-15EX is seen as one of the contenders. Pratt & Whitney's F100 engines have powered the United States Air Force's entire operational fleet of F-15s for more than the past 40 years, including its most current variants. The latest upgraded F100-PW-229 has a fully modular architecture that ensures ease of maintenance and incorporates leading edge technologies in materials, cooling, and health management including some advanced 5th generation technology. It is also fully capable of integrating with the F-15EX's fly-by-wire flight control system.

The F100's safety, reliability, and performance record with the F-15 is second-to-none. With more than 28 million hours flown, the F100 is an industry leader in fighter engine reliability and provides excellent value to its operators through low costs per flight hour. The engine currently powers frontline fighters for the USAF and air forces around the world, and is technologically fully capable of powering the most challenging missions against any adversary – now and in the future. These traits along with quality and value over the entire lifecycle, provide the Indian Air Force with a superior propulsion system for this critical aircraft and for their missions.

As India takes on a renewed 'Self-Reliant' approach towards defence modernisation, indigenous jet fighters in various stages of consideration and development like the Advanced Medium Combat Aircraft (AMCA) and the Tejas MKII are of significant importance. We believe that these are great steps forward in advancing India's defence and industrial capabilities, and that such platforms work best when augmented with next-gen propulsion systems.

In India, Pratt & Whitney is committed to building capabilities for high value services that will help operators get the best from their next-generation products, and creating an innovative aerospace and defence ecosystem that transforms the country's aviation aspirations into reality. We are confident that our engines are the best choice to power India's defence aircraft, and are pleased to engage with our customers on any opportunities that they see fit for us in the long term.

Courtesy: P&W

Ashmita Sethi, President and Country Head, Pratt & Whitney

"Lockheed Martin Reaffirms Commitment to Advancing India's Security and Industrial Capabilities at Aero India 2021"

Lockheed Martin is showcasing its diverse portfolio of defence capabilities and solutions at the 13th edition of Aero India 2021 at Yelahanka, Bengaluru. The company's exhibit this edition highlights its product portfolio across Aeronautics, Rotary and Mission Systems, and Missiles and Fire Control businesses. This includes a broad span of state-of-the-art capabilities, including the F-21 fighter,

MH-60R 'Romeo' multi-mission helicopter, the S-76D helicopter and the C-130J Super Hercules transport aircraft.

"Aligned with the Indian government's *Atmanirbhar Bharat Abhiyaan* and the 'Make in India' initiative, we are participating in Aero India 2021 and reinforcing our commitment to supporting the growth of an indigenous defence manufacturing ecosystem while continuing to

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deliver our best capabilities to support the Indian MoD and Services," stated William (Bill) Blair, Vice President and Chief Executive, Lockheed Martin India. "We see tremendous strength and opportunity in India›s defence industry – both public and private – including start-ups and Micro, Small & Medium Enterprises (MSMEs). Aero India serves as an excellent platform for us to explore new partnerships and strengthen existing ones."

The prime attraction at the Lockheed Martin›s stand is the **F-21 fighter aircraft** which is on offer to the Indian Air Force. The company is leveraging both 4th and 5th generation technologies to offer the best solution to meet or exceed the IAF's capability needs, provide 'Make in India' industrial opportunities, and accelerate India-US cooperation on advanced technologies, including but not limited to fighter aircraft. The F-21 demonstrates Lockheed Martin's commitment in delivering an advanced, scalable single-engine fighter to the IAF: "For India, From India".

The Indian Navy's most recent rotary wing acquisition**, MH-60R 'Romeo' Seahawk helicopter,** also occupies a prominent place at Lockheed Martin's Aero India display. The MH-60R is the world's most advanced maritime helicopter and brings vital anti-submarine and anti-surface warfare capabilities to the Indo-Pacific region. The MH-60R is the latest thread in the stories of Lockheed Martin and US-India partnerships. In fact, it is the largest contract Lockheed Martin has ever signed with India. The first batch of the MH-60R helicopters will be delivered to India in 2021.

The **S-76D helicopter** has an unmatched record of safety and reliability, delivering the safety, reliability and efficiency customers have come to expect from the S-76 family of aircraft, but with faster cruise speed and more efficient fuel burn. In all roles, including the difficult Search and Rescue role, it has been incredibly well received providing a stable, low workload, reliable platform and speed, for when minutes matter. With S-76-class helicopters working for customers all over the world on a diverse set of operations, it›s well positioned to meet growing global customer needs.

On display at the show is India's workhorse, **C-130J Super Hercules** airlifter, represents a strong legacy of partnership between India and the US. The IAF has been extensively using its fleet of 12 Super Hercules for humanitarian efforts in wake of the Covid-19 pandemic, as well as to support the movement of troops and material to support regional military operations. All C-130Js now built and delivered around the world have major components manufactured in India through Tata Lockheed Martin Aerostructures Limited (TLMAL), a joint venture located in Hyderabad that has the distinction of being the single-global source of C-130J empennage assemblies.

As part of the Javelin Joint Venture, Lockheed Martin also produces the **Javelin** anti-tank guided missile system. This versatile and effective one-man-portable and platform-employed multi-target precision weapon system provides capability to defeat a broad spectrum of close combat threats on the modern battlefield. Using fire-and-forget technology, the weapon guides itself to the target without external commands, allowing soldiers to take cover or reposition. With a range of 65 meters to 4 kilometers in most operational conditions, as well as the ability to operate through adverse weather and battlefield obscurants, Javelin can be deployed in a variety of environments and conditions. Lockheed Martin has nearly 240 suppliers — including MSMEs that feed into its two joint ventures, TLMAL and Tata Sikorsky Aerospace Limited — that benefit from the vision of Lockheed Martin and Tata working together. Lockheed Martin has integrated more than 70 Indian suppliers, including MSMEs, into its global supply chain. At the show, the company representatives will discuss partnership opportunities with Tier 1 suppliers and prospective Indian industry partners that strengthen India-US defence industrial ties and 'Make in India' opportunities.

William L. Blair,
Vice President and Chief Executive,
Lockheed Martin India

Thales and Bharat Dynamics Limited bring STARStreak Air Defence System to India

Thales and Bharat Dynamics Limited (BDL) have signed a Teaming Agreement to work in partnership on the STARStreak Air Defence system with the support of both the Governments of India and the United Kingdom. The Teaming Agreement was signed by Thales and BDL in the presence of UK and Indian Government representatives in a virtual ceremony on 13 January 2021.

Through the agreement, BDL will become part of the STARStreak global supply chain, providing the opportunity for export of Indian manufactured components to existing and future STARStreak Air Defence customers, including the UK Armed Forces.

This agreement will also provide the opportunity for BDL to offer a 'Make in India' STARStreak solution to the Indian Government, with a capability that match as the immediate air defence needs of the Indian Army and Air force, and with 60% of the system manufactured in India.

It also represents an opportunity for further UK and Indian Industrial co-operation and will cement the ambition for closer collaboration and co-development between the two nations, supporting the ambitions of our governments› recently signed Defence Technology and Industrial Capability Cooperation MoU.

Alex Cresswell, CEO of Thales in the UK stated: "Today's signing is a significant milestone for all parties concerned and I look forward to Thales and BDL developing a close working relationship. This is good news for our business in Belfast in Northern Ireland, for the strong supply chain of UK SMEs with whom we work and for our teams in India. The UK and India have a strong tradition of industrial partnership in defence, innovation and sharing technology and we are thankful to both the Governments for their strong support to this excellent initiative."

VAYU Interview with Michael Koch, VP, Boeing Defence, Space & Security, India

VAYU : Boeing has strengthened its defence business in India with many of its iconic platforms servicing the Indian armed forces. How do you see the Indian market growing from your perspective?

Boeing: India's defence sector is poised for growth and Boeing is committed to supporting and enabling this progress. Boeing has had a presence in the country for over 75 years now, and we have had many firsts with India. India was the first international customer for the P-8, is the largest international operator of C-17s and P-8s, and the Harpoon missile was the first US weapon system on an Indian-built fighter.

The future looks promising and we continue to see several opportunities in India. We're engaged with our defence customers on their requirements for the Indian Air Force's Multi-Role Fighter Aircraft and the Indian Navy's Carrier-Borne Fighter programme. Early last year, the Ministry of Defence signed a contract for the acquisition of an additional six Apaches for the Indian Army.

Today, with 11 C-17s, 9 P-8Is plus three more on order, 22 AH-64 Apaches with six more on order with the Indian Army, and 15 CH-47 Chinooks, India is at the front and centre of Boeing's business plans.

We are also seeing the growth in our localisation of MRO services and training, and the value that Boeing Defence India, our local establishment in India, is able to provide through the lifecycle of Boeing products. We work with the Indian Air Force and the Indian Navy to provide exceptional operational capability and readiness to the P-8Is, C-17s, and 'Head of State' aircraft through local sustainment services in India. Boeing is also providing pilot training for the Indian Air Force fleet of C-17 aircraft and we are in the process of providing training to Indian Navy pilots on the P-8I.

We are contributing to the growth of India's aerospace industry; that is why we're investing in partnerships across the ecosystem in skilling, research & technology, and manufacturing. India's role in our global supply chain is big and getting bigger. Our commitment to India is deep and it is for the long term; our vision is to bring the best of Boeing to India and export the best of India to the world.

VAYU : Boeing recently announced results of ski jump trials of the F/A-18 Block III Super Hornet. Are there any updates on your talks with Indian Navy for their fighter requirements?

Boeing: Boeing and the US Navy have recently proved that the F/A-18 Super Hornet can operate from a ski jump ramp, thereby demonstrating the aircraft's ability to operate on Indian Navy carriers.

We are engaging with the Indian Navy and have responded to the Request for Information for the Multi-role Carrier Borne Fighter (MRCBF) programme. This is a very exciting opportunity to partner with both the Indian Navy and the US Navy. The F/A-18 Super Hornet is the frontline carrier-based fighter of the US Navy, and will not only provide superior war fighting capability but also create opportunities for cooperation in naval security and aviation between the United States and India. The aircraft will be an incredible tool to ensure security and safety in the Indo Pacific region for decades to come.

