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AERO INDIA 2021 SPECIAL

EXCLUSIVE INTERVIEW TO SP'S CHIEF OF THE AIR STAFF AIR CHIEF MARSHAL R.K.S BHADAURIA

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PAST TO PRESENT: IAF'S C-17 GLOBEMASTER III HEAVY LIFT AIRCRAFT MAKING A STEEP CLIMB FROM LEH (ONE OF THE CRUCIAL CONFLICT ZONES) AIRPORT IN LADAKH REGION. IL-76 TRANSPORT AIRCRAFT OF IAF, IN THE BACKGROUND.

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PUBLISHER AND EDITOR-IN-CHIEF
Jayant Baranwal
SENIOR EDITOR
Air Marshal B.K. Pandey (Retd)
DEPUTY MANAGING EDITOR
Neetu Dhulia
SENIOR TECHNICAL GROUP EDITOR
Lt General Naresh Chand (Retd)
PRINCIPAL CORRESPONDENT
Ayushee Chaudhary
CONTRIBUTORS
India: Group Captain A.K. Sachdev (Retd), Group Captain Joseph Noronha (Retd)
Europe: Alan Peaford
USA & Canada: LeRoy Cook
CHAIRMAN & MANAGING DIRECTOR
Jayant Baranwal
PLANNING & BUSINESS DEVELOPMENT
Executive Vice President: Rohit Goel
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DEPUTY MANAGER - CIRCULATION
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GROUP RESEARCH ASSOCIATE
Survi Massey
RESEARCH ASSISTANT
Sarthak Baranwal
DESIGN
Holistic Directions: Jayant Baranwal
Designers: Vimlesh Kumar Yadav, Sonu S. Bisht
GROUP DIRECTOR - SALES & MARKETING
Neetu Dhulia
DEPUTY DIRECTOR - SALES
Rajeev Chugh
SP'S WEBSITES
Sr Web Developer: Shailendra P. Ashish
Web Developer: Ugrashen Vishwakarma

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E-mail: subscribe@spguidepublications.com
subscribe@sps-aviation.com

LETTER TO EDITOR
editor@sps-aviation.com; expert@sps-aviation.com

For Advertising details, contact:
neetu@spguidepublications.com
rajeev.chugh@spguidepublications.com

SP GUIDE PUBLICATIONS PVT LTD
A-133 Arjun Nagar, (Opposite Defence Colony)
New Delhi 110003, India.
Tel: +91 (11) 24644693, 24644763, 24620130
Fax: +91 (11) 24647093
E-mail: info@spguidepublications.com

Representative Office
BENGALURU, INDIA
204, Jal Vayu Vihar, Kalyan Nagar,
Bengaluru 560043, India.
Tel: +91 (80) 23682204

MOSCOW, RUSSIA
LAGUK Co., Ltd., (Yuri Laskin)
Krasnokholmskaya, Nab.
11/15, app. 132, Moscow 115172, Russia.
Tel: +7 (495) 911 2762
Fax: +7 (495) 912 1260

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AERO INDIA 2021 SPECIAL

COVER IMAGE

IAF C-17 GLOBEMASTER III Heavy Lift Aircraft making a steep climb from Leh Airport in Ladakh Region-IL-76 Transport aircraft in the background

(Cover Photo: Abhishek Singh / SP Guide Pubns)

COVER DESIGN BY: *SP's Team*

SPACE

VIEWPOINT

MILITARY

REGULAR DEPARTMENTS

BAOA Awards 2017
SPECIAL CONTRIBUTION TO BUSINESS AVIATION

Aerospace Media Awards — Asia
11th February 2020 – Singapore

NEXT ISSUE: *POST-COVID TRENDS*

Our sincere gratitude to Air Chief Marshal R.K.S. Bhadauria for taking out the time to give some very enlightening and insightful answers, to our inquisitive questions on a diverse range of subjects.

While the world is cancelling a host of leading shows, India has gone ahead with unmatched conviction and is organising Aero India 2021 with not even a fraction of change or an effect out of COVID-19.

This decision of the government to go ahead and host the prestigious biennial Aero India Air Show 2021 at Air Force Station Yelahanka in Bengaluru, is indeed a morale booster particularly for the Indian aerospace industry which is on the cusp of transition as the government in power has launched a major drive to make the nation self reliant through a scheme labelled as "Atmanirbhar Bharat".

The Indian Air Force (IAF) shoulders a major responsibility to guarantee the security of the nation. This was been clearly emphasised by Air Chief Marshal R.K.S. Bhadauria, Chief of the Air Staff (CAS) in an exclusive interview to SP's. This Aero India 2021 Special Issue of *SP's Aviation* carries this interview with the CAS in which he describes in detail the challenges before the nation today as well as in the future as also the responsibilities of the armed forces and the contribution by the Indian aerospace industry to sustain and enhance the operational capability of the IAF.

The government has recently given the go ahead to the Indian aerospace major Hindustan Aeronautics Limited (HAL) to produce 83 light combat aircraft Tejas Mk 1A to equip five combat squadrons in the IAF. Hopefully, the Indian aerospace industry will be able to deliver against this order in time for the IAF to place orders for additional combat platforms. As for the transport fleet, a project has been initiated for HAL to manufacture the Airbus C295 in large numbers. As the C295 will be produced indigenously, it may be worth considering this platform as a replacement in due course, for the An-32 fleet currently service with the IAF. This will be a major boost for domestic production of the C295. This issue of the magazine carries articles examining these aspects in detail.

While the effort at achieving self reliance in the Indian aerospace industry is laudable, the current deficiency in the combat fleet of the IAF which, after the induction of the 36 Rafale jets that is underway, will reduce to eight squadrons or 144 aircraft. To cater for this deficiency, it is necessary to push for the project to procure 114 multi role fighter aircraft (MRFA) initiated by the IAF a few years ago.

The situation in respect of the combat fleet of the IAF is only going to get worse over the next decade as with the retirement from service of the ageing fleets of Jaguar and MiG-21 Bison aircraft, a total of twelve squadrons or 216 aircraft, the IAF will be in serious difficulty. This calls for a major enhancement of the indigenous capability to produce modern fighter aircraft for the IAF. This is important as going by the experience in the recent past, procurement of combat aircraft from abroad is not going to be easy.

All this and more in this Aero India 2021 Special Issue of *SP's Aviation*. Welcome aboard and wish you happy landings! Do visit us at Hall E, Stall No E4.6 at the Aero India Air Show!

JAYANT BARANWAL
PUBLISHER & EDITOR-IN-CHIEF

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ISRO PSLV-C45 SUCCESSFULLY LAUNCHES EMISAT AND 28 CUSTOMER SATELLITES

SPACE'S PRIVATISATION TO LAUNCH EXPANSIVE GROWTH

Opening up the space sector to private companies is likely to allow better availability of resources for ISRO to carry more ambitious space exploration missions

By **AYUSHEE CHAUDHARY**

PHOTOGRAPH: ISRO

THE SPACE SECTOR OF INDIA WAS OPENED UP IN JUNE 2020 by the Union Cabinet led by Prime Minister Narendra Modi, enabling the participation of Indian private sector in the entire gamut of space activities, allowing private firms and startups to build satellites and rockets, besides offering space services to customers in the country and across the world. The government also shifted all operational assets of Indian Space Research Organisation (ISRO) to New Space India Ltd (NSIL), a commercial entity, and formed the Indian National Space Promotion and Authorisation Centre (IN-SPACe) as a regulator to ensure a level-playing field for the private sector.

With the creation of IN-SPACe, the reforms are aimed to pro-

vide a level playing field for private companies and start-ups. Subsequently, several ventures had submitted proposals with IN-SPACe under the Department of Space (DoS). The proposals pertain to a vast range of activities including satellite constellation, small satellite launch vehicles, ground station, geospatial services, propulsion systems and application products.

"The decision to unlock India's potential in the Space sector has heralded a new age of public-private partnership in this sector. This marks a big change that will further strengthen India's foray into the Space sector. Private industry and startups will be co-passengers with ISRO in this age of space research. I am hopeful that the country would soon become the manufacturing hub of space assets. The professionalism and transparency in policies as well as the decision-making process of the government will prove beneficial for the companies joining the Space sector," said Modi in an interaction in December 2020 with key industries, startups and academia from the Space sector via video conferencing to encourage their participation in space activities.

The privatisation of space sector was analysed with mixed reactions but largely garnered a welcome for being the timely transformation that the industry needed. ISRO "wholeheartedly" invited the private sector to participate in the country's new space era through its new nodal agency, IN-SPACe.

"India is among a handful of countries with advanced space technology that can play a significant role in boosting the industrial base of the country," said ISRO chairman K. Sivan during a press conference. According to him, even though it might take some time for the system to be formalised, the new reform will allow India to become a 'global technology powerhouse'. However, he did suggest some policy changes for a smooth functioning and accessibility.

According to him, the new mechanism will provide fair and equitable space for private enterprises. "The role of NSIL is being recalibrated to transform its approach of a supply-driven model to being a demand-driven model for space-based services," Sivan added. An increased private participation in India's space activities shall allow space-based applications and services to be accessible to everyone more widely.

IN-SPACe will have a Chairman, technical experts for space activities, safety expert, experts from academia and industries, legal and strategic experts from other departments, members from the Prime Minister's Office (PMO) and the Ministry of External Affairs (MEA) of Government of India. IN-SPACe will work out a suitable mechanism for promotion & hand holding, sharing of technology and expertise to encourage participation of Non-Government-Private-Entities (NGPEs) in space activities. It will act as an autonomous body, under DoS, as a single window nodal agency for enabling and regulating space activities and usage of ISRO facilities by NGPEs. IN-SPACe will also permit establishment of facilities, within ISRO premises, based on safety norms and feasibility assessment. As far as ISRO is concerned, it will continue to carry out space activities including advanced R&D, interplanetary missions, human spaceflight and capacity building activities.

ISRO has done an exceptional job in conducting the missions that it has all these years, standing at par with any other global space agency but it has done so in limited resources and extremely low financial budgets especially when compared to its counterparts like the global space giant, NASA (National Aeronautics Space Agency). Even NASA is now working with SpaceX and advancing towards commercial space flights. Bringing in the private companies for the missions will expand ISRO's resources because space exploration is not just all fancy, it is a huge financial commitment as well. The private companies providing space-based services shall also help ISRO in catering to the growing demand for space-based applications and services. The need and demand for satellite data, imageries and space technology is now multi-disciplinary, from weather to agriculture, to communication, to development, and more.

Sivan had also stated earlier that there were a few companies that were in the process of developing their own launch vehicles, the rockets like ISRO's PSLV that carry the satellites and other payloads into space, and ISRO would like to help them do that. Right now, all launches from India happen on ISRO rockets, the different versions of PSLV and GSLV. Sivan said ISRO was ready to provide all its facilities to private players whose projects had been approved by IN-SPACe.

> **"The decision to unlock India's potential in the Space sector has heralded a new age of public-private partnership in this sector. This marks a big change that will further strengthen India's foray into the Space sector," said Prime Minister Modi**

This would let ISRO concentrate on science, research and development (R&D), and explore interplanetary missions, human spaceflight and other larger projects like the space station. At present, ISRO is often engaged with various routine activities as well that consumes majority of its resources. So enhancing the private involvement in the space sector is a commercial as well as a strategic gain especially when more and more players from across the globe are entering the space sector.

As Sivan pointed out, the space-based economy is expected to "explode" in the coming years, in India as well as abroad, setting up NSIL and IN-SPACe amid that scenario is a majorly significant and much needed step. Sivan also noted that the space sector reform introduced by the government is going to be a "real game changer" as private sector participation in the space sector has been increasing worldwide and it is a healthy trend, as it increases diversity. In India too space sector start-ups are taking developmental activities in both launch vehicles as well as in satellites, however, there was no mechanism available in the country to extend technology and infrastructure support to them which will now be answered, he added.

ISRO will remain the core space organisation for the country with decision-making authority related to activities, missions and projects. It will focus more on (R&D), exploring new technologies, and planning new space missions. NSIL has come up as an assisting body to the ISRO to facilitate private participation in its programmes while IN-SPACe will work on the mechanism for ISRO's engagement with industries and to meet demands of the private sector in space programmes. SP

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REPLACEMENT OF AVRO BY C295 – PROGRAMME MOVING AHEAD

Finalisation of the long-pending deal for the C295 will bring much-needed relief not only for the IAF and the Indian aerospace industry, but also for the OEM

THE SAGA OF THE EFFORT BY THE INDIAN AIR FORCE (IAF) to replace its ageing fleet of 50 HS-748 Avro twin-turboprop aircraft began nearly eight years ago when on July 24, 2012, a Request for Information (RFI) for 56 transport aircraft was issued. The HS-748 Avro fleet has been in service with the IAF since the early 1960s and is definitely overdue for replacement. As per the RFI, the selected original equipment manufacturer (OEM) was required to supply the first 16 aircraft in fly away condition and manufacture the remaining 40 in India in collaboration with an Indian aerospace company in the private sector selected by them. What is noteworthy is that in this deal valued at $2.4 billion, the public sector company Hindustan Aeronautics Limited has been excluded. Thereafter, in May 2013, a global Request for Proposal (RFP) also referred to as Tender, was issued to which the only response received was from the European aerospace major Airbus Defence and Space with the offer of the EADS CASA C295, a twin-turboprop tactical military transport aircraft manufactured by the company at its facility in Spain. The Indian company to be a partner of the OEM in this project is Tata Advanced Systems Limited (TASL). The case has now been sent to the Cabinet Committee on Security (CCS) for final approval which hopefully will be received before the end of the current financial year.

AIRBUS C295 IN FLIGHT

TASL is a fully owned subsidiary of Tata Sons, that has been involved in the Indian aerospace and defence industry. TASL already has a joint-venture with Sikorsky Aircraft Corporation to manufacture airframes of S-92 helicopters for civil and military markets. Another joint-venture that TASL has entered into is with the American aerospace and defence major Lockheed Martin to manufacture aero structures for the C-130 Hercules transport aircraft and its upgraded variants as also manufacture wings for the F-16 fighter aircraft. TASL has also entered into an agreement to produce structures for the Pilatus PC-12NG aircraft up to 2026. TASL has also joined hands with Boeing to set up Tata Boeing Aerospace Limited (TBAL), a joint venture company that will be the sole manufacturer of the airframes for the AH-64 Apache attack helicopter that Boeing will market globally. Given the impressive and credible record of TASL, the decision by Airbus Defence and Space to select this Indian company to be its partner in the C295 project, appears to be the right one.

The C295 is a multi-role transport aircraft with payload capacity of 9.25 tonnes or 71 troops, With payload limited to six tonnes, the operating range of the aircraft can be extended to 2,000 nautical miles. As per the OEM, a total of 209 C295s have been ordered by 28 countries across the globe. This platform is much smaller in size as compared with the C-17 Globemaster III and the C-130J Super Hercules, both powered by four engines, that are in the inventory of the IAF.

In a critical review of the plan to manufacture just 40 aircraft within the country, it appears that the number is much too small in view of the heavy investment that would be required to create the necessary infrastructure. There could be some relief as the Indian Coast Guard plans to buy six maritime patrol variants of the C295. In addition, the Border Security Force plans to buy four, taking the total number for manufacturing in India to 50. However, there a huge market potential in the possibility of the IAF opting for the C295 to replace the fleet of 104 An-32 aircraft that were inducted beginning in 1985 and should be due for retirement from service in not too distant a future. As the payload capacity of the An-32 is only 7.5 tonnes, the C295 would be the right platform to replace this fleet more so because the C295 would be manufactured within the country.

Finalisation of the long-pending deal for the C295 will definitely bring much-needed relief not only for the IAF and the Indian aerospace industry, but also for the OEM. SP

—By Air Marshal B.K. Pandey (Retd)

PHOTOGRAPH: AIRBUS

PROCUREMENT OF 83 LCA TEJAS MK 1A CLEARED

Clearance of the deal for 83 LCA Tejas Mk 1A will be a major step forward in the ambitious 'Make in India' programme aimed at achieving the national goal of Atmanirbhar Bharat

JANUARY 13, 2021 WILL BE INDEED A RED LETTER DAY IN THE history of the Indian aerospace industry as well for the Indian Air Force (IAF) as it was on this day that a long awaited proposal by the IAF to procure 83 Light Combat Aircraft (LCA) Tejas Mk 1A fighter jets from the Indian aerospace major Hindustan Aeronautics Limited (HAL), was formally cleared by the Cabinet Committee on Security (CCS) chaired by Prime Minister Narendra Modi himself. The deal valued at ₹48,000 crore is the largest indigenous procurement so far in the history of the IAF and the Indian aerospace industry. The combat platform being procured, has been designed, developed and manufactured indigenously and in this particular deal, some major companies in the private sector as also hundreds of SMEs and MSMEs will be involved. It is estimated that over 50,000 new job opportunities will be created in the country through this procurement. This will also be the first procurement under the category "Buy (Indian-Indigenously Designed, Developed and Manufactured)". The platform will initially come with an indigenous content of 50 per cent which will progressively be increased 60 per cent by the end of the programme.

LCA TEJAS MK 1A COMBAT AIRCRAFT IN ACTION

Alongside the deal for 83 LCA Tejas Mk 1A, the CCS has also accorded approval of the project to create the required infrastructure at the airbases where the LCA Tejas Mk 1A squadrons will be deployed as well as at the selected Base Repair Depot (BRD) of the IAF to enable it to carry out periodic servicing at the airbases as well as major repairs at the BRD. This will facilitate the process of maintenance of the fleet as well as help the IAF to ensure enhanced flight-line availability of the aircraft.

The LCA Tejas Mk 1A variant is an improved version of the LCA Tejas Mk 1. The LCA Tejas Mk 1A is a state-of-the-art, modern, fourth-plus generation, single-engine combat aircraft equipped with Active Electronically Scanned Array Radar, Beyond Visual Range Missile, Electronic Warfare Suite and is endowed with Air-to-Air Refuelling capability that will significantly enhance its operational range. Compared to the LCA Mk 1, the Mk 1A has 43 improvements that were projected by the IAF. These improvements have made the LCA Tejas Mk 1A a significantly more potent platform that should meet with the operational requirements of the IAF. The earlier version, is already in service with the IAF, with the second squadron being operationalised by the Air Chief Marshal R.K.S. Bhadauria, Chief of the Air Staff, on May 27, last year. As the IAF was not totally satisfied with the capabilities of the LCA Mk 1, its production was limited to 40 aircraft, just enough to equip two squadrons.

Even though it has taken the aerospace industry nearly four decades to offer a modern combat aircraft to the IAF, it has happened at a time when the IAF needed such a platform urgently. Efforts by the IAF over the last two decades to procure modern combat aircraft to sustain its fighter fleet at the authorised level of 42 squadrons, has been partially successful with the induction of just two squadrons of Rafale jets from Dassault Aviation of France. In the meantime, the strength of the combat fleet has dwindled to 32 squadrons as against the authorised level of 42 squadrons. Induction of 83 LCA Tejas Mk 1A will help the IAF enhance the strength of its combat fleet by five squadrons. The major advantage is that since this platform is being produced by the Indian aerospace industry, the IAF can easily place orders for more of this aircraft or its more advanced version in the future. The IAF thus can now hope to restore the combat fleet to its full potential.

Despite the fact that the deal is only for 83 LCA Tejas Mk 1A combat aircraft, under the prevailing deficiency in the combat fleet, it will still be a major boost for the combat capability of the IAF. In addition, it will help in arresting further fall in the strength of the combat fleet due to the retirement from service of the ageing fleet of MiG-21 Bison followed by the six squadrons of Jaguars. This deal will also be the first major step in the ambitious 'Make in India' programme recently launched by the government to achieve the national goal of Atmanirbhar Bharat. As described by Rajnath Singh, Minister of Defence, induction of the fleet of the LCA Tejas Mk 1A, will indeed be a game changer for the Indian aerospace industry. SP

—By Air Marshal B.K. Pandey (Retd)

PHOTOGRAPH: KARTHIK KUMAR / SP GUIDE PUBNS

IAF CHIEF AIR CHIEF MARSHAL R.K.S. BHADAURIA FLYING THE RECENTLY PROCURED APACHE ATTACK HELICOPTER, FROM US ADDING TEETH TO FLEET

THE INDIAN AIR FORCE IN TRANSITION

In the era of the bi-polar world, as India was close to the Soviet Union, the IAF had a dominating presence of Russian aircraft including fighters, transports and helicopters

By **AIR MARSHAL B.K. PANDEY (RETD)**

IN 1964 THE MIG-21, THE FIRST SUPERSONIC COMBAT JET THAT was procured for the Indian Air Force (IAF), was from the Soviet Union. Since then, the IAF remained heavily dependent the Soviet Union for the supply military aircraft and helicopters. Prior to this, the IAF procured combat jets from Western countries which included the de Havilland Vampire, the Folland Gnat, the Hawker Hunter, the English Electric Canberra – all from Britain, the Ouragan (renamed as Toofani in India) and the Mystere from Dassault Aviation of France. In addition, the IAF received the first Anglo-French combat platform, SEPECAT Jaguar in 1979 and the Dassault Mirage 2000 in the mid 1980s. Except for the Jaguar and the Mirage 2000 that continue to be in service with the IAF today, all other combat platforms listed above have been retired from service. The six squadrons of Jaguar are practically on the last leg and would be retired from service in a decade or so.