VAYU: Why do you believe the Super Hornet will meet the Indian Navy's requirements for a carrier borne fighter?

Boeing: It is important to understand that, apart from being the most lethal, advanced and combat-proven aircraft, there would be benefits from the incredible know-how and technology investments made by the US Navy related to aircraft carriers and fighter operations at sea. As a strategic partner for security, US Navy is leaning in to provide the best solution available for Indian Navy. This includes the F/A-18 Block III Super Hornet, but it also includes deep capabilities in sustainment, logistics, flight ops, carrier and network integration, etc. These machines are powerful on their own, but they are far more potent when they are part of a fully integrated network of capabilities.

The Super Hornet was designed for the carrier deck and benefits from decades of experience which Boeing and US Navy have had operating classic Hornets. The Indian Navy would receive the benefit of US Navy's multi-billion dollar investments in Block III technologies, including advanced networks, longer-range detection with Infrared Search & Track, an all-new Advanced Cockpit System, improved signature reduction and a 10,000+ hour life. The F/A-18 Block III Super Hornet will be a game changer for the Indian Navy providing them several unique and differentiated capabilities.

Another important operationally relevant distinction is that the Super Hornet would prove a force multiplier for the Indian Navy through enhanced networked warfare with other US origin assets that the Indian Navy and the Indian Air Force have, or are in the process of acquiring. The F/A-18 Super Hornets can optimally interface with the P-8I, augmenting lethality of these platforms and enhancing India's force projection capabilities.

As part of Boeing's 'for India, by India' philosophy, the Block III Super Hornets can be serviced in partnership with the Indian Navy, US Navy and industrial partners from India and the US throughout the lifecycle of the aircraft. This will further develop advanced expertise in aircraft MRO in India, resulting in higher availability of the aircraft at competitive pricing. All these together, with the fact that the Super Hornet is the most affordable tactical fighter in its class 'per flight hour' differentiates Boeing's F/A-18 Block III Super Hornet offer for the Indian Navy.

VAYU: The P-8I has always proven its capabilities and has been a strong pillar for Indian Navy when it comes to maritime security. There are three more to be delivered? What updates on the remaining P-8I delivery and your future plans for P-8I fleet?

Boeing: In November, last year, Boeing delivered the ninth P-8I to the Indian Navy. This was the first of the four options aircraft, with the remaining three scheduled for delivery this year. The Indian Navy was

the first and is the largest international customer for the P-8. This aircraft is an integral part of the Indian Navy's fleet and is approaching an impressive milestone of 30,000 flight hours since its induction in 2013.

Our focus has been, and will continue to be on delivering the world's best maritime patrol aircraft to the Indian Navy. We have been supporting India's growing P-8I fleet by providing spares, ground support equipment and field service support. Boeing's logistics support has enabled the highest state of fleet-readiness at the best possible cost. Boeing is currently completing construction on a Training Support & Data Handling (TSDH) Centre at INS *Rajali*, Arakkonam, in Tamil Nadu and a secondary centre at Naval Institute of Aeronautical Technology at Kochi, as part of a training and support package contract signed in 2019. The localised, ground-based training will allow the Indian Navy crew to increase mission proficiency in a shorter time, while reducing the on-aircraft training time resulting in increased aircraft availability for mission tasking.

The P-8I's unmatched maritime surveillance and reconnaissance capabilities, versatility and operational readiness are uniquely qualified to perform India's range of missions across the Indian Ocean Region, and thus the aircraft has proven to be an important asset to the Indian Navy. We do believe that the Navy has requirement for more P-8Is as also more Harpoons and we stand ready to support them.

VAYU: When can the Indian Army expect its Apache helicopters?

Boeing: The AH-64 Apache helicopters will be a force multiplier for the Indian Army, just as they are today for the Indian Air Force. The Indian Army AH-64E Apaches are planned to be delivered in country 48-49 months after contract award. We are assessing any impacts owing to Covid-19 and communicating regularly with the Indian Army. Our Tata Boeing Aerospace Ltd (TBAL) joint venture in Hyderabad is a critical source of Apache manufacturing for the US Army and customers worldwide. Much of the contracted six Apaches for the Indian Army will be built at the state-of-the-art TBAL manufacturing facility, right here in India.

MBDA Meteor and MICA on a Rafale (photo: Dassault)

MBDA's GAME-CHANGING WEAPONRY

'Make-in-India' commitments and Rafale weaponry at Aero India 2021

MBDA, the manufacturers of the Rafale's game-changing weaponry, is showcasing its *Make in India* commitments during Aero India 2021. Notably MBDA's stand in Hall B 3.4 features a display wall of missile system components 'Made in India' by the company's large Indian industrial ecosystem. Also exhibiting in Hall B is L&T MBDA Missile Systems Ltd, MBDA's joint venture with Larsen & Toubro, which will be displaying the systems offered to the Indian Armed Forces as well as its work on MICA missile launchers for the Indian Air Force's new Rafale fighters.

MBDA is not new to partnership with the Indian Armed Forces and Indian industry, indeed it has been delivering battle-winning capabilities to the Indian Air Force and collaborating with Indian industry for over 50 years. Throughout this history, there have been two guiding principles: to provide the very best technologies for the Indian Air Force, and to work in true partnership in support of the Indian Defence Industry. The company then is fully committed to the 'Make in India' programme, which aligns with MBDA's long-term strategy.

Aero India 2021 will also be a milestone year for MBDA, marking the first exhibition where Indian Air Force-operated Rafale fighter aircraft will be present.

Overwing ASRAAM on the Jaguar

MBDA is well known as manufacturer of the weaponry that makes Rafale such a potent airborne force. Perhaps the best known is the ramjet-powered and network-enabled Meteor beyond visual range air-to-air missile from MBDA. This next generation missile is widely

The SCALP deep strike cruise missile with Rafale

recognised as a game changer for air combat, and will provide the Indian Air Force with an unrivalled air dominance capability. Key to this is Meteor's throttleable ramjet engine, active radar seeker and datalink that combine to provide unmatched end-game speed and manoeuvrability at greatly extended ranges, resulting in its all-important 'No-Escape Zone' which is more than three times greater than any other existing or planned BVR weapons.

Also arming India's Rafales is the SCALP deep strike cruise missile, which is no less game-changing than the Meteor. SCALP has proved itself unerring with its unmatched ability to combine very long range with devastating target effect on even the most hardened of military infrastructure during combat operations. Its long-range enables it to be fired at extended stand-off ranges, beyond the reach of hostile air defence systems or altogether even outside hostile airspace.

Other examples of technological edge weapons equipping the Indian Air Force are the MICA and ASRAAM within visual range (or dogfighting) missiles. MICA arms both the Rafale and Mirage 2000 and is the only missile in the world featuring two interoperable seekers (active radar and imaging infrared) to cover the spectrum from close-in dogfight to long beyond visual range.

ASRAAM is providing the IAF's Jaguar fleet with a step-change in air combat performance. Industrial partnership is of equal importance given the vitality of sovereign industrial defence capability. MBDA has been assisting the development of sovereign Indian missile industry, both public and private, for over 50 years. Partnerships the MBDA has formed with Indian industry have resulted in over 40,000 missiles of the MILAN family produced in India – a noteworthy and on-going success. Key components for both MICA and ASRAAM missile systems are made in India, and a selection of Indian-made components are on display in a special *Make in India* display area on the company's stand.

The Mistral ATAM system has been successfully integrated on the Advanced Light Helicopter (ALH) and final integration is being done on the Light Combat Helicopter (LCH). Utilisation of the Mistral missile on India's helicopter platforms also provides a bridge to their use in a ground based VSHORAD role, where the missile is fully compliant with India's requirements and outperforms the capabilities of its rivals.


Mistral ATAM


Boris Solomiac,
General Delegate, MBDA India

Flying Past the Pandemic

Dassault Aviation Group in 2020

In 2020, 13 Dassault Rafales were exported, in line with the policy, versus 26 in 2019. At the same time, in 2020, 34 Dassault Falcons were delivered, versus 40 in 2019. In 2020, 15 Falcons were ordered, compared to 40 in 2019. The Covid-19 outbreak, triggering an unprecedented global pandemic crisis, very restrictive

travel restrictions and strong uncertainties about the worldwide economy, directly affected Dassault's order intakes.

As of 31 December 2020, the backlog included 62 Rafales and 34 Falcons, compared to 75 Rafales and 53 Falcons as on 31 December 2019.

Rolls-Royce: "A natural partner in India's journey of self-reliance"

Rolls-Royce Adours power the Jaguars (photo: Simon Watson)

The world is recuperating from the devastating effects of a continuing pandemic and economies are slowly rising from this crisis, finding more resilient and innovative ways to survive and succeed. Amidst this, India is pursuing its 'Atmanirbhar Bharat' vision, which is also reflected strongly in its outlook for future of the defence sector.

Not surprisingly, India today has the third largest Army, the fourth largest Air Force and the seventh largest Navy in the world. India is fifth on the list of the world's biggest military spenders. Further, given changing geopolitical considerations, Defence remains a critical sector from the perspective of national security and the government is well aligned in its goal to develop a high degree of self-reliance in Defence, as in other sectors.

Currently, the country is at the right juncture to build a vibrant local defence industry ecosystem that could support both domestic and export demand. With a mix of defence public sector undertakings and private companies, as well as research capabilities and manufacturing set-ups, India has a huge defence industrial base. This provides an excellent opportunity to build and/or scale up an industrial base centred on indigenous manufacturing. Co-creation and subsequent manufacturing for India and for the world, is a goal we can aspire to achieve in this sector. However, if we need to accelerate the pace of indigenisation, we perhaps need a quantum leap in the way it is approached.


Adour powered Hawk of the IAF (photo: Simon Watson)


Adour powered Jaguar at HAL

India today has the width and the weight to invest in co-creation programmes through collaboration with willing global players with the goal to co-develop relevant technologies and IP in critical areas. With a co-owned IP in areas of strategic importance, not only can India commercialise production locally, but also use its base to become a global supplier and exporter of defence technologies.