In the era of the bi-polar world during which India was closer to the Soviet Union, the IAF soon had a dominating presence of Russian aircraft including fighters, transports and helicopters on its inventory. Apart from the MiG-21 variants, the fighter fleet of the IAF inducted the MiG-23, MiG-25, MiG-27, MiG-29, Su-7 and the Su-30 MKI. Of these the MiG-21 Bison, MiG-29 and the Su-30 MKI continue in service today. The MiG-21 Bison fleet however, is expected to be retired from service in the next five years. That will leave three squadrons of MiG-29 and 15 squadrons for Su-30 MKI in service with the IAF.

With the end of the cold war era and the emergence of a uni-polar world, the IAF felt unshackled from Russia and began to explore other options to build up the strength of the combat

PHOTOGRAPH: IAF

fleet that had dwindled considerably with the retirement of the older fleets acquired from both the West and the Soviet Union. At this point in time, the IAF saw the opportunity to transit from being confined to the traditional source Russia and explore other options available in the world. Unshackled from the traditional source Russia, the IAF initiated a proposal in 2002 to acquire 126 medium multi-role combat aircraft (MMRCA) for which a global tender was issued in August 2007 to all the major aerospace and defence companies across the globe. From among the six combat platforms in the race for the tender, the IAF selected the Rafale, a 4.5 generation combat jet from Dassault Aviation of France. As per the terms of the contract, 18 aircraft were to be supplied in fly away condition by the original equipment manufacturer (OEM) and the remaining 108 would have to be manufactured in India by the Indian aerospace major Hindustan Aeronautics Limited (HAL) in collaboration with the OEM. Unfortunately, the contract negotiations encountered some insurmountable impediments related to warranty by the OEM in respect of the 108 platforms to be manufactured in India. On account of this issue, the project encountered a logjam and was finally cancelled in 2015. This came as a major blow to the effort by the IAF at transition through the acquisition of a modern combat platform from Western sources rather than to remain dependent on Russia alone.

As a stop-gap arrangement, the government arranged direct purchase of 36 Rafale jets from Dassault to equip two squadrons. Delivery of Rafale jets have commenced and it is expected that all 36 aircraft to equip two squadrons should be with the IAF by early next year. This can be regarded a success at transition, albeit minor. Having realised that it would be necessary for India to become self reliant in the aerospace industry to enable the IAF to build up the strength of the combat fleet to the authorised level of 42 squadrons from its present strength of 32, the government is taking appropriate steps to help the Indian aerospace industry deliver. On January 13 this year, the government cleared a proposal for HAL to manufacture 83 light combat aircraft (LCA) Tejas Mk 1A for the IAF. Valued art ₹48,000 crore, this is the largest order for combat aircraft placed on the HAL by the IAF. This indeed has been a major step forward to help the IAF transit to reliance on indigenous production of combat platforms instead of procurement from foreign sources. As per plans of the Indian aerospace industry, the IAF will be assisted in transiting to the LCA Mk II and thereafter to the Advanced Medium Combat Aircraft (AMCA), a fifth generation combat platform that is expected to go into production by 2030.

> As per plans of the Indian aerospace industry, the IAF will be assisted in transiting to the LCA Mk II and thereafter to the Advanced Medium Combat Aircraft

TRANSPORT FLEET

As has been the case with the combat fleet wherein the IAF is beginning to transit from the traditional source of procurement to another, though at a painfully tardy pace, the experience has been somewhat similar with then transport fleet. Ageing fleets of C-47 Dakota, Caribou, C119 Fairchild Packet and the HS-748 Avro, all from Western sources, were replaced by An-12, An-32 and IL-76, all from the Soviet Union. However, with the freedom to look for sources other than Russia, the IAF managed to procure the most reputed platforms from the United States namely the Lockheed Martin C-130 Super Hercules tactical transport aircraft and the Boeing C-17 Globemaster III heavy-lift aircraft. This has been transition for the transport fleet of the IAF in the real sense. A programme is underway to replace the fleet of Avro aircraft with the Airbus C295 to be manufactured in India by HAL.

HELICOPTER FLEET

Like the combat fleet, bulk of the helicopter fleet consisting of the Mi-4, Mi-8 and Mi-17 transport helicopters, the Mi-26 heavy-lift helicopter and the Mi-25 and Mi-35 attack helicopters have all been procured from the Soviet Union/Russia. Of these, only the Mi-17 helicopters are in service in sizeable numbers. The Mi-25 attack helicopters has been retired from service and of the Mi-35 fleet, only a few remain in service. To add muscle to the helicopter fleet, in March 2019, the IAF began to receive the CH-47 Chinook heavy lift platform of which a total of 15 have been ordered. In addition, the IAF has ordered 22 AH-64E(I) Apache attack helicopter that began arriving in September 2019. With both these platforms supplied by Boeing, the helicopter fleet of the IAF is witnessing a real transition in operational capability. SP

ARRIVAL OF THE NEW RAFALE HAS SIGNIFICANTLY AUGMENTED THE COMBAT CAPABILITIES OF THE IAF

PHOTOGRAPH: ABHISHEK SINGH / SP GUIDE PUBNS

EXCLUSIVE INTERVIEW TO SP's

INDIAN AIR FORCE'S LCA TEJAS SOARING HIGH WITH A VIEW OF MOON IN THE BACKGROUND. THE HOME-GROWN PROGRAMME HAS BEEN GIVEN FULL ASSURANCE OF SUPPORT BY CHIEF OF THE AIR STAFF (CAS), AIR CHIEF MARSHAL R.K.S. BHADAURIA.

"OUR CHALLENGE IS TO INCREASE THE SYNERGY AND COHESIVENESS TO ENSURE JOINT OPERATIONS IN TRUE SENSE. AIR POWER WOULD PLAY A VERY SIGNIFICANT AND CRITICAL ROLE."

PHOTOGRAPH: ABHISHEK SINGH / SP GUIDE PUBNS

AIR CHIEF MARSHAL BHADAURIA, CAS, PROCEEDING FOR SORTIE ON HTT-40

In an exclusive interview to **Jayant Baranwal**, Editor-in-Chief, ***SP's Aviation*** on the occasion of Aero India 2021 **Air Chief Marshal R.K.S. Bhadauria**, Chief of the Air Staff, gave some very candid, genuine and insightful responses

***SP's Aviation* (SP's): Rafale's ongoing induction**

(a): How do you feel about Rafale - combination of Beauty and Beast? What kind of capabilities is this bringing to our Air Force?

Chief of the Air Staff (CAS): Without any doubt, the aircraft has provided a significant boost to the IAF's overall combat capability. The onboard avionics, weapon systems, radar and enhanced survivability features makes it one of the most potent fighter platforms in the region. The outstanding weapon carrying capability, in terms of advanced BVRs and precision long range stand-off A-G weapons has provided the IAF the decisive edge over our adversaries.

> "The future battle scenarios would increasingly become more complex and advanced unmanned air systems and optionally manned next generation combat vehicles would increasingly feature in inventories of the air forces"

(b): While we are set to get 36 Rafale inducted by 2022, do you think just two squadrons- even if Rafale indeed remains one of the best fighters in the world and can therefore be interpreted as Omni role- offer some check and control on our fighter squadrons' scenario?

CAS: The IAF is committed to increase its Squadron strength in a pragmatic manner and we are taking concurrent and parallel steps in this direction. Inclusion of a high-tech platform in the form of Rafales, even if in limited numbers, has bolstered our capabilities manifold, because in today's era, quality is more important than quantity. While we would continue our efforts towards increasing the numbers of available

PHOTOGRAPH: IAF

(LEFT) CAS ONBOARD LCH FOR A SORTIE; (RIGHT) AND WITH THE TEST TEAM OF HTT-40 AFTER THE FLIGHT

fighter squadrons, our focus would be towards infusing higher technology and weapons capability in our current platforms and planning next gen technologies in our future platforms.

SP's: Manned versus unmanned

(a): How do you perceive the debate of manned fighter versus unmanned combat system?

CAS: There has been a quantum jump with respect to technology in the last decade in unmanned platforms. While the UAVs are increasingly becoming more potent and lethal, it is presently not possible to programme them for all possible scenarios, especially for conduct of autonomous missions in complex and unknown environment. Therefore, the human in the cockpit would be required till the AI can match human intelligence in a high-end conflict scenario. The future battle scenarios would increasingly become more complex and advanced unmanned air systems and optionally manned next generation combat vehicles would increasingly feature in inventories of the air forces. When our planned UCAVs become a reality, we would need to plan a mix of manned fighters and UCAVs to optimise the force structure.

(b): Even if we traditionally believe that manned fighter will always have an edge over unmanned, can we discard the potent roles of latter? Particularly in view of constantly evolving means and techniques of warfare?

CAS: In the coming years, as the UAV technology matures, so would the manned technology. Technologies, allowing the pilot to control a swarm of UAVs for guiding them towards targets are evolving. Trials are also ongoing for retrieving swarms of small drones into mother-ships. With the advent of optionally manned platforms, the line between manned and unmanned is going to blur further. I think we are about to achieve a breakthrough in not manned or unmanned technology, but in teaming. The manned-unmanned teaming would allow the unmanned platforms to be utilised for high risk missions and operations over contaminated areas, while providing much longer arm to the manned platforms thereby allowing them to operate from depths.