A co-development and co-creation led strategy would be attractive to global players at both Government to Government as well as Government to Global Private sector level. A shared research and development programme will distribute the risks among the parties, and if the outcome is breakthrough innovation, the rewards could be significant for all. There are several examples of such a model thriving in this part of the world, such as the UK-Japan co-development programme for air-to-air missiles, UK-Singapore collaboration to co-develop new technologies that will power the future of aircraft propulsion, better counter-terrorism measures and a more efficient military logistics system.

Rolls-Royce: India's Partner in Progress

Rolls-Royce has been India's military partner for nearly nine decades, with over 750 engines of 10 engine types powering aircraft of the Indian military. Our MTU brand of engines power India's indigenously-developed Arjun Main Battle Tanks as well as several Indian Coast Guard and Navy ships.

The company has been an early proponent of 'Make in India'. For the last 60 years, Rolls-Royce engines have been made in India, under license by Hindustan Aeronautics Ltd. (HAL), India's largest defence manufacturer. We have strong joint ventures for manufacturing and work closely with supply chain partners to deliver global quality standards from India. We have also nurtured engineering talent in India to work on global research and development (R&D) programmes.

With a legacy partnership that rests on many years of capability development and co-manufacturing, Rolls-Royce is committed to partnering India's progress. We believe the future will be all about 'Creating in India' in collaboration with willing global players, with India co-owning the Intellectual Property (IP) in areas of strategic importance. This will catapult India's vision to create a strong ecosystem and commercialise production locally, and eventually use this base to boost global supply chain and export capabilities.

Additionally, as India progresses towards 'Atmanirbharta', it must embrace technology at an increasing pace across all spheres of industry and society. Specifically, in the defence sector, the country's aspiration to evolve from a regional power to a global power will need to be coupled with the creation of well-defined initiatives focused on indigenisation and self-reliance, driven by technology at its core.

Rolls-Royce has a strong base of capabilities across technology development to supply chain and manufacturing, built over many years. Add to this our proven commitment to India through successful transfer of whole engine technology. We have also successfully participated in and led international combat engine collaborations in many markets. We believe, therefore, that Rolls-Royce is well positioned as natural partners in India's defence growth and 'Atmanirbhar Bharat' journey.

We believe the time is right for pursuing opportunities in partnership, co-creation and co-production to build a robust local manufacturing sector, which will also contribute significantly to economic growth in the future.


Kishore Jayaraman, President, Rolls-Royce India & South Asia

"Long and trustworthy partner of India"

VAYU Interview with

Pierre Dickeli, CEO, Safran India Pvt Ltd (Part-I)

VAYU : Please update us on Safran's 'Make in India' initiatives and collaborations with the DRDO and BEL.

Safran: Safran has been a long and trustworthy partner of India for more than 60 years in many aeronautical fields of activity such as space propulsion (Vikas engines), helicopter engines, military engines for the Jaguar, Hawk, Mirage 2000 and Rafale, as well as inertial navigation systems and optronics solutions, engines and equipment for civil aircraft. Currently employing more than 600 employees at eight companies and a maintenance training centre in Hyderabad for CFM engines, Safran has continuously expanded its footprint in India and will continue to offer design, production and support services in aerospace and defense space. We are the largest provider in India for turbo-shaft engines for helicopters and has the unique distinction of powering 100% of helicopters manufactured by Hindustan Aeronautics Limited (HAL). India is also the largest installed base worldwide for Safran with more than 1,200 INS (Sigma family) in use and being the reference of India's Armed Forces.

In line with Indian government's 'Make in India' initiative, Safran is building up an Indian supply chain for LEAP engines, through which it has already secured approximately 200 million euros of offset. Our current Indian supply base includes JV SHAe, Godrej & Boyce, Maini, Recaero India, Mach Aero India, SQUAD (JV with AEQUS and A&D), SESI (Safran Engineering Services India). We are also working to figure out giving India access to air, land and sea applications through transfer of technologies that have been conducted with HAL for more than 30 years in various applications such as transfer of production for gyro mechanical navigation systems (ULISS) and Sigma-95N for fighters, AFCS (Automatic Flight Control System) and AHRS (Attitude Heading Reference System) for helicopters or co-development with DRDO/BEL of local inertial navigation systems (Land-INS and Air G3-INS).

HAL LUH (photo: Phil Camp)

We have also started developing a local supply chain in India, through Indian suppliers that have been qualified and integrated in our global supply chain and the creation of production centers such as the HAL/SAFRAN JV based in Bangalore and Hyderabad cluster.

Under the Shakti engine cooperation with HAL, we have provided more that 70% transfer of technology for manufacturing and have set up a helicopter engine MRO JV. Once operational, this would help improve the turnaround time to repair and overhaul military helicopter engines. In addition to this, we have offered to collaborate with DRDO on the development of a military engines for their Indian fighter programmes including transfer of technology.

VAYU : Could you please elaborate on Safran's role in partnering India in achieving self-reliance

Safran: At Safran, we believe achieving self-reliance means dealing with design, development, production as well as support and that is why we are willing to address all these activities, when it comes to working in India.

Harness Final Inspection at Safran facility in Hyderabad, India (Photo: Christophe Viseux/CAPA Pictures/Safran)

The production concerning development of a supply chain in India has already started and we are aiming to develop an MRO shop in India to support the civil engines as well at the appropriate time. The objective is to entail a significant foreign investment, create numerous highly skilled jobs, promote local MSMEs to act as a supplier to MRO shop, while also improving logistics efficiency and overall turnaround time (TAT) of engines availability to the airline operators in India.

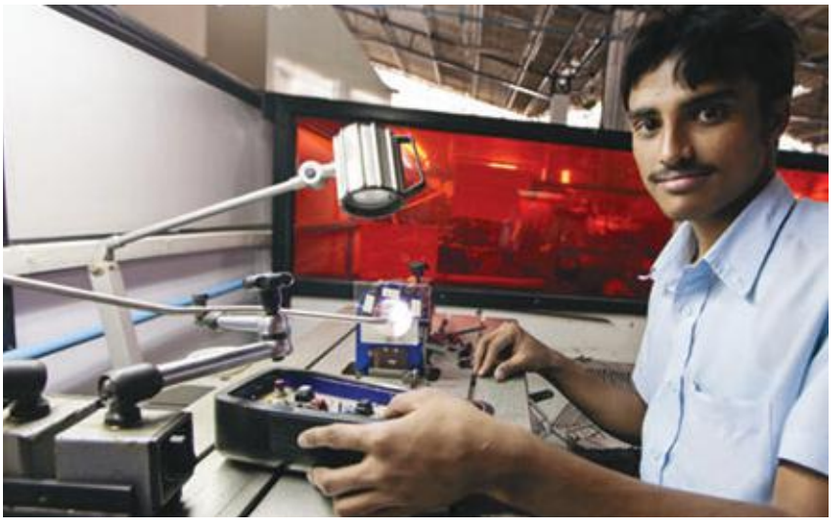
We are already working to achieve design and development through our current activity with HAL on helicopter turbines. Safran's relationship with HAL dates back to early 1960s with the transfer of licence for the Artouste engine to HAL. Since then, the engines for the Dhruv and Cheetal helicopters from HAL have been added to the portfolio. Initiated by HAL and powered with the support of Safran, the two extremely prestigious helicopter programmes: Light Combat Helicopter (LCH) and the Light Utility Helicopter (LUH) are close to entering service in the coming months.

Currently, Safran Helicopter Engines has about 1,700 engines in service within India, of which about 1,500 are flying with the military operators. Jointly with DRDO, we have proposed to build the capability to design, develop, certify and produce engines in India for all the Indian platforms in order to make India sovereign in the strategic domain of military aerospace engine and join the only 3 other countries in the world that have this capability.

Advanced courses in line maintenance and borescope inspection for CFM56 at Training Centre Hyderabad (photo: Atul Sharma/CAPA Pictures/Safran)

Safran Electronics & Defense has strengthen its partnership with HAL on helicopter autopilots providing state-of-the-art development and integration capabilities to replace existing test benches and set up a software workshop to develop and validate control laws necessary for the use of AFCS on ALH Navy, LUH and the LCH.

Safran Electronics & Defense is also completing a ToT of Navigation Complex System with BEL for submarines which will become the reference and indigenous solution for all future Indian submarines programmes.



Joint venture HAL Bangalore. Quality control and Cleanliness Inspection (photo: Ayush Ranka/CAPA pictures/Safran)

We can confidently state that we are in India for the long run and are seeking more local partnerships to build an entire ecosystem and contribute to Prime Minister's 'Aatmanirbhar Abhiyan'

(Interview to be continued tomorrow in our Show Daily Day 2, 4th February)

Rafael at Aero India 2021

Rafael is deeply committed to India and is sending a significant delegation to Aero India 2021. The Company has demonstrated its ability to respond quickly and effectively to emerging needs, without making any quality compromises, as a result of its flexibility, its ability to make swift adjustments, and due to its vast experience in customer requirement analysis and tailor-made solutions.

Among its wide variety of solutions, at Aero India 2021, Rafael is showcasing the following systems and capabilities:

Rafael's air warfare systems are among the best in the world, stand-alone, or in combination, as an integrated suite that acts as part of a net-centric array that once installed on any platform, gives it advanced, 4.5 generation capabilities.

Its airborne missile systems include long range active-radar as well as full-sphere IIR air-to-air missiles for short-to-beyond visual range threats (Derby MkIII & Python-5). Its array of air-to-surface missiles (SPICE 250, 1000 & 2000) includes stand-off weapons and precision-guided ammunition kits for use against high-value ground targets, and ROCKS - a new generation extended stand-off range air to-surface missile designed for pin-point accuracy strike of high-value targets in a GPS-denied arena. Rafael's electro-optic targeting and navigation pod (Litening 5) is the most widely used pod in the world and its unique airborne reconnaissance pod (Reccelite XR) is known for its ability to shorten the sensor-to-shooter cycle. Rafael's airborne communication systems include the BNET SDR for full connectivity on all levels. Rafael also offers an advanced airborne electronic warfare set of solution.

Air Defence: Rafael offers a full range of multi-layered air defence to meet the imperative demand for air superiority and effective defence. Its multi-layered, mixed weapon systems, ensure decisive, efficient responses against all types of airborne threats including aircraft, helicopters, short to long-range missiles, and rockets. Rafael's multi-layered protection systems provide comprehensive protection for armed forces and population centers by delivering victory in the air and full protection on the ground. These solutions include the SPYDER, C-Dome and Drone Dome systems, supported by Sky Spotter, a passive Electro Optical Early Warning System with high probability of detection and very low false alarm rate, complementing the performance of legacy radars. Rafael's Integrated C^4I Air & Missile Defence System (MIC^4AD & Optimiser), provide command and control for the operation of both air and missile defence missions.

SDR Communication: Rafael's BNET SDR is a unique radio and network architecture that enables future digitised warfare by delivering ultra-wideband, low delay, data integrity and availability for reliable information interchange capabilities. BNET allows natural continuation of fighting since all forces are connected as they proceed to their new missions and objectives without the need to push forward relay equipment. All BNET radios share the same architecture and same baseband waveform implementation in different form factors and all radios of land, sea, and air units participate in one scalable MANET network.

Spike – a family of missiles: With sales of well over 34,000 missiles, Spike is in use by 35 nations, including India. Spike is an advanced 5th generation electro-optically-guided missile system family that has accumulated a substantial track record of target engagements including tanks, air defence targets, armoured vehicles, soft vehicles, marine vessels and structural targets. More than 6000 Spike missiles have been fired in training and combat, and more than 45 different platforms have been integrated, including vehicles, helicopters (more than 10 different types) and marine boats.

Also present at the show are two of Rafael's subsidiaries - CONTROP, which specialise in the development and production of Electro-Optical and Precision Motion Control Systems for Defence, Para-Military and Homeland Security (HLS) applications, providing some of the most innovative solutions for surveillance and reconnaissance activities used in the world today.

In addition, Rafael's subsidiary Aeronautics will display its integrated turnkey solutions based on unmanned systems platforms, payloads and communications for defence and civil applications. Designed as leading-edge UAS-based solutions, Aeronautics' systems offer operationally proven solutions for Intelligence, Surveillance and Reconnaissance (ISR) systems requirements.

Rafael Advanced Defense Systems Ltd. designs, develops, manufactures and supplies a wide range of high-tech defence systems for air, land, sea, and space applications for the Israel Defence Forces and the Israeli defense establishment, as well as for customers around the world. Rafael is one of Israel's three largest defence companies, and employs 8000 people and numerous subcontractors and service suppliers, including in the United States.

AERO INDIA 2021
SHOW DAILY
03 February 2021
VAYU Day 1

First LSP LCH in ground run

Coinciding with the 300th ALH rollout, 'Ground Run' of the first Limited Series Production (LSP) Light Combat Helicopter was carried out on 29 September. This project has been taken up by the Company proactively while the order from Services on HAL is in process. The LCH was piloted by Gp Capt (retd) Hari Krishnan Nair S, Chief Test Pilot and Gp Capt (retd) C G Narasimha Prasad, Senior Flight Test Engineer of Flight Operations, Rotary Wing.

HAL's Hawk-i test fires 'Smart Anti Airfield Weapon'

In a major boost to the indigenous Hawk-i programme, on 21 January 2021 HAL successfully test fired a *Smart Anti Airfield Weapon* (SAAW) from the Hawk-i aircraft off the coast of Odisha. The indigenous stand-off weapon developed by the Research Centre Imarat (RCI), DRDO is the first smart weapon fired from an Indian Hawk Mk.132.

"HAL has been focusing on the *Atmanirbhar Bharat* campaign. The Company owned Hawk-i platform is being extensively used for certification of systems and weapons developed indigenously by DRDO and CSIR labs" stated Mr. R. Madhavan, CMD, HAL.

The aircraft flown by HAL test pilots Wg Cdr P. Awasthi (Retd) and Wg Cdr M. Patel (Retd) executed the weapon release in text book manner and all mission objectives were met. The telemetry and tracking systems captured all the mission events confirming the success of the trials.

Mr. Arup Chatterjee, Director, Engineering and R&D, HAL stated, "HAL is indigenously enhancing the training and combat capability of Hawk-i. HAL is in discussions with Indian Armed Forces for integration of various weapons on Hawk platform.

The *Hawk-i* is HAL's internally funded programme offering the Indian Armed Forces an upgrade and combat capability for the Hawk, transforming the Advanced Jet Trainer, providing training on sensors and weapons in peacetime, into a potent combat platform during war-like operations.

The SAAW is an aircraft-launched, advanced, precision strike weapon of 125 kg category used to attack and destroy enemy airfield assets such as radars, bunkers, taxi tracks, runways within a range of 100 kms. The SAAW had earlier been successfully test fired from a Jaguar aircraft.

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Rosoboronexport: 20 years in the global arms market


Il-76MD

The BMP-3 IFV


The Ka-52 gunship


The Yak-130 and MiG-35

4 November 2020 marked the 20th anniversary of Rosoboronexport (part of the Rostec State Corporation). The company was established by decree of the President of the Russian Federation as part of the reform of the country's military-technical cooperation system.

Before 2000, deliveries of Russian arms to the world market were made by Rosvooruzhenie and Promexport as well as by a number of manufacturers. Rosoboronexport was set up as the basis of effective vertical executive power in the field of military-technical cooperation. The company received the right to export the entire range of military products.

"Rosoboronexport has become a leader in the international arms market over the past two decades and achieved strong results in promoting products manufactured by domestic enterprises, including those affiliated to Rostec. Its key financial indicators – the order book and the value of deliveries – have increased fivefold since 2000. Over the years, Rosoboronexport has signed more than 26,000 contracts with partners and delivered over $180 billion worth of products to 122 countries around the world. A high level of competence, attention to trends and customer needs, demonstrated over the years, clearly suggest that the company has good prospects for expanding its footprint and deepening cooperation with partners," stated Sergey Chemezov, CEO of Rostec and Chairman of the Board of Directors of Rosoboronexport.

Russia has consistently ranked second among the arms exporters and military equipment. "Our foreign partners have received products worth over $85 billion for their air forces. Exports of equipment for air defence and ground forces has exceeded $30 billion for each of these services of the armed forces and $28 billion for the navy," stated Alexander Mikheev, Director General of Rosoboronexport and Deputy Chairman of the Russian Engineering Union.

Rosoboronexport pays 'special attention' to industrial partnership projects with foreign customers. The company has a large portfolio of fulfilled projects for licensed production and joint ventures in India, Jordan, Malaysia, Vietnam and several other countries. "Today the world's economies require localisation and are interested in technology transfer and job creation. Therefore, Southeast Asian and North African countries, India, and China have already established their own industrial platforms. Rosoboronexport is ready to work on them and, together with industry and Rostec State Corporation, promote Russian high-tech solutions, develop new products jointly with partners," further stated Alexander Mikheev.

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Tel: +91-80-4255 6909 Fax: +91-80-2521 6541
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Russian Helicopters unveils the upgraded Mi-171Sh

The Russian Helicopters holding company has presented the upgraded Mi-171SH 'Storm' military transport helicopter; the helicopter, featuring enhanced protection and unique strike capabilities, was manufactured at the Ulan-Ude Aviation Plant. Mi-171Sh 'Storm' is equipped with upgraded engines, new rotor system with an improved profile composite main rotor and X-shaped tail rotor, as well as latest version of the President-S on-board aircraft defence system. The armoring effectively protects the crew and the most parts of the helicopter, as well as the troop compartment. Two sliding doors on the sides and a ramp enable ultra-fast troop deployment. In addition, the helicopter comes with improved armament, including 12.7 mm caliber machine guns and modern guided missile weapons with the OPS-24N-1L target sight system, which allows to engage against various ground and air targets.

First Mi-26T2 for 'Ministry of Emergency Situations'

Russian Helicopters and the Russian Ministry of Emergency Situations have agreed on the delivery of the first heavy Mi-26T2 helicopter for the department's needs. The Mi-26T2 is an upgraded version of the Mi-26T heavy transport helicopter. It has modern avionics, enabling operations at any time of the day, in adverse weather conditions and overterrain that lacks landmarks for orientation. The upgrade has also allowed reducing crew to 3 persons.

The helicopter is equipped with modern navigation system and comes with a glass cockpit (digital system for flight instrument displays), systems for inertial navigation, Glonass and Navstar positioning, enhanced ground proximity warning, and energy-absorbing seats for the crew. It is equipped with a digital autopilot, capable of both navigating as well as landing the helicopter. Its enhanced avionics can significantly reduce the workload on pilots, simplify their work, and also reduce the flight preparation time. Compared to the basic version, many processes are automated. At the same time, almost all systems are redundant to increase reliability and safety.

Rafael's SPYDER ADS Family

Short/Medium Range Mobile Air Defence Systems

Spyder SR-I-Derby

At Aero India 2021, Rafael Advanced Defense Systems is exhibiting SPYDER (Surface-To-Air Python & DERBY MkIII).

SPYDER is a quick reaction, low level surface-to-air missile system designed to counter attacks by aircraft, helicopters UAVs and precision guided munitions. The system provides effective protection of valuable assets, as well as first-class defence for forces located in the combat area. It incorporates Rafael's most advanced, proven performance air-to-air missiles - the Derby MKIII active radar (RF) missile and the Python-5, a dual waveband Imaging Infra Red (IIR) missile. The SPYDER family includes the SPYDER-SR (Short Range) and the SPYDER-MR (Medium Range) systems.