SP's: Combat Helicopters

(a): How do you find the Apaches in terms of meeting the minimum level of expectations of our Air Force?

CAS: Apache is an extremely reliable and a capable platform and has seen multiple combat employments world-wide. AH-64E(I), the India specific version of this advanced multi-role combat helicopter, has met the expectations of Indian Air Force in every sense. Apache readily fits in to our concept of operations and its timely induction has bolstered our overall combat capability substantially.

(b): There have been some arguments as to helicopters can never play a major combat role. How do you perceive this?

CAS: The role of helicopters in active combat has undergone many transformations over the years and I think they will continue to make a difference in the modern battlefield. The heli-lift by IAF's Mi-4 helicopters during Meghna Heli Bridge operation played a major role in liberation of Bangladesh in 1971 war. Similarly, effectiveness of IAF's Mi-25 gunships in Search and Strike role in Jaffna and success of Apaches in Gulf War are a few of the many examples of stellar contribution by helicopters in combat operations. Additionally, with ever increasing threats of sub-conventional warfare, helicopters are the best medium to engage slow moving unmanned platforms. For future operations, with larger numbers of unmanned platforms in battlefield, the roles and utilisation of combat helicopters in my view would only get more diversified and they would continue to play a major role in shaping the battlefield.

> "For future operations, with larger numbers of unmanned platforms in battlefield, the roles and utilisation of combat helicopters in my view would only get more diversified and they would continue to play a major role in shaping the battlefield"

(c): How do you find the progress of Indian programmes such as LCH?

CAS: The LCH received Initial Operational Clearance on August 17 and its performance has been validated through requisite trials including in hot and high altitudes. Currently the MoD is in the final stages of negotiating a con-

PHOTOGRAPHS: IAF

tract with HAL for delivery of the Limited Series Production (LSP) version of the LCH. These helicopters will allow IAF to be closely involved with the development process of the final product and at the same time build operational experience on the platform. The LCH is being developed specifically to suit the requirements of IAF and IA in Indian terrain and climatic conditions and will definitely add significant teeth to our arsenal, we are eagerly looking forward to its induction.

> "Safeguarding our own space assets from any adversary action (covert or overt) will be the key area of focus, towards which having a robust Space Situational Awareness (SSA) setup is an inescapable necessity"

SP's: LCA

(a): How satisfied you are with the LCA the Tejas?

CAS: LCA is a product of indigenous efforts towards building a potent fighter aircraft with contemporary capabilities. "Tejas" is the first advanced Fly-by-Wire fighter aircraft designed, developed and manufactured in India. The aircraft has excellent flying qualities and all pilots who have flown this machine echo this sentiment. The onboard sensors and weapons capability is being progressively improved and it is going to be a potent platform for the IAF for many years to come. IAF is satisfied with the planned enhancements in LCA Mk 1A which will provide us with requisite contemporary combat capability.

(b): Off late, we do believe our Air Force has not been very satisfied with the progress of this programme. What all changes and improvements have been introduced if that's case?

CAS: Like all new inductions, the LCA had its own share of teething problems. However, HAL, ADA and the IAF have worked together to overcome them. We are happy that the FOC configuration has begun to roll out with improved weapons capability, enhanced flight envelope, inflight refuelling capability and advanced features for low speed handling. There are always complexities in any program of this nature and IAF is proactively involved as part of the larger team effort to set up appropriate eco system.

SP's: Future Wars

(a): Which of the three service, according to you, will be the major players in terms of conquering any possible conflicts and concluding the success for the country? Who will dominate the future wars?

CAS: Each service brings a unique set of capabilities to the battle-space. We have to understand that no one service can win the war on its own. Our challenge, as is the challenge for most modern armed forces, is to increase the synergy and cohesiveness to

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THE DEPLETING SQUADRONS OF MIG-21 NEED URGENT REPLACEMENT

DEPLETING NUMBERS — CAUSE FOR CONCERN

India's military planners have then to make crucial assessments and decide on a military air strategy that will allow the IAF to optimally employ the depleted air assets

By GROUP CAPTAIN C.J. WEIR (RETD)

PHOTOGRAPH: SP GUIDE PUBNS

THE INDIAN AIR FORCE (IAF) IS AN INTERNATIONALLY recognised professional fighting arm of India and this recognition has come about from proving itself in wars and bolstered by the several international joint exercises that the IAF has participated in with distinction. The country has invested large sums of money to create a well-oiled combat machine that depends on its dedicated Air Warriors to extract the most from the weapon systems placed at their disposal. The IAF is the only arm that can attack the enemy with pin-point accuracy on land beyond 50 kilometers of the international border. It is also responsible for preventing an adversary from attacking our country from the air as well as on the surface. Examples from history abound where air power has proved to be decisive in the success of a battle. Ignoring air power has also proven to be a

fatal folly. Unfortunately, for various reasons, the strength of the combat aircraft of the IAF has steadily dwindled over the years as suitable replacements have not kept pace with inevitable retirement from service at the end of their total technical life. The regional geo-political situation for India has played out in a manner where armed conflict is on-going in varying degrees of intensity. Several analysts were of the view that a single-front low intensity conflict would be the worst-case scenario in this decade. They have clearly been proved to be wrong, as today, we are faced with the possibility of a two and a half front full-fledged war scenario. In this context, the depleted strength of the combat fleet of the IAF in the current scenario, is indeed a matter of great concern.

THE SITUATION

A well-oiled combat machine, the IAF, has a multi-dimensional air strategy, focused tactical employment and training to ensure that the strategic and tactical objectives can be met with. The scenario that exists in our part of the world is probably unique, in the context of application of air power, as the adversaries are equally equipped and well trained. The classic degrees of air power dominance are so relevant. In the first three to four days of conflict, the IAF can create a hard fought "favorable air situation" and in ten days of war, a situation of air superiority may be achieved. It would be somewhat difficult to achieve air supremacy in a war lasting for 30 days on the Western front. On the central and Eastern fronts, achievement of only a "favorable air situation" is likely to be possible.

The current strength of the combat fleet of the IAF is 32 Squadrons against the sanctioned strength of 42 squadrons. The IAF has to cater to the activation of the Western, Northern and the Eastern front and possibly the Nepalese (north central) front too. The challenges are many, but then that is what superior forces are all about. The intention of the enemy on each of these fronts may be different. Expansionist land grabbing of key strategic areas may be the end state of the enemy in the North and East, whereas destruction of our assets may be the end state of the enemy in the West. India's military planners have then to make these very crucial assessments and decide on a military air strategy that will allow the IAF to optimally employ the depleted air assets.

THE CONSEQUENCES

Firstly, pilot training in squadrons is the bedrock of capability and it is the first to get impacted as the necessary flying hours that are required to attain and then maintain the desired level of flying skills, are not available. In addition, the multi-role aircraft require a pilot to become proficient with a large number of systems and weapons, all of which require more flying hours for training. Secondly, the strategic flexibility would now be impeded as there is a sheer deficit in the number of combat aircraft available on the flight line. The combat aircraft and personnel would have to be rapidly moved and redeployed inter-theatre as crisis situations are bound to develop. This shifting of forces, though possible, causes a loss of precious time. In addition, the varying terrain need armament fuses and aircraft ballistics to be reset which adds to the loss in time of employment. In this lethal environment, battle losses should be expected to be high. Also, with the number of combat aircraft available being low, the capability and air power will continue to reduce as the war progresses. Thirdly, the destructive potential, the hallmark of the capability of the IAF, would receive a set-back as aircraft would be prioritised to stave off a crisis situation on the ground over a very large frontage. This will have a cascading effect as it will increase the vulnerability of the Indian surface forces to enemy air attack. In addition, other surface vital areas and vital points would become more vulnerable. Fourthly, force multipliers such as the Airborne Warning and Control System (AWACS) and aerial tankers would not be able to operate with the required degree of freedom.

SUGGESTED SOLUTIONS

As in most complex situations there are no simple solutions or a magic wand to waving away the problem. The recently accorded sanction by the government for the purchase of 83 light combat aircraft Tejas Mk 1A is a positive step. However, getting just 16 aircraft per year would be woefully inadequate and this must be ramped up. The problem of the depleting aircraft strength can best be solved, to a great extent, if one understands the need to get a multi generation fleet. The time frame is critical as the adversaries are primed and threatening and the government needs to act now. The military situation may spiral out of control and there may be a two-plus-front war in 2021. This is the scenario any solution would need to address. The first step should be to make fly worthy all the aircraft moth-balled in the last three to four years. This would provide an additional 100 aircraft of the MiG-21/Jaguar class. The next step would be an emergency purchase of another 100 MiG-21 of any variant from any source. The capabilities of the MiG-21 are well known as are its limitations. However, it is the only aircraft where the IAF has adequate number of engineers, infrastructure and pilots to be able to very quickly deploy into battle. These third-generation aircraft when deployed for air-to-ground attack tasks, would allow the multi-role aircraft to be used for more important tasks as planned. These aircraft could be used most effectively to prevent enemy ground forces from entering and holding Indian territory specially along the foothills of the Himalayas in the central (Nepal) and Eastern sectors. Pilots who are type qualified, even retired and medically fit volunteers, should be recalled into service and made current by giving them adequate flying. Maintenance facilities for the MiG-21 be revamped, restarted and be tasked to get these aeroplanes battle worthy, all of this in the next four months! It is better to be prepared rather than to be surprised by the enemy.