It's truck-mounted Missile Firing Units (MFU) are equipped with both IIR and RF missiles. The MFU carries any combination (IIR/RF) of missiles on a rotatable launcher assembly. The system's high mobility allows quick deployment and operational agility. It has 360° day/night, all-weather engagement capability. The system can also engage multiple threats simultaneously. It has Lock-On-Before Launch (LOBL) and Lock-On-After Launch (LOAL) modes of operation. The intercept envelope spans from less than 1km to 15km against targets flying at altitudes between 20m and 9000m.

The truck-mounted Command and Control Unit (CCU) comprises a surveillance radar with advanced ECCM capabilities that can simultaneously track multiple targets. Wireless data link communication enables deployment of the MFU's at a distance from the CCU. The CCU can operate with neighboring SPYDER air defence batteries and share information with higher echelons. This interoperability provides this air defence system with high flexibility in combat situations. SPYDER's highly modular structure also allows easy adaptation to customer platforms and future growth. The system is operational worldwide. With a shared operational approach and technologies, SPYDER-SR and SPYDER-MR can be deployed together for significant advantages.

SPYDER-SR

SPYDER-SR is a combat-proven, quick reaction, low level surface-to-air missile system designed to effectively counter attacks by aircraft, helicopters UAVs stand-off weapons and precision guided munitions. SPYDER-SR provides excellent protection of valuable assets, as well as first-class defense for forces located in the combat area. It provides all-weather, network-centric, self-propelled, multi-launch, short-range air defence. The system enables 360 degree missile launching within 5 seconds of the target being declared hostile by the system. SPYDER-SR features Rafael's advanced proven-performance air-to-air missiles; the i-Derby Active Radar missile and Python-5, a sophisticated dual-waveband Imaging Infra Red (IIR) missile.

SPYDER-MR

SPYDER-MR Medium Range Air Defense Missile System (MRADMS) shares SPYDER-SR's cutting-edge technology. It engages and destroys the same wide spectrum of threats at medium ranges and protects high-value assets (capital areas, air force bases, etc.) as well as maneuvering combat forces.

SPYDER-MR provides all-weather, network-centric, self-propelled, multi-launch, quick-reaction ADS capability and enables 360 degree missile launching within seconds of the target being declared hostile by the system. SPYDER-MR features proven-performance air-to-air missiles - the i-Derby Active Radar missile and Python-5, a sophisticated dual-waveband Imaging Infra Red (IIR) missile. Both missiles are equipped with a booster.

Courtesy: Rafael

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BY INVITATION

Prysmian Group: "A leader in aerospace cable market"

Prysmian Group is the worldwide leader in energy and telecommunication cables, a position achieved through organic growth, innovation, targeted acquisitions, sustainability and integrity. In 2018, the Prysmian Group acquired General Cables, further reinforcing its leadership. With a turnover of $11 billion and a workforce of 30,000 personnel, Prysmian tackles most markets and business units. The Indian market is clearly identified as core strategy of the group, leveraging innovation on cables solutions, nurtured by the teams' diversity, even while respecting strong values that are recognised throughout the country.

The Prysmian Group has been leader in the aerospace cable industry since the 1960s when Fileca France provided first generations cables to the Concorde programme. Today, Prysmian continues to build on that prestigious heritage leveraging knowledge and expertise to provide for civil, military and space applications. Prysmian develops and manufactures cables following EN, US standard and abides with OEM's stringent programmes such as Airbus (ABSxxx) and Boeing (BMSxxx).

Its key current programmes and deliveries include those for the Airbus A300/A350, Dassault Mirage 2000 and Rafale, Sukhoi MC21, Ariane programmes 5 and 6, Comac C919 and ARJ21, Lockheed Martin F-35 as also and military applications for Boeing aircraft types.

The Company's all–cable solutions follow the FAR 25 Compliance for flammability, smoke density and toxicity data, also bringing utmost importance to ArcTracking resistance that evaluates the cables resistance.

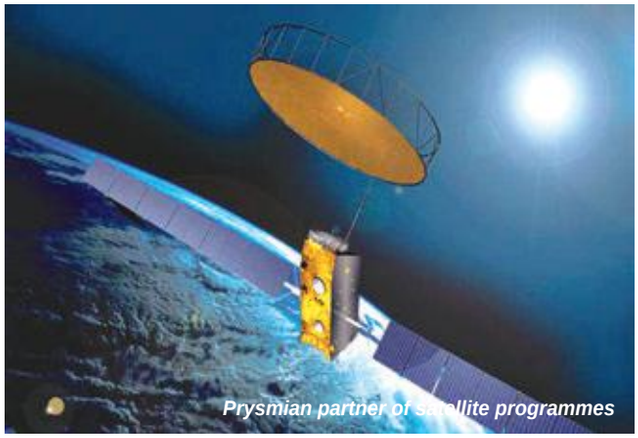
It has production facilities in France and Mexico coupled with an optimised integrated supply chain which allows the company to provide on time delivery and service excellence.

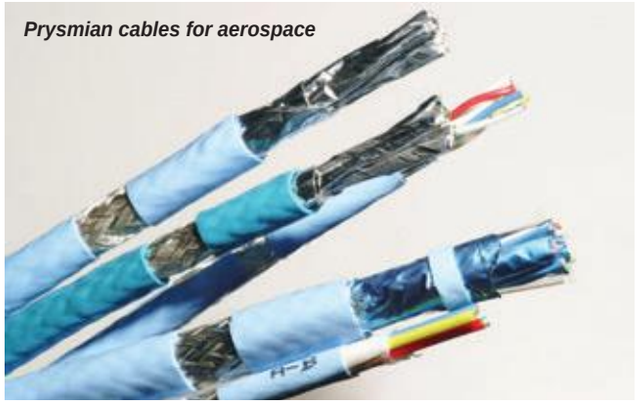
Because of its long-lasting expertise and reactivity recognised by the aerospace key accounts, Prysmian BU Aerospace is involved in most strategic client's processes.

Benoit Lecuyer, CEO Prysmian India: "Prysmian leverages its aerospace cables presence in India, backed by key accounts recognition, fueled by innovation, diversity and values"

Major recent achievements are the Comac qualification to supply the ARJ21 and C919, Ariane 6, sole selection by Latecoere, a major OEM for optical fibres.

Recent innovations and developments include high voltage cables for the futuristic aerospace electric hybrid run, optical fibres such as Lifi, Arian 6 projects, EWISS (aircraft electrical wiring interconnect system) for the COMAC projects, which are also great recognition by clients on Prysmian adaptability.


Prysmian partner of satellite programmes


Prysmian cables for aerospace

Prysmian India is currently selling HVAC, HVDC, cables for submarine, rolling stock, railways, cranes, mining, nuclear, wind, solar, marine, defence, aerospace, O&G, fire survival, accessories, partial discharge measurements, e-mobility etc.

In India, the company is finalising acquisition of one of its JVs Ravin Cables. From March 2021 onwards, its investment plans will strengthen the 'Make in India' initiative and will deliver more cables from India, including LV, MV, FR FS cables, localise some Prysmian R&D and innovation, in addition to Prysmian cables coming from their factories in the EU, Turkey, US and Asia.

"Prysmian innovates constantly, along with its partners"

Boeing's F/A-18 Super Hornet successfully performs ski-jump launch

The ski-jump launch successfully demonstrates the Block III Super Hornet's compatibility with Indian Navy carriers

In December 2020, Boeing and the US Navy "proved that the F/A-18 Super Hornet can operate from a ski jump ramp, demonstrating the aircraft's suitability for India's aircraft carriers." The demonstrations, held at Naval Air Station Patuxent River, MD, showed that the Super Hornet would do well with the Indian Navy's Short Takeoff but Arrested Recovery (STOBAR) system and validate earlier simulation studies by Boeing.

The F/A-18 Block III Super Hornet will offer the Indian Navy value in the form of advanced warfighter technologies at a low acquisition cost and affordable cost per flight hour because of its ease of maintainability design and durability. The Indian Navy stands to benefit from the multi-billion dollar investments made towards new technologies in the Super Hornet by the US Navy and several international customers. This includes advanced network technology, longer range and low-drag with conformal fuel tanks, long-range detection with Infrared Search & Track, enhanced situational awareness with a new Advanced Cockpit System, improved signature reduction and a 10,000+ hour life.

As part of Boeing's proposed "By India, for India" sustainment programme, the Block III Super Hornets can be serviced in partnership with the Indian Navy as well as India and US-based partners throughout the lifecycle of the aircraft. This will further develop advanced expertise in aircraft maintenance in India, resulting in higher availability of the aircraft, at competitive pricing and reduced risk for the Indian Navy.

Boeing is on schedule to deliver next-generation Block III capabilities to the US Navy in 2021 and by 2024, one squadron per carrier air wing will consist of Block III Super Hornets. Making the platform the US Navy's dominant force in the skies, the Super Hornet provides the most weapons at range in the U.S. Navy's fighter inventory, including five times more air-to-ground and twice the air-to-air weapons capacity.

Courtesy: Boeing

Big is Beautiful !

Rolls-Royce runs first engine on world's largest and smartest aerospace testbed

The R-R UltraFan

Rolls-Royce has successfully completed the first engine run on its state-of-the-art Testbed 80, which will be the largest and smartest indoor aerospace testbed in the world when it is officially opened in the coming months.

With an internal area of 7,500m^2, making it larger than a Premiership football pitch, the testbed has conducted its first run on a Rolls-Royce Trent XWB engine at the test facility in Derby, UK. This is a major milestone in the project which has been under construction for almost three years and represents a £90m investment.

Testbed 80 has been designed to test a range of today's engines, including the Trent XWB and the Trent 1000, but will have the capability to test the UltraFan demonstrator, a blueprint for the next generation of even more efficient engines, as well as the hybrid or all-electric flight systems of the future. The versatility of the testbed means it is able to accommodate engines of all sizes up to 155klbf thrust – that's enough power to launch a Boeing 747 with one (huge) engine.

The Testbed 80

The testbed is also home to a powerful x-ray machine that is able to capture 30 images per second and beam them directly to a secure cloud, where engineers around the world can analyse them along with the 10,000 other data parameters we can measure. "We are the only engine manufacturer in the world to x-ray our engines while they are running. This unique test allows us to inspect engines to minute levels of detail and obtain precise levels of data."

Courtesy: Rolls-Royce

Airbus Helicopters H145M: 'The Flying Command Post'

The Airbus H145M is a true multi-role helicopter as, in addition to tactical air transport of six fully equipped special-forces commandos, this light twin-engine helicopter can be deployed for fire support, armed reconnaissance, evacuation of wounded or for hostage rescue. But attention is shifting to ever greater extent to its use as a flying command post. In cooperation with industrial partners, Airbus Helicopters is working to further expand the command, control, communications, computer, collaboration and intelligence (C5I) capabilities of the H145M. Helicopters are able to manoeuvre in low-level airspace in a way that fixed-wing aircraft and UAVs simply cannot – all the while collecting and collating data for distribution to ground-based units on the battlefield.

To exploit these capabilities to the maximum, Airbus Helicopters is working to equip the H145M with jam-resistant Link 16 Variable Message Format (VMF) technology and a Battle Management System (BMS) for enhanced networking. BMS integration has already been successfully demonstrated on numerous occasions. With this connection, the long range and high speed of helicopters compared with ground-based systems represents a particular challenge. A demonstration of digitally aided close air support (DACAS) and digitally aided MEDEVAC with VMF and Link 16 is in preparation.

Courtesy: Airbus Helicopters

Strong presence of Airbus at Aero India 2021

Airbus is showcasing a wide selection of its advanced sustainable aerospace technologies and services Aero India 2021. "Airbus' participation at Aero India is a reaffirmation of our commitment to the rapid modernisation and indigenisation of the Indian aerospace and defence sector," states Rémi Maillard, President and Managing Director, Airbus India & South Asia. "The exhibition is a foremost platform to highlight innovations and technological advancements achieved in this sector, and we are proud to be able to showcase our best products and services to the show."

The display includes Airbus› innovative products along with its customer services and training capabilities. A section is dedicated to highlight the company›s strategic local industrial partnerships focused on developing a sustainable aerospace ecosystem in the country. On display are scale models of the C295 medium transport aircraft digital display of the A330 Multi-Role Tanker Transport (MRTT) aircraft.

As for helicopters, there are scale models of the H225M multi-role helicopter and the AS565MBe Panther, the all-weather, multi-role force multiplier.

A special attraction is the S850 radar on a digital platform, a high-power satellite offering extensive SAR capabilities, including the monitoring of a high number of targets with frequent revisits and enhanced performance in a single pass.

Updates from MBDA

UK orders production of SPEAR mini-cruise missile

MBDA has received a contract valued at £550 million for production of the SPEAR missile system from the UK Ministry of Defence. SPEAR (known in UK service as SPEAR3) is a first-of-class network enabled miniature cruise missile. SPEAR will be the main medium-to-long-range strike weapon of the UK F-35 combat aircraft, enabling them to defeat challenging targets such as mobile long-range air defence systems at over-the-horizon ranges in all weathers and in highly contested environments.

Qualification firing trials of the Sea Venom/ANL

The Sea Venom/ANL anti-ship missile has completed its qualification firings trials, with a successful final firing at the French Armament General Directorate test site at Ile du Levant. Soon to start equipping the Royal Navy's AW159 Wildcat and Marine Nationale's H160M Guépard shipborne helicopters, the Sea Venom/ANL anti-ship missile is a co-operation project developed under the Lancaster House treaty between France and the United Kingdom.

First firing of a Medium-Range Missile (MMP)

MBDA has carried out the first firing of an MMP missile from an ARQUUS Sabre Special Forces vehicle, as part of a firing campaign implemented with the support of the French Army and of the *Direction Générale de l'Armement* (DGA - French Procurement Agency).

The MMP – the first fifth-generation missile to be deployed in combat – has been in service with the French Army for two years. 'Flexible and versatile', it has been battle-tested and deployed in various theatres around the world (desert, tropical, mountainous and Arctic areas).

SYSTEMS FOR TODAY AND TOMORROW

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The advanced design of Nammo's 70 mm Multi-Purpose Penetrator (MPP) system is the result of sustained research and years of expertise.

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SECURING THE FUTURE

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Aeronautics highlights its Orbiter 4

"The most advanced small tactical UAS for ISTAR and maritime missions, with long endurance of up to 24 hours"

Aeronautics Ltd., a leading provider of integrated turnkey solutions, which are based on unmanned systems, payloads and communications for defence, HLS and civil applications.

for defence and HLS applications, is highlighting its Orbiter 4, the 'most advanced Small Tactical UAS available today' for ISTAR and maritime missions.

This lightweight UAV is capable of carrying multiple payloads, enabling ISTAR multitasking. Easy to operate, with a low logistical footprint and small crew of up to three personnel, Orbiter 4 suits all operational needs. Based on an open-architecture, fully-redundant platform, this highly-transportable vehicle-mounted system offers silent flight, making it ideal for covert operations.

The main applications of Orbiter 4 include land and maritime ISTAR, artillery fire management and BDA, target acquisition for precision-guided weapons, communications intelligence (COMINT), electronic intelligence (ELINT), electronic warfare (EW), communications relay, border patrol and reconnaissance, ISR envelope for strategic facilities security, search and rescue, and emergency response.

"Orbiter 4 is the most reliable and advanced platform on the market today," says Matan Perry, Vice President for Marketing & Sales at Aeronautics. "It delivers higher capabilities than other tactical platforms in operation today, with greater endurance, serviceability, operational flexibility and cost-effectiveness. Being part of Rafael Advanced Defense Systems, Aeronautics utilises the technological synergy between the two companies, Rafael brings its advanced air, land and naval defence capabilities and Aeronautics its proven ISTAR technologies for further strengthening Aeronautics status as a leading UAS solutions provider", Matan adds.

As a leading-edge provider in the field of unmanned aerial systems, Aeronautics identifies its customers' operational needs and responds with innovative technological solutions. The Group's broad product portfolio offers combat-proven solutions for Intelligence, Surveillance and Reconnaissance (ISR) missions, with demonstrated excellent performance and operability. Backed by continuous research and development, these systems are built on three decades of technological and operational experience.

Elbit Systems showcase array of capabilities and solutions

Elbit Systems BrightNite

Elbit Systems display at Aero India 2021 includes a range of solutions which are presented at the Company's stand and a variety of capabilities showcased at its Indian partner's stands, among them being munitions, Electronic Warfare (EW), Signal Intelligent (SIGINT), airborne self-protection systems, solutions for rotary and fixed wing aircraft, training and simulation systems as well as communication solutions.

Airborne munitions: The supersonic *Rampage* air-to-ground guided missile, the *Delilah* long-range air-to-ground loitering missile, the GATR laser guided rocket solutions for air-to-ground or ground-to-ground applications, the SLR 70mm 7 tubes helicopter rocket launcher, the LIZARD family of Laser/GPS Guidance Kits general purpose bombs, the MPR 500 multi-purpose rigid penetration and surface attack bomb and Fuses for aerial munitions compatible with modern precision guided bombs such as JDAM, Paveway, LIZARD and hard penetrator warheads.

Airborne self-protection capabilities: The Mini-MUSIC DIRCM system, IR spectral decoy flares, a mini-countermeasure dispenser system and mini-IR decoy flare, the All-in-SMALL EW suite, the UREP Unified Self-Protection Suite for fighter aircraft.

Hermes 900 in service with the Israeli Air Force

Rotary & Fixed Wing Solutions: Brightnite non-gimbaled enhanced vision system for helicopters, Large Area Panoramic HD Airborne Display, Head Mounted Display and Display and Sight Helmet (DASH).

Training & Simulation Mission Management System: Skybreaker networked multi-cockpit aircraft training centre, Special Mission Aircraft Suite.

Communication Solutions, Data-Links and Search and Rescue solutions: E-LynX Mobile Tactical Software Defined Radios, StarLite Data-Links, Elad-10 wideband data-link system, Personal Recovery Device (PRD), PRC-648 Personal Locator Beacon (PLB) series, ELT 648 variant of the PRC-648 PLB, PRC 434/CS Advanced dual mode long-endurance Personal Rescue Beacon (PRC), Mission Airborne Radio & Computer Software Defined Radio (MARC/SDR).

Elbit Systems, Hall C, stand C5.6

Elbit Systems are also at the following stands

HAL at Hall E, Stand E 3.3:
- AES-212
- Head-Up-Display

Alpha Design Technologies (ADTL) Hall C
- Mi-17 smart glass cockpit demonstrator
- Skylark I-LEX
- Sky-Striker loitering munition in Canister
- Full drones portfolio
- AFV solutions
- Rattler GX
- Rattler H
- HattoriX PLDR
- Mini coral
- XACT th 70
- E-LynX Family

Bharat Electronics (BEL) Hall E.3
- Indigenous HMDS/HPS
- CoMPASS payload
- Spectro
- Mini-Music
- J-Music
- All-in-Small

MKU: Enhancing capability with Indigenous Technology

Boltfree Helmets

Instavest

MKU, an Indian defence company, engaged in the manufacture of systems and solutions in the sectors of Personal Armouring, Platform Armouring and Electro-Optics have been showcasing their latest technologies focussed on enhancing capability. Some highlights are their range of night vision and thermal devices, bullet resistant jackets with ILDS for effective weight reduction in body armour and low trauma bolt free helmets.

Night Vision and Thermal Imaging Weapon Sights

MKU has indigenously designed and developed Night Vision Devices based on the latest Generation 3 technology which offers great enhancement in the quality and resolution of these devices, even in very low light conditions. MKU has designed and developed a range of thermal devices based on Uncooled Micro Bolometer technology. These include Thermal Weapon Sights compatible with weapons such as Carbines, INSAS, AK-47 and other assault rifles.

The company has established a State-of-the-Art manufacturing facility in Kanpur which is fully equipped with test equipment for environmental testing as per JSS 55555 and MIL Std 810 along with complete test facility for EO devices and sensors.