> The depleting strength of the combat fleet of the IAF is indeed a matter of serious concern for all

CONCLUSION

The depleting strength of the combat fleet of the IAF is indeed a matter of serious concern for all. Couple this to the prevalent situation created by a belligerent and expansionist China and the threat becomes serious which Pakistan will take advantage of. In the next three to four months, if the IAF prepares itself with adequate numbers of combat aircraft, the combined threat from China and Pakistan can be much more effectively dealt with. In the interest of national security, it would be necessary to take decisions swiftly and implement these without delay. SP

BOEING F-15EX IS A LEADING CONTENDER FOR THE MRFA PROGRAMME

URGENCY OF 114 MULTI-ROLE FIGHTER AIRCRAFT

The Government needs to appreciate the urgency of acquiring the 114 combat platforms that the IAF needs and move the plan forward without further delay

By **AIR MARSHAL B.K. PANDEY (RETD)**

IF THERE IS ONE SERIOUS AND AGONISING PROBLEM THAT THE Indian Air Force (IAF) has been battling with over the last two decades, is its inability to maintain the strength of the fleet of combat aircraft at the currently authorised level of 42 squadrons. The impediments to its efforts encountered so far, have proved to be insurmountable. With the sanctioned strength of 18 aircraft per squadron, the total strength of the combat fleet of the IAF would be in the region of 756 aircraft. In the days of the bi-polar world, the majority of combat aircraft the IAF consisted of MiG and Sukhoi fighters procured initially from the Soviet Union and later from Russia. Combat platforms inducted from Western sources were the British Vampires, the Jaguar from the Anglo-French firm SEPECAT, the Ouragan (renamed in India as Toofani) and the Mystere, both from Dassault Aviation of France. Compared to the procurements from the Soviet Union and Russia, numbers procured from Western sources were significantly lower.

PHOTOGRAPH: BOEING

THE LAST MAJOR INDUCTION PROGRAMME

The last major induction of combat aircraft from the traditional source Russia, was the Su-30 MKI air dominance fighter. The exercise to procure the fleet of Su-30 MKI commenced with the signing of a $1.462 billion deal with the Russian firm Sukhoi for 50 of this combat platform that were to be supplied by the original equipment manufacturer (OEM) in fly away condition. Thereafter, over the years, several contracts for this platform were signed with the OEM, totalling to 222 aircraft – all to be manufactured under license by the Indian aerospace major Hindustan Aeronautics Limited (HAL) at their facility in Nasik in the state of Maharashtra. With all these acquisitions, the IAF will finally have a total of 272 Su-30 MKI aircraft, equivalent of 15 squadrons. However, in June 2020, it was decided by the IAF to place an order for 12 more Su-30 MKI aircraft essentially to compensate for losses due to crashes so that the strength of the fleet does not fall below the sanctioned strength of 272. Currently, the Su-30 MKI that is also endowed with the capability to carry nuclear weapons, is the backbone of the combat fleet of the IAF.

ACQUISITION OF 36 RAFALE JETS

As the large part of MiG-21 fleet, that was inducted beginning in the mid 1960s, were becoming obsolescent and would have to be retired from service in the near future, the IAF initiated a case for the procurement of 126 Medium Multi-Role Combat Aircraft (MMRCA) through a global tender floated in August 2007. As per the terms spelt out in the tender, the first 18 aircraft would have to be supplied in fly away condition by the OEM winning the contract. The remaining 108 aircraft would have to be manufactured by the OEM in India in collaboration with an Indian firm selected by them as their partner. From the six combat platforms that joined the competition for the tender, the Rafale jet from Dassault Aviation of France was identified by the IAF as the preferred platform. This induction would have added seven squadrons to the combat fleet significantly boosting the combat potential of the IAF. This contract would also have provided a golden opportunity for growth to the Indian aerospace industry. Regrettably, the eight years of effort proved to be fruitless as the tender encountered insurmountable problems on account of which it failed and was finally cancelled in 2015.

Since the failure of the MMRCA tender, more of the older fleets of combat aircraft have been retired from service on account of which, the strength of the combat fleet has dwindled to 30 squadrons as against the newly authorised level of 42 squadrons, short by 12 squadrons or 216 aircraft. As an emergency stop-gap arrangement, in response to an urgent request by the IAF, the NDA Government headed by Prime Minister Narendra Modi, negotiated a deal for the direct purchase of 36 Rafale jets that would be supplied by the OEM in fly away condition. This would equip just two squadrons as against the seven if the MMRCA tender for 126 aircraft had succeeded.

INDIGENOUS AEROSPACE INDUSTRY

In the intervening years, the Indian aerospace industry has provided the IAF with one squadron of the light combat aircraft (LCA) Tejas Mk 1 and the second squadron is currently in the process of being equipped and is expected to be fully operational in not too distant a future. The total order for the LCA Tejas Mk 1 has been restricted to 40 as the IAF was not quite satisfied with the performance of this platform. The IAF projected the requirement of as many as 43 improvements on the platform which HAL has accepted and has firmed up plans to bring out an improved version designated as the LCA Tejas Mk 1A. On January 13 this year, the Cabinet Committee in Security (CCS) cleared the proposal by the IAF to acquire 83 of this version which will equip five squadrons. However, unless the rate of production of the LCA Tejas Mk 1A is beefed up to 16 aircraft per year as claimed by HAL, the time frame for the availability of the proposed five squadrons to the IAF, will continue to be plagued by uncertainty. The IAF thus will not have the confidence to bank on the proposed five squadrons of the LCA Tejas Mk 1A to help arrest the ever increasing deficiency in its combat fleet.

DEFICIENCY IN THE IAF COMBAT FLEET

With the 36 Rafale jets that are expected to be delivered by the end of this year and two squadrons of LCA Tejas Mk 1, the strength of the combat fleet of the IAF will increase to 34 squadrons – still deficient by eight squadrons. Besides, the six squadrons of MiG-21 Bison and six squadrons of the Jaguar are becoming obsolescent and will have to be retired from service in a decade or so. If there is no further induction by then, the strength of the combat fleet of the IAF will reduce to 22 squadron. This will be disastrous for the IAF especially in view of the escalating tension with China in Ladakh that is likely to worsen in the coming years as also the never-ending conflict with Pakistan. Besides, the nation needs to be adequately prepared for the possibility of a two-front war involving both China and Pakistan.

> The nation needs to be adequately prepared for the possibility of a two-front war involving both China and Pakistan

PROPOSAL FOR ACQUISITION OF 114 MRFA

As the IAF is not really in a position to depend totally on the indigenous industry to provide capable combat aircraft in the numbers needed to build up the strength of the combat fleet to the authorised level and that too in the required time frame, it becomes a critical necessity for the IAF to look for the possibility of procurement of combat platforms from foreign sources that can be delivered in a respectable time frame. In this context, the proposal to procure 114 Multi-Role Fighter Aircraft (MRFA) with at least fourth-plus generation capability in order to regain and maintain its combat edge over the People's Liberation Army Air Force of China and its strategic partner, the Pakistan Air Force, becomes highly significant. To push forward this acquisition plan, the IAF issued a Request for Information (RFI) in 2018 to which response was received from six global aerospace majors offering their platforms namely Boeing F-15EX, Lockheed Martin F-16 Fighting Falcon (renamed as F-21), Dassault Aviation Rafale, Eurofighter Typhoon, Saab Gripen and Russian United Aircraft Corporation's MiG-35. Unfortunately more than two years have passed since the issue of the RFI but there has not been any significant progress in the project after receipt of response from global vendors.

The Government needs to appreciate the urgency of acquiring the 114 combat platforms that the IAF needs and move the plan forward without further delay. SP

THERE ARE PLANS TO INCORPORATE SOME SIXTH-GENERATION TECHNOLOGIES IN THE UNDER DEVELOPMENT FIFTH-GENERATION ADVANCED MULTIROLE COMBAT AIRCRAFT (AMCA)

6TH-GENERATION FIGHTERS: CLOSER THAN YOU THINK!

India's military-industrial establishment needs to get cracking on sixth-generation technologies like optional manning, swarm drones, DEW, hypersonic weapons and ensure that they are effectively built into the AMCA

By JOSEPH NORONHA

IN SEPTEMBER 2020 CAME THE STUNNING NEWS THAT THE United States (US) has secretly designed, built and test flown a prototype sixth-generation fighter jet under the Next-Generation Air Dominance (NGAD) programme. This was an event not expected for years. In fact, the last time an experimental fighter took off in the US was during the shootout for a fifth-generation fighter 20 years ago. That contract eventually was won by Lockheed Martin's F-35 Lightning II. It took over ten years to complete and has become the most expensive American weapons programme ever. Other nations are still struggling to make their own fifth-generation fighters. But this unnamed sixth-generation jet has taken just a couple of years from the time serious work on the project commenced to actual flight.

There are a handful of other sixth-generation programmes in various stages of development around the world. While the European Future Combat Air System (FCAS) is expected to launch the first flight of its New Generation Fighter (NGF) in 2026 the British-led Tempest is expected to be operational by 2035. Both China and Russia are also believed to be working on their own sixth-generation combat planes. What is a sixth-generation fighter? At present the definition is delightfully vague. According to Wikipedia, "A sixth-generation fighter is a conceptualised class of jet fighter aircraft design more advanced than the fifth-generation jet fighters that are currently in service and development."

FIFTH-GENERATION FUNDAMENTALS

So what are the characteristics of fifth-generation jet fighters? The key ones are stealth, sensors, and supercruise. Stealth

PHOTOGRAPH: ADA

technology helps the aircraft to avoid detection by reducing or reflecting radar emissions, infrared, visible light, radio frequency spectrum and audio. The sensor suite includes advanced electronically scanned array (AESA) radar and electro-optical sensors to detect adversaries at long distance. It also includes sensor fusion – merging data from a variety of sensors and presenting it to the pilot as useful information. Supercruise means the fighter can fly supersonic without afterburner, thus significantly conserving fuel and increasing its combat endurance.

GET SET FOR THE SIXTH-GENERATION

Analysts believe that sixth-generation jet fighters are likely to have certain distinct characteristics as under:

- Stealth would continue to dominate. The aircraft may even have an advanced skin to manage heat distribution and to foil detection by radar, infrared and thermal systems thus making it low-observable in multiple spectrums.
- The design would be modular facilitating rapid swapping of components as well as future upgrades.
- It would have extensive Artificial Intelligence (AI) and be optionally manned.
- It would be able to control drone swarms in both defensive and offensive operations.
- It would have impressive electrical power generation capability to facilitate the operation of laser and hypersonic weaponry.
- It would be powered by an advanced engine – probably a variable cycle engine that can configure itself to act like a turbojet at supersonic speeds, while performing like a high-bypass turbofan for efficient cruise at lower speeds. This would be achieved through an adaptive fan that would allow the engine to use a third stream of air to increase or decrease the bypass ratio to the optimum for a particular altitude and speed.

UNITED STATES IN THE LEAD

It is a no brainer that the US which produced the world's first two fifth-generation fighters, the Lockheed Martin F-22 and F-35, should be first off the blocks with a sixth-generation combat jet. However, nothing is known about the prototype or its first flight except that it has happened. The plane's appearance and size, which company developed and whether it was manned or not – are details that remain undisclosed. It is safe to assume that the platform emerged from one of the three leading aerospace majors – Northrop Grumman, Lockheed Martin or Boeing. Both Northrop Grumman and Lockheed Martin have already worked on NGAD fighter projects and earlier images reveal a strong stealth emphasis with virtually no vertical structures. Lockheed's older pictures show a perfectly flat, blended wing-body with no protruding fins.

The new US jet is an early result of a design, development and production philosophy called digital modelling that greatly expedites the entire process. Digital modelling, in a nutshell, means virtually identifying as many potential flaws and limitations as possible prior to choosing the most suitable model and only then building an optimised system. This could eliminate years of repeated prototyping and testing and aims to manufacture a new class of jet fighter in less than five years. If the model succeeds, the US could rapidly build new aircraft using the best technology available and factoring in near-term threats rather than building for unknown threats a couple of decades into the future that might or might not materialise.

The so-called Digital Century Series envisages several small batches of distinct fighter jets with each batch incrementally better than the preceding one. This could tie up adversaries such as Russia and China in vain attempts to keep pace with US technological advances and perhaps even throw them off balance. The US is already way ahead of other nations when it comes to many advanced technologies that go into sixth-generation fighters – like variable cycle engines, laser weaponry, manned-unmanned teaming and AI. In December 2020, the US Air Force tested an AI agent named ARTUμ that controlled and directed radar on a manned reconnaissance plane while carrying out tactical navigation.

The new US jet is an early result of a design, development and production philosophy called digital modelling that greatly expedites the entire process

CHINA AND RUSSIA

China which became only the second nation to operationalise a fifth-generation fighter – the Chengdu J-20 – is reportedly working on a new stealth jet with sixth-generation capabilities such as commanding drone swarms, AI, as well as hypersonic and laser weaponry. It is expected to be operational by 2035.

Russia's fifth-generation Sukhoi Su-57 was declared operational only in December 2020, becoming the fourth aircraft type in the world to attain this status. Its potentially sixth-generation stealth interceptor, the Mikoyan MiG-41, is expected to take to the skies by 2025.

LEAPFROGGING TO THE SIXTH GENERATION

Europe completely missed out on building fifth-generation fighters, but is trying to make up for lost time by determinedly pursuing the sixth-generation platform. France and Germany launched the FCAS programme in July 2017 and Spain joined in 2019. Its main components will be the NGF, a sixth-generation fighter, as well as "remote carrier vehicles" (swarming drones) and cruise missiles. The NGF's key capabilities will include improved stealth, enhanced situational awareness through an advanced avionics and sensor suite and manned-unmanned teaming. It will have greater manoeuvrability, speed and range, thanks to its powerful engines and advanced flight control system.

The Tempest is another tri-national sixth-generation fighter programme, this time featuring the UK, Italy and Sweden. Launched in 2018, the Tempest combat jet is planned to enter service in 2035. Apart from other features, it is likely to include optional manning, directed-energy weapons (DEW) and hypersonic weapons.

India, whose efforts to obtain a fifth-generation fighter have also not borne fruit, now plans to incorporate some sixth-generation technologies in the under development fifth-generation Advanced Multirole Combat Aircraft (AMCA) being developed by Hindustan Aeronautics Limited. Although the target for the AMCA is to enter production in 2030, this looks rather ambitious and seems likely to slip. India's military-industrial establishment needs to get cracking on sixth-generation technologies such as optional manning, swarm drones, DEW, hypersonic weapons and ensure that they are effectively built into the AMCA so that India is not left behind in this high-stakes race for military aviation superiority. SP

INDIA'S INDIGENOUSLY DEVELOPED DRDO'S RUSTOM II

UAVS – A POTENTIAL OPERATIONAL ASSET

Unmanned aircraft technologies have matured well beyond just reconnaissance, security and targeting. Unmanned Aerial Systems are now undertaking a wide range of missions

By AIR MARSHAL ANIL CHOPRA (RETD)

UNMANNED AERIAL VEHICLES (UAV) ARE PLAYING A SIGNIFICANT role in the face-off between India and China in Ladakh. Meanwhile, Pakistan continues to use drones to drop weapons to operatives in India in Punjab as well as in Jammu and Kashmir. World over, drones have been used aggressively for a few decades now. More recently, drones were used to attack Saudi Aramco oil processing facilities at Abqaiq and Khurais, to kill Iranian Major General Wasem Soleimani, to attack insurgents in Mali and in the 'War on Terror' by the United States (US).

UAS TECHNOLOGIES HAVE MATURED

Unmanned aircraft technologies have matured well beyond just reconnaissance, security and targeting. Unmanned Aerial Systems (UAS) are now undertaking a wide range of missions. Solar-powered UAS are already flying. There are dual use (optionally manned) aircraft. The US Air Force has already modified combat aircraft such as the F-4s and F-16s to fly them under remote control. For long, the Russians have been using unmanned MiG-21s as targets. In France, Dassault leads a multi-nation project for delta wing Unmanned Combat Aerial Vehicle (UCAV) 'Neuron' of the size of the Mirage 2000. The United Kingdom has a Strategic UAS programme 'Taranis'. UAS such as the Northrop Grumman X-47B, are taking-off and landing by themselves including on moving aircraft carriers. Autonomous inflight refuelling has been tested. Lockheed Martin's UCLASS drone 'Sea Ghost' looks rather like a stealth bomber and is expected to carry 1,000-pound class weapons. Drones are already delivering supplies to troops deployed on the front lines. Coordinated UAS swarms have been tested by several countries. The UAS vision document of the US Air Force indicates that by the year 2047, every military mission would be unmanned.

UAS MILITARY MISSIONS AND CLASSIFICATION

The UAS could be a fixed-wing aircraft or a rotorcraft. The military missions include 'target' for aerial gunnery, 'decoy' for enemy missiles, reconnaissance, battlefield intelligence gathering, unmanned aerial combat missions, operational logistics and as platforms for defence research and development. UAS are classified based on weight and on range of operations. 'Dull', 'Dirty' and 'Dangerous' missions are normally assigned to them. Dull means long bor-

PHOTOGRAPH: DRDO

ing reconnaissance missions; dirty could mean entering a chemical, nuclear, or radioactivity affected area; dangerous missions involve penetrating contested air space or opening corridors for fighters to surge into or targets requiring long-range precision attacks. UAS are also being used for missions such as electronic attack. The UAS swarm could also act as a multi-strike decoy or jam the enemy defences through sheer numbers. UAS will continue to act as an eye-in-the-sky and also to mark targets for attack by laser weapons and support to direct fires.

Armed UAS or UCAVs such as the General Atomics Predator and Reaper carry air-to-ground missiles and have great combat capabilities

MAJOR UAS MANUFACTURERS

UAS already outnumber manned aircraft in US Armed Forces. During theatre level operations in Afghanistan, UAS flew nearly 2,00,000 hours a year. The US is also the lead manufacturer of large and combat UAVs with Israel a close second. China leads in small civil UAVs. General Atomics, Northrop Grumman, Aviation Industry Corporation of China (AVIC), Israeli Aircraft Industries (IAI) and Elbit Systems are the world's leading manufacturers. China's Chengdu plant makes the Wing Loong series and Guizhou plant makes WZ-2000. IAI's Harpy, Harop, Searcher and Heron are flying world over in large numbers, including in India. Elbit's Hermes 450 is an assault UAS. Miniature UAS are being used for visual and audio snooping operating in small confines like rooms or bunkers. Rotary winged UAS (RUAS) such as Northrop Grumman MQ-8B Fire Scouts are increasing in numbers. The debate between manned vs unmanned need not be a binary one. Offloading some manned tasks to UAS will help aircrew focus on other critical areas requiring human interface.

AI AND DRONE SWARMS

UAV Swarming involves aerial robots flying synchronously with cross-references. Fixed formation group flights and complex group manoeuvres are possible. The swarm of drones behaves and functions somewhat like swarms occurring in nature, e.g. honeybee swarms. Very small drones – some weighing less than five pounds – can cause devastating effect if they are armed with weapons and flown in a swarm of large numbers. Drone swarms can be both remotely operated or fly autonomously or may accompany ground vehicles and other aircraft.

UAS EVOLVING OPERATIONAL ADVANTAGES

Armed UAS or UCAVs such as the General Atomics Predator and Reaper carry air-to-ground missiles and have great combat capabilities. MQ-1 Predator is armed with Hellfire missiles and is being used as a platform for ground attack. UAS like RQ-9 Reaper are being used to patrol and secure borders. Payloads like synthetic aperture radar can penetrate clouds, rain or fog and by day or night. On the other hand, the Northrop Grumman Global Hawk operates virtually autonomously giving live feedback and only needs a command to 'Takeoff and Land'. Advances in technology have enabled more capabilities and Small Unmanned Aircraft Systems (SUAS) are being deployed on the battlefield. UAS roles have thus expanded to include strike missions, suppression and/or destruction of enemy air defence, electronic warfare, network node or communications relay, combat search and rescue, counter-terrorism and combinations of these. Full-fledged air-to-air combat capability, increased autonomy and UAS-specific munitions are part of the roadmap. UCAV is now a "first day of the war" force enabler which complements a strike package by performing the SEAD missions. They operate at a fraction of the total Life Cycle Costs (LCC) of current manned systems.

DRONE COUNTERS

Drone detection requires combination of radar, radio frequency (RF), electro-optical (EO), infrared (IR), and acoustic sensors. Interdiction would be through direct bullet firing, jamming RF and GPS signals, spoofing, lasers, cyber-attacks, physical nets to entangle the target, projectiles, electromagnetic pulse (EMP), camouflage and concealment, water projectors, birds of prey or using another drone for direct hit, and combinations of those. Drone counters could be ground or air-based. Drone swarms too have some weaknesses and limitations. The US is now deploying new radars like the Q-53 system that can detect and identify such small objects and then initiate the kill-chain using laser weapons. Cyber solutions to defeat drones are using multi-spectral sensor systems to detect and then using cyber electromagnetic to either disable the drone or physically take over and divert.