Bullet Resistant jackets for enhanced comfort and mobility

MKU's latest line of body armour solutions for bullet resistant jackets is focussed on weight reduction. Besides complying with latest industry standards, there are added features and functionalities in this line up of ballistic vests for survivability, enhanced comfort and mobility.

Insta Load Distribution System (ILDS)

Light weight armour is no more light weight, but is now over 12kg (due to evolving threats) which is what it used to be long ago before the advent of light weight armour. The weight is bound to increase further as threats evolve. MKU is working towards designing solutions that help address this inevitable weight factor. MKU has developed a patented solution ILDS (Insta Load Distribution System) which re- distributes the weight of body armour from the shoulder, resulting in reduced compression of the backbone. This helps the soldier by making him more nimble and mobile and prevents long term back injuries.

Insta Series - Protection and Survivability Vests

MKU has also developed and incorporated survivability features such as the patented, simple to use, quick release system in their vests for soldiers which is essential in critical situations like when uniform catches fire, need of urgent medical care or while wading through water. These vests have been designed for male and females soldiers for Special Forces & Tactical Units, Law Enforcement and Security Agencies

Low Trauma, Bolt Free Helmets

Helmets with bolts are susceptible to lethal injuries due to secondary projectiles when a bullet or fragments hit the bolts. MKU has developed patented Boltfree helmets to address this major concern. With the use of RHT technology and specially designed harness and padding systems, the company has considerably reduced resultant trauma in ballistic helmets. MKU helmets are built using special materials and coatings to overcome these problems besides providing comfort over extended periods of usage.

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Controp launches SPEED-LR for long-range ground observation

Controp Precision Technologies Ltd., a company specialising in the field of electro-optics IR defence and homeland security solutions, has launched its newest long-range ground observation system known as the SPEED-LR, a fully-digital and stabilised multispectral system that represents a new standard in the land surveillance market.

This will significantly increase surveillance capabilities for defence and HLS Forces around the world, particularly when it comes to rapidly detecting and identifying potential threats from increased distances. The new system incorporates many features of its bigger brother, the top-of-the-range SPEED-ER, including cutting-edge sensor technologies for day, night and low visibility surveillance. The expanded SPEED family gives more choice for existing or potential customers and allows them to select a system that meets their requirements and budget.

"This SMART system has multi-tasking capabilities and there is nothing quite like it in the market right now," said Guy Oren, Vice President of International Marketing and Sales at Controp Precision Technologies. "Being part of the renowned SPEED family, our customers can expect a lot of the same great features that are already present on our other SPEED systems, including exceptional multispectral capability," he added.

The SPEED-LR incorporates a high definition (HD) cooled mid-wave infrared sensor and HD day camera, as well as a short-wave infrared camera. The latter sensor allows users to see effectively through obscurants such as mist humidity, fog, dust, or smoke, ensuring that threats are not missed. The new system also incorporates superb line-of-sight stabilisation to ensure a sharp image for operators, at the narrowest field of view even when fully zoomed in.

"We see this as a persistent surveillance tool, where the SPEED-LR will be able to act like a passive radar sensor, scanning the environment and automatically detecting multiple targets," further stated Oren. "We are very proud of the SPEED-LR and the fantastic work that the CONTROP team has done to make this available for our customers, particularly in these challenging times," said Oren.

Controp specialises in the development and production of Electro-Optical Infrared (EO/IR) and precision motion-control systems for surveillance, defence and homeland security. Controp's main product lines include: high-performance stabilised observation payloads used for day/night surveillance on-board UAS, small UAS and aerostats/balloons, helicopters, light aircraft, maritime patrol boats, remote weapon stations and ground vehicles; automatic intruder-detection systems for coastal and border surveillance, port/harbour security, the security of sensitive sites, ground-troop security and anti-drone applications; thermal imaging cameras with high-performance continuous zoom lens and state-of-the-art image enhancement features and more. Controp's products are in daily operational use in many of the most critical surveillance, homeland security and defence programmes worldwide.

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Indigenous Punch

LCA Mk.I (FOC) (SP-21) (Photo: Deb Rana)

13 January 2021 witnessed a landmark moment when the CCS approved procurement of an additional 83 indigenous LCA fighter aircraft.

In late 1983, the Light Combat Aircraft programme was launched as an indigenous effort to develop a fourth generation combat aircraft to meet future requirements of the Indian Air Force. The programme was the responsibility of the newly formed Aeronautical Development Agency (ADA) in collaboration with HAL's Aircraft Research & Design Center (ARDC).

The LCA prototype made its maiden flight when TD 1 (KH2001) piloted by Wg Cdr Rajiv Kothiyal flew from Bangalore on 4 January 2001. The former Prime Minister of India Atal Bihari Vajpayee later named the LCA as *Tejas* (Radiance). A decade later, the LCA (LSP-4) achieved Initial Operating Clearance (IOC), making its maiden flight in June 2010.

Line up of LCA Mk.1 (IOC) at AFS Sular(Photo: Manorama/PTI)

The LCA programme has proceeded apace and currently there are two squadrons of the Tejas in service with the IAF No. 45 Squadron *(Flying Daggers)* at AFS Sulur was declared active on 1 July 2016, while No. 18 Squadron *(Flying Bullets)* got its first Tejas on 27 May 2020.

Of the initial order of 40 LCA, 16 each are of IOC and FOC standard while the rest are twin-seater.

LCA Mk.1 FOC (SP-21) conducted its first flight on 16 March 2020. The most easily observable additional feature of the FOC variant is its air-to-air refueling probe.

The FOC standard has additional fuel carrying capability. While the LCA IOC carries 2350 kg fuel carrying capability of IOC variant with its external drop tanks of 1200 and 800 liters capacity, Tejas FOC has an additional 725 litres center line drop tank with pressure refueling.

The LCA FOC will be equipped with one Derby or Astra BVRAAM as well as ASRAAM or R-73E for close range air combat, and the GSH 23 mm twin barreled cannon will be integral.


LCA AF Mk.2 MWF (photo: Vayu)

LCA Mk. 1A

Tejas Mk. 1A is a further modification of the basic Tejas and will have 43 'improvements' over the current platform. Some of these are:

Open Architecture Mission Systems for seamless net centric operation through software defined radio, 3D , vector , full colour satellite map modes

Active Electron Scanned Array (AESA) radar: Low Probability of Intercept (LPI), the AESA radar provides extended air to air track ranges for launching BVRAAMs even in interleaved modes on multiple targets which can be clearly identified, utilising advanced NCTR mode and integrated Interrogator/Transponder.

There is a new generation AESA-based jamming system with higher effective radiated power (ERP) through directional noise, directed deception and hybridized jamming techniques. According to public reports, some of the initial LCA Mk.1AS will be equipped with the Israeli-origin ELTA 2052 while later models will get the indigenously developed *Uttam*.

Digital Wideband Radar Warning Receiver: Multi-channel digital receivers with instantaneous tracking & identification of emitters in the entire frequency band, deeply integrated with passive modes of AESA radar and AESA jammer

New Generation Helmet Mounted Display System (HMDS): Wide envelope Helmet Mounted Display System with fully integrated air-to-air and air-to-ground modes; enhanced trackers with strap on Inertial sensors provide maintenance free, high accuracy operations.

First flight of the first Tejas Mk.1A is projected around 2023. The Cabinet Committee on Security headed by the Prime Minister approved procurement of 73 LCA Tejas Mk-1A fighter aircraft and 10 LCA Tejas Mk-1 trainer aircraft at the cost of Rs. 45,696 crore along with Design and Development of Infrastructure sanctions worth Rs.1,202 crore.

LCA Mk.2 or MWF (Medium Weight Fighter)

The LCA Mk. 2 is further development of the Mk.1 being an attempt to develop a platform of medium category with advanced features. The former CAS ACM Birender Singh Dhanoa said in 2018, "We're looking at 12 squadrons of the Light Combat Aircraft Mk.2". However, his successor ACM RKS Bhadauria has stated "In the long run, the IAF will have 40+83 Tejas Mk I/IA and around six squadrons of Tejas Mk II. Eventually, we aim to boost our capabilities with the fifth generation plus AMCA (Advanced Medium Combat Aircraft)". According to latest reports 170 Mk.2 version is being considered.

We now examine some features of the Mk.II on how this compares with the LCA Mk. 1A in terms of capability:

Addition of Canards: The most distinctive feature of the LCA Mk.2 is addition of close coupled canards, positioned below the avionics bay cover, just behind the cockpit, above the wing plane and below the avionics bay cover. These are set at a negative dihedral angle, the addition significantly increasing lift produced by the wing and augmenting lift act as air brakes to reduce landing roll, stabilise the wing LE vortices for medium to high angle of attack and to help achieve better area ruling for reduced wave drag.

Longer Fuselage: The Mk.II will have a longer fuselage than the Tejas Mk.1A, length of the fuselage increased to 14.6m. The increased internal volume is to facilitate carrying of additional systems with more internal fuel, this increase range, endurance and enhancing performances.

Leading Edge Root Extension: LERX will have a positive impact on the wing aerodynamics stability.

New AESA: Expected to be equipped with indigenous *Uttam* AESA.

Stealth: To decrease the radar cross section (RCS) several measures have been taken. Carbon composites of the airframe will decrease the RCS as also paint coating with Radar Absorbing Material. The air intake ducts will feature a twisted design so that engine blades are shrouded within the intake duct.

Smart Large Area Display (LAD) and Head Up Display (HUD): The LCA Mk.II will be equipped with upgraded Fly by Wire (FBW) controls with advanced Digital Flight Control Computer (DFCC), indigenous actuators, a Smart Cockpit, Internal Unified Electronic Warfare Suite (UEWS), On Board Oxygen Generated System (OBOGS), Infrared Search and Track (IRST) and Missile Approach Warning System (MAWS).

More composites in the air frame will decrease its weight, with empty weight of 7000 kg, lighter than even the LCA Mk. 1, and able to carry 3300 kg of internal fuel with take-off clean weight of 11000 kg.

The maximum take-off weight will be increased to 17500 kg. Hard points will be increased to 11 thus despite of Self Protection Jammer and Targeting Pod being attached, the Mk.II can carry more weapons than the Mk.1.

The Mk.II will be powered by the GE F414-INS6 engine, with maximum thrust of 98 Kn. Ferry range is increased to 3500 km, a limit of -3.2 to 9 and MAX speed Increased to Mach 1.8. According to reports, ADA will unveil the Mk.II in 2022, the first flight to be conducted by 2023, entry into production by 2025-2026. However according to some other sources, "this is a very ambitious time line."

The AMCA

While the LCA Mk.1, Mk.1A and Mk. 2 (MWF) will bridge the gap needed to replenish much of the retiring fighter aircraft fleet currently in service, the IAF will need a futuristic platform to meet future requirements. Aerospace technology is progressing rapidly and so is nature of the threat. Instead of a specific platform that the IAF in future will face network-based high technology platforms ranging from advanced fourth generation to fifth generation aircraft, stealth unmanned platforms, long range surface to air missiles and future electronic warfare machines. To meet the fifth generation threat, the IAF will also need fifth generation fighters which is where the AMCA is going to play a very important role.

The Advanced Medium Combat Aircraft or AMCA is an indigenous attempt to develop a fifth generation fighter aircraft, the most ambitious indigenous project which will reshape IAF. An initial amount of Rs 90 crore was allocated for the feasibility study, then sanction for the design phase accorded in December 2018 with an allocation of more than Rs 400 crore.

It is reported the unmanned version also will be developed for the future. Five prototypes of AMCA will be developed in a proposed public-private joint venture.

Proposed specifications of AMCA

- Body conformed antennas
- Flushed electro-optical sensors and stealth features
- Maximum Take Off Weight of 25 tonnes
- Internal fuel capability of 6.5 tonnes
- Specially designed detachable fuel tanks compatible with the internal weapons bay
- The internal bay will be able to carry four weapons.
- The non-stealth mode will feature 10 weapon stations.
- Diverterless supersonic intakes
- Advanced active and passive sensors integrated with electronic warfare suite.
- Vehicle Monitoring System (IVHM), Serpentine Air Intake, Infrared Search and Track (IRST) and Missile Approach Warning System (MAWS)
- Mk. 1 version will be equipped with two F-414-INS6 engines with 98 kN thrust, while Mk. 2 will be equipped with indigenous 110 kN engines developed with the help of a foreign collaborator.

Taxi trials of the AMCA are aimed for 2024-25 with the first flight expected to be conducted by 2025-2026, entering into production by 2029. Series production of AMCA Mk.2 version is expected to be by 2035.

According to various reports, ADA are working on three different projects: LCA Mk. II, AMCA and TEDBF for the Indian Navy. All prototypes are reported to be unveiled in 3-4 years and all will be airborne in 7-8 years.

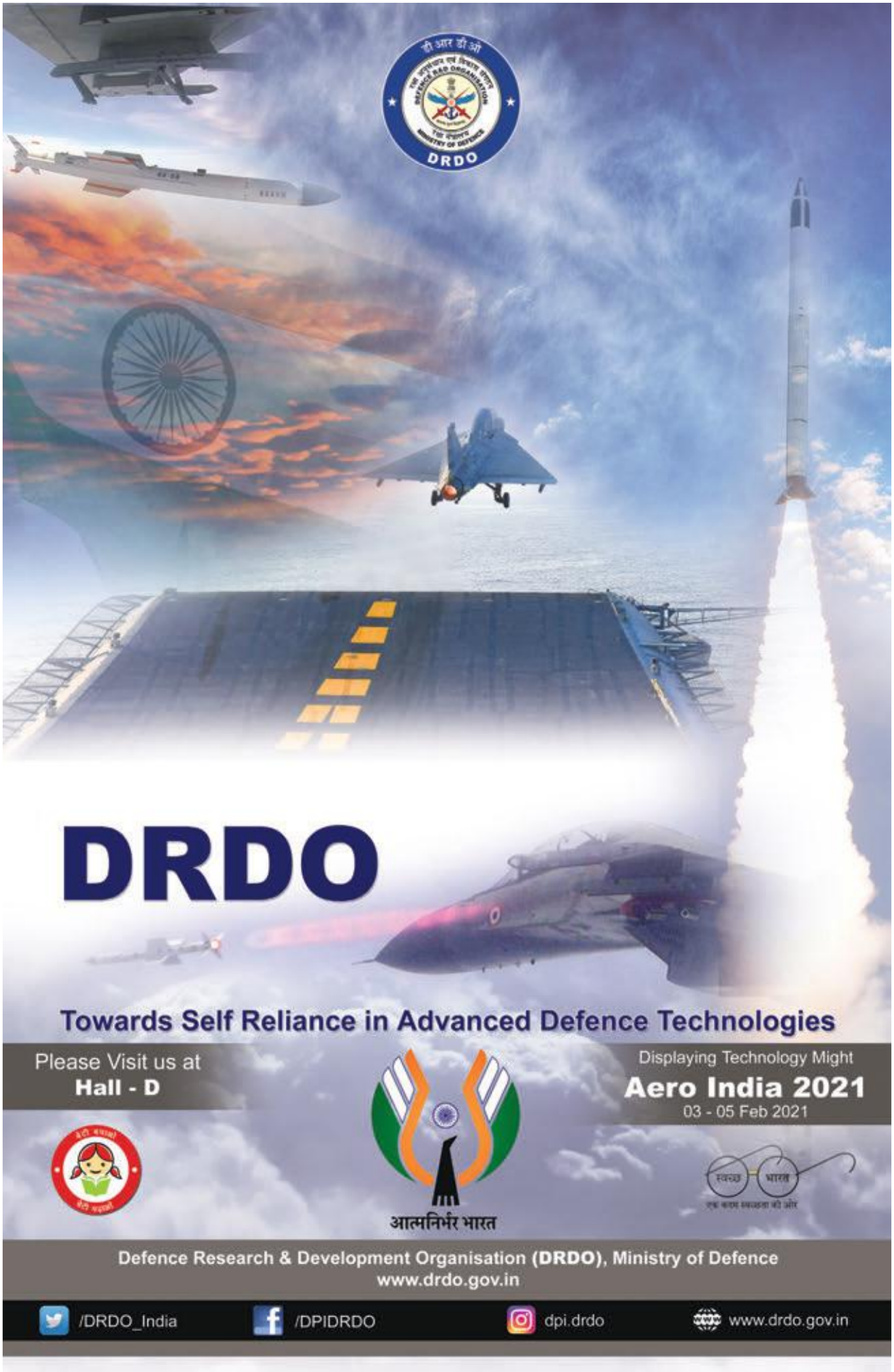
The fourth largest air force in the world sees multiple challenges ahead. It must take necessary steps to maintain the dominance without facing economic strain. Pakistan is no more India's primary concern and the focus must be shifted towards the largest advisory China. To combat the challenges procurement of foreign platforms can give India capability to conduct some crucial missions for some time, but it is only the indigenous platforms which can augment the strength needed for it. IAF to enter fifth generation era very soon.

All the specifications mentioned above are based on reports or articles published till 6 January 2021. Aero India 2021 is likely to unveil some new specifications as well as changes.

AMCA model at Defexpo 2020 (Photo: Vayu)

Sankalan Chattopadhyay
(twitter@vinoddx9)

(Source & Courtesy: LiveFist, DDR & Onmanorama)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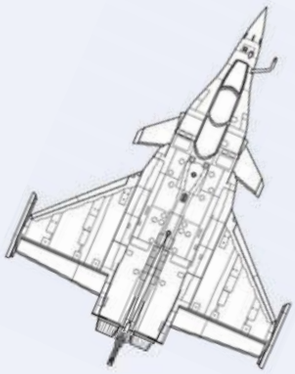
Vayu Aerospace Pvt. Ltd.
E-52, Sujan Singh Park,
New Delhi 110 003 India
Tel: +91 11 24617234
Fax: +91 11 24628615
e-mail: vayuaerospace@lycos.com
e-mail: vayu@vayuaerospace.in

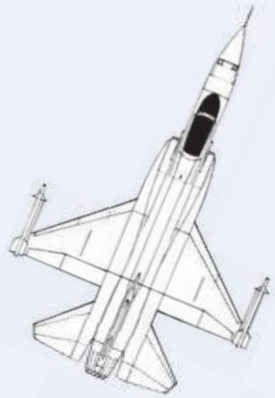
How do they stack up?

Current IAF, PAF and PLAAF combat aircraft types and numbers



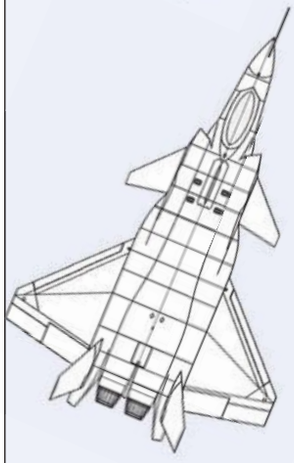
Indian Air Force

Dassault Rafale	11	*
Dassault Mirage 2000	49	
Sukhoi Su-30MKI	264	
Sepecat Jaguar	138	
MiG-21bison/bis	66	
MiG-29UPG	65	
HAL Tejas Mk.1	20	**
Total	**613**	



Pakistan Air Force

Lockheed Martin F-16	68	
CAC/PAC JF-17 Thunder	138	***
Dassault Mirage III	56	
Dassault Mirage 5	69	
Chengdu F-7P/PG	60	
Total	**391**	



Chinese Air Force

Xian H-6	128	
Xian JH-7	69	
Chengdu J-7	390	
Shenyang J-8	100	
Chengdu J-10	435	
Shenyang J-11	346	
Shenyang J-16	200	+
Chengdu J-20	90	+
Sukhoi Su-30	76	
Sukhoi Su-35	24	
Total	**1858**	**+**

* With 25 more on order
** With 103 more on order
*** With 62 more on order

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