INDIAN UAS CAPABILITY

The Indian Armed Forces operate nearly 150 Israeli Heron and Searcher II. The Heron can operate up to maximum 52 hours duration at up to 35,000 ft. The Searcher is a scaled-up variant of the Scout UAV. UAVs are also operating in insurgency prone Jammu and Kashmir to sanitize the border and in remote regions of Ladakh helping incursion management. The Indian Navy is covering the coastline and into the Indian Ocean. The Indian Air Force (IAF) uses them for target lasing, Battle Damage Assessment in addition to ISR functions. In Naxal prone areas, UAS are tracking possible movements and also directing security forces to the targets. India's National Technical Research Organisation (NTRO) also operates UAVs. The IAI Harpy is a loitering munition, designed to attack radar systems. The IAI Harop (Harpy 2) is an anti-radiation loitering drone that can either operate fully autonomously, using its anti-radar homing system or in a human-in-the-loop mode. The IAF has around 160 and have named them P-4. Purchase of the advanced Heron TP variant is under consideration. Two General Atomics Predator drones have been leased by the Indian Navy in November 2020 from the US for extended surveillance in the Indian Ocean. The Indian Armed Forces are likely to get 30 Predator drones in the near future, ten for each service.

INDIGENOUS UAS AND WAY AHEAD FOR INDIA

India is conscious of Chinese UCAV like the WZ-2000 and Shenyang's 'Dark Sword'. Pakistan has the 'Burraq' (Chinese UCAV design) and 'Shahpar' surveillance UAS. The Indian DRDO's UAS 'Nishant' with endurance of four hours, can take on intelligence and reconnaissance tasks. DRDO is also developing autonomous stealth UCAV for the IAF named 'Ghatak'. It will be similar in design to Northrop Grumman 'B-2 Spirit' flying-wing and capable of releasing missiles and precision bombs. DRDO's 'Rustom' (TAPAS-BH-201) UAS is meant to replace the Israeli 'Heron' in all the three services in the future. A large number of Indian companies showcased small UAVs at the Def Expo 2020 and are getting orders. India has to push ahead in this important operational asset. SP

B-52 STRATOFORTRESS LONG-RANGE STRATEGIC BOMBER

DOES INDIA NEED A STRATEGIC BOMBER?

As bombers are large aircraft, they have large radar cross-section (RCS) and as such, are vulnerable to both airborne and ground based air defence (AD) weapons

By AIR MARSHAL ANIL CHOPRA (RETD)

WITH THE H-6 BOMBER AIRCRAFT OF THE PEOPLE'S LIBERATION Army Air Force (PLAAF) of China positioned in large numbers at Kashgar and also a few at Hotan, not too far from India-China border in Ladakh, it is time to understand the importance and role of strategic bombers. The major world powers have had strategic bombers since World War II. Even today the three largest air forces of the world of the United States (US), Russia and China operate strategic bombers. India, with the fourth largest air force has only fighter-bombers. It is also time to understand the implications of not having strategic bombers as also the need for the to have this aircraft on its inventory.

WHAT IS A STRATEGIC BOMBER?

A strategic bomber is a medium-to-long-range bomber aircraft designed to drop large amounts of air-to-ground weaponry on distant targets for impeding the enemy's capacity to wage war. Unlike tactical bombers, fighter-bombers and attack aircraft that are used in air interdiction operations to attack enemy combatants and military equipment, strategic bombers are designed to fly deep into enemy territory to destroy strategic targets such as major infrastructure, logistic establishments, military installations, factories and cities, as also to undertake nuclear strike missions. During World War II, both sides used bombers to wither enemy's ability to continue fighting. Later American Boeing B-29 Superfortress dropped atomic bombs on Hiroshima and Nagasaki in August 1945. Nuclear strike missions nowadays can also be carried out by fighter-bombers. In case of India, the Su-30 MKI, Mirage 2000, Jaguar and the Rafale, all have strategic nuclear delivery capability.

THE COLD WAR STRATEGIC BOMBERS

During the Cold War, the US and United Kingdom on one side and the Soviet Union on the other, kept strategic bombers ready to takeoff on short notice as part of the deterrent strategy. The

PHOTOGRAPH: USAF

Boeing B-52 Stratofortress bombers were kept in the air round the clock, orbiting some distance away from their fail-safe points near the Soviet border. The British produced three types of "V bombers" for nuclear delivery. The Soviet Union had the Tupolev Tu-4, Tu-16 "Badger" and China had Xian H-6 (a version of the Tupolev Tu-16). France had the Dassault Mirage IV and later the Mirage 2000N and Rafale fighter bombers for nuclear role.

CURRENT AND EVOLVING STRATEGIC BOMBER

The current bombers are the American Rockwell International B-1B Lancer, the Northrop Grumman B-2 Spirit designs incorporate various levels of stealth technology and the Tupolev Tu-160. B-52 (last produced in 1962) and Tupolev Tu-95 remain in service and can also deploy the latest air-launched cruise missiles and other "stand-off" precision weapons such as the JASSM and the JDAM. Some are being upgraded like the Tu-22M bombers. All these are also used for delivering non-nuclear, high explosive weapons, and have taken part in the wars in Iraq and Afghanistan. Typically, Tupolev Tu-160 can carry 45,000 kg of ordnance, and Northrop Grumman B-2 Spirit 23,000 kg. Northrop Grumman B-21 is an under-development stealth bomber. Also 2037 Bomber will be a stealth, supersonic, long-range, heavy-payload strategic bomber. Xian H-20 (20-tonne load) is a Chinese under-development stealth bomber to be ready by 2025. The Tupolev PAK DA is the Russian next-generation stealth strategic bomber.

THE CHINESE XIAN H-6 BOMBER

The Xian H-6 is a license-built version of the Soviet Tupolev Tu-16 twin-engine jet bomber that first flew in 1959. At least around 180 were built and China is estimated to currently operate around 120. Among the many variants, the H-6A is the nuclear bomber, H-6B the reconnaissance variant, H-6C conventional bomber, H-6E nuclear bomber with improved countermeasures and the H-6D anti-ship missile carrier. The H-6G acts as a director for ground-launched cruise missiles. The H-6H and H-6M carry land-attack cruise missiles and the H-6N can undertake aerial refuelling. The latest, H-6K, entered service in 2009. It has a glass cockpit and claimed combat radius of 3,500 kilometres. The six under-wing hard-points can carry YJ-12 ALCMs cruise missiles or the nuclear missiles. China also reportedly tested a roughly 20 ft long, 10-tonne bomb analogous of the American "Mother of all Bombs" carried by an H-6K.

INDIAN BOMBERS

India operated three squadrons of vintage American heavy bomber B-24 liberators till 1968, which were left behind by the British. The English Electric Canberra variants were inducted in 1957, and were the backbone of the Indian Air Force (IAF) for bombing raids and photo-reconnaissance for several decades. The fleet was retired in May 2007 after rendering 50 years of service. For some reason, the IAF never chose to replace its bomber fleet and preferred to induct fighter-bombers instead.

BOMBER STRENGTHS AND VULNERABILITIES

As bombers are large aircraft, they have large radar cross-section (RCS) and as such, are vulnerable to both airborne and ground based air defence (AD) weapons. They are also expensive to acquire and maintain. They have to be operated from airbases located in depth, but they are endowed with longer range capability. Of course they can carry electronic warfare equipment to support deep penetration missions. A bomber can carry large armaments including cruise missiles and as such is a great weapon platform. Presence of bombers can also exert psychological pressure on the enemy, but shooting down of even a single bomber would seriously dent morale of the side affected. Three or four modern fighter aircraft could do the job of a bomber and perhaps more efficiently.

DOES INDIA NEED A BOMBER?

The IAF was deliberately not used in offensive role in 1962 war with China reportedly because PLAAF had the Il-28 bombers that could attack Indian cities such as Kolkata and Guwahati. This had a psychological impact on the leadership of that time. Against Pakistan, India has used even the An-12 in bombing role and one squadron of the An-32 also has been assigned the bombing role. Does this indicate that the IAF misses a bomber?

A significant part of China is out of range of Indian fighter bombers. Aerial refuelling is not possible in enemy territory. Chinese bombers can reach much deeper inside India. The three major powers continue to develop future bombers. China will have a stealth bomber in near future. Larger bombers have greater real-estate onboard and will have greater power resource for both electronic warfare and to deploy directed energy weapons. A bomber can help India take the war deeper into enemy territory. Can India's fighter-bombers, surface-to-surface missiles and cruise missiles stand-in for bombers, remains a moot question. If it was so true then the major powers need not develop bombers. Also, both India and China are large countries, therefore it may be of interest for India to have a bomber of its own. The bombers will carry a large complement of cruise missiles, both for land attack and anti-shipping roles. They will be a great asset for dominance of the Indian Ocean Region. One can expect India and China to maintain adversarial relations for some time to come. China will continue to use surplus resources to befriend India's neighbours. A strategic bomber would be significant deterrent.

As the American bombers are likely to be very expensive, India could join hands with Japan or some other country to develop bombers indigenously

OPTIONS FOR INDIA

If India has to become a significant power in the long run, it must develop bombers. Bomber as a platform can combine more roles. The future is in Directed Energy Weapons (DEW). A bomber class aircraft will have greater potential. A bomber could also become a platform for launching small satellites. Currently the IAF is down to 32 fighter squadrons. With current defence budgets, it could take nearly two decades and heavy investments restore the strength of the combat aircraft fleet to the authorised level of 42 squadrons. India would also need funds for the fifth-generation fighters. Modern bombers are costly to acquire and maintain, yet major powers see the investment as important. As the American bombers are likely to be very expensive, India could join hands with Japan or some other country to develop bombers indigenously. India will have to consider acquiring some strategic bombing assets, at least 20 of them in the long run. SP

BOOSTING THE INDIAN DEFENCE ECOSYSTEM

With the focus on F/A-18 Block III, F-15EX fighter solutions, the P-8I deliveries and Apache manufacturing, Boeing highlights advancements with the Indian Armed forces

By **AYUSHEE CHAUDHARY**

SALIL GUPTE, PRESIDENT, BOEING INDIA, VICE PRESIDENT, BOEING INTERNATIONAL

SURENDRA AHUJA, MANAGING DIRECTOR, BOEING DEFENCE INDIA

MICHAEL KOCH, VICE PRESIDENT, BOEING DEFENCE, SPACE & SECURITY, INDIA

ANKUR KANAGLEKAR, DIRECTOR, INDIA FIGHTERS LEAD, BOEING DEFENSE, SPACE & SECURITY

REITERATING ITS COMMITMENT TOWARDS NOT JUST 'MAKE IN India' For India but also Make In India For the World, ahead of Aero India 2021, Boeing underlined the growth it expects for the aerospace and defence industry in India.

One highlight in the India's defence ecosystem is the F/A-18 Block III Super Hornet being offered to the India Navy. Stated to be one of the most advanced multirole frontline fighter of the US Navy, the aircraft recently accomplished a successful launch from the ski-jump ramp at Naval Air Station Patuxent River, Maryland which is a significant validation to demonstrate the Super Hornet's suitability for the Indian aircraft carrier. "Unlike the US Navy, the Indian Navy uses Short Takeoff but Arrested Recovery (STOBAR) system and it was important to prove that the Super Hornet is compatible for this," stated Ankur Kanaglekar, Head India Fighters Sales, Boeing Defence, Space and Security.

The Block III variant is expected to provide several unique advantages to the Indian Navy. Being offered as two carrier compatible variants, it will allow the Indian Navy to execute missions from the carrier that benefits from having a second crew. The Super Hornet would also act as a lynchpin of the naval aviation collaboration between the US Navy and the Indian Navy that will improve interoperability between the two navies. It will also interface with P-8I aircraft and other assets of US origin to act as a force multiplier for the Indian Navy.

"We are offering the Super Hornet in a two-seater, i.e. F variant and a single-seater i.e. E variant, both of which are carrier compatible which will allow the Indian Navy to execute mission from the carrier that benefits from having a second crew. Most importantly the Indian Navy would be able to integrate technology related man-unmanned interface with two-seater Super Hornet on its aircraft carrier. The two-seater variant is also additionally a trainer that will ensure Indian Navy's assets are never under-utilised," added Kanaglekar.

Boeing has also received approval from the US government to offer F-15EX fighter to the Indian Air Force (IAF). F-15EX is said to be the latest and most advanced version of the combat-proven, multi-role, all-weather day/night F-15 aircraft family. Boeing believes that the F-15EX can offer a future-ready, multi-role solution to the Indian Air Force in the form of unmatched payload, performance, and persistence by integrating leading edge technologies, networks, and weapons and sensors. Proposals to procure over a hundred fighters are being evaluated

PHOTOGRAPHS: BOEING

by the IAF. Boeing is looking forward to working closely with IAF. The F-15EX for India would be coming in single and two seater aircraft configuration, featuring an advanced cockpit system with AESA radar, fly by wire flight control and the capability to carry up to 22 missiles which is, "more weapons than any other fighter in its class". The upgraded cockpit also offers a 10W profile head up display, 10x19 large area display areas and the digital joint helmet mounted cueing system that "allows faster digital processing and comes with night vision aids that makes way for some game-changing situational awareness".

In July 2020, the US Air Force (USAF) awarded Boeing an indefinite-delivery/ indefinite-quantity contract with a ceiling value of nearly $23 billion. The contract includes option for up to 200 jets, with the USAF projecting to buy at least 144 F-15EX aircraft.The F-15EX for the US Air Force is progressing toward delivery of the first two jets before the end of March. The F-15 has been a legacy platform for the past 4 decades.
The F-15EX is a future-ready, multi-role solution in the form of unmatched payload, performance, and persistence by integrating leading edge technologies, networks, weapons and sensors and is expected to be relevant and contemporary for the next 30-40 years.

To ensure mission readiness, "we are also in the process of delivering three P-8I Long Range Maritime Patrol Aircraft to the Navy this year. The Indian Navy is utilising the P-8Is at a higher rate than the US Navy. Since induction, the Indian Navy has surpassed 29,000 flying hours already and the interim support agreement significantly increasing the aircraft availability," said Surendra Ahuja, Managing Director, Boeing Defence India. India is the largest and first international customer for P-8I aircraft.

The Indian Navy had already received the Acceptance of Necessity (AoN) from the Defence Ministry in 2019 to procure six additional P-8Is and discussions are on with the US government. India has the second highest fleet of the aircraft globally. Further, a 60,000 sq. ft. Training Support and Data Handling Centre is being set up at INS Rajali, Arakkonam (the base for P8-I fleet), with a secondary centre at Naval Institute of Aeronautical Technology (NIAT), Kochi.

Apart from these, Michael Koch, Vice President, Boeing Defence, Space & Security, India, also informed that six AH-64 Apache attack helicopters for the Indian Army will start manufacturing in India this year at the Tata Boeing Aerospace Limited facility in Hyderabad which is Boeing's joint venture with Tata Advanced Systems Limited. Initially, a contract for twenty-two AH-64 Apaches from Boeing was signed for the IAF and later the optional clause was exercised for six more for the Indian Army, with the deal being signed early last year.

Boeing completed the deliveries of all 22 AH-64E Apache helicopters to the Indian Air Force in 2020 and India and the US signed the contract for the acquisition of six Apaches for the Indian Army the same year.

The facility has been producing aero-structures for Boeing's AH-64 Apache helicopter, including fuselages, secondary structures, and vertical spar boxes for international customers. The six Apaches for the Indian Army will be built at the state-of-the-art TBAL manufacturing facility right here in India.

Koch also highlighted KC-46 as the tanker for the future being "right-sized and purpose built". "The KC-46 can operate from more than 100 additional airports in India than the competing products. It is not oversized but right-sized, comes with an international design, less maintenance, less fuel burn, is smaller in size but has more capacity," he added.

Boeing also announced the launch of Boeing India Repair Development and Sustainment (BIRDS) hub initiative to integrate India services strategy. While sharing its 2021 growth strategy for the Indian market, Boeing noted that it will feature advanced defence and commercial capabilities at Aero India 2021. The BIRDS hub initiative envisions a competitive MRO ecosystem for engineering, maintenance, skilling, repair and sustainment services of defence and commercial aircraft in India, as part of its commitment to supporting and strengthening indigenous aerospace and defence capabilities in the country. The initiative will also focus on skill development programmes that will help suppliers develop capabilities and gain experience across Boeing platforms.

BOEING F-15EX FIGHTER AIRCRAFT

"India's aerospace industry is persevering through the global pandemic, which has brought significant challenges. The nation's fundamental growth drivers remain resilient and robust, making India an attractive business destination globally, and Boeing is committed to the advancement of India's aerospace industry," said Salil Gupte, President, Boeing India.

Boeing plans to hold discussions with customers and industry partners about its range of capabilities in multi-role fighter aircraft, vertical lift platforms, aerial multi-role tankers, unmanned systems and commercial platforms, in addition to technologies, services, world-class sustainment and training capabilities at the exhibition. Boeing's exhibit, themed "Building The Future Together", aims to focus on its partnerships with India's armed forces and highlight the strategic investments the company has made to develop India's indigenous aerospace and defence ecosystem. At the exhibit, Boeing will feature a range of advanced capabilities including the F/A-18 Block III Super Hornet, F-15EX, KC-46A, AH-64E Apache, P-8I, Chinook, 737-10 and 787-9. SP

DESERT KNIGHT 2021 CONCLUDED

PHOTOGRAPHS: ABHISHEK SINGH / SP GUIDE PUBNS, IAF / TWITTER

(TOP) IAF'S NEW RAFALE APPROACHING JODHPUR AIRFIELD AFTER A PRACTICE MISSION;
(ABOVE LEFT) AIR CHIEF MARSHAL R.K.S. BHADAURIA WITH FRENCH AMBASSADOR DURING THE EXERCISE;
(ABOVE RIGHT) AIR CHIEF MARSHAL BHADAURIA DURING HIS INTERACTIONS AT JODHPUR STATION.

THE INDIAN AIR FORCE AND FRENCH AIR AND SPACE FORCE participated in Exercise Desert Knight 2021 at Air Force Station Jodhpur. A first of its kind bilateral exercise (Ex DK-21), Rafale aircraft from both sides along with Su-30 MKI and Mirage 2000 aircraft of the IAF undertook complex missions including Large Force Engagements. Combat enablers included AWACS, AEW&C aircraft of the IAF as well as A400M and A330 based MRTT (Multi Role Tanker and Transport) aircraft of the FASF. Both Air Forces exercised in realistic settings with an aim to enhance operational capabilities and interoperability. The exercise provided an opportunity to share best practices and evolve operational concepts; particularly for effective combat employment of the Rafale fleet.

Chief of Defence Staff, General Bipin Rawat visited Air Force Station Jodhpur on January 21, 2021 and interacted with participating forces. He also flew on-board the MRTT along with Major General Laurent Lherbette, the FASF contingent leader where he was given an overview on conduct of the exercise and witnessed air-to-air refuelling operations by IAF & FASF fighters.

On January 23, 2021, Chief of the Air Staff, Air Chief Marshal R.K.S. Bhadauria visited Air Force Station Jodhpur along with the Ambassador of France to India, H.E. Emmanuel Lenain. The Distinguished Visitors were received by Air Marshal S.K. Ghotia AOC-in-C South-Western Air Command. CAS interacted with members of IAF and FASF contingents. He expressed his appreciation on the complexity of operations conducted and interoperability achieved by participants within a short span of four days. He also commended the planning, operational and maintenance staff from both sides for smooth and safe conduct of the exercise. CAS wished the FASF contingent the very best for the next phase of their Skyros deployment. SP

(TOP) AIR CHIEF MARSHAL R.K.S. BHADAURIA WITH THE INDIAN AIR FORCE AND FRENCH CONTINGENTS;
(ABOVE LEFT) FRENCH A400M DURING DESERT KNIGHT EXERCISE 2021;
(ABOVE RIGHT) INDIAN AIR FORCE'S RAFALE LANDING.



IAI IS OFFERING A MULTI-MISSION TANKER TRANSPORT (MMTT) BASED ON A B767-300ER COMMERCIAL AIRCRAFT TO THE INDIAN AIR FORCE

MORE OPTIONS FOR FLIGHT REFUELING AIRCRAFT FOR THE IAF

THE INDIAN AIR FORCE (IAF) HAS SET A GOAL TO REPLACE ITS aging aerial refueling assets with at least six FRA tankers. This is the third time the IAF plans to convert this fleet, which operates six IL-78M FRA operated by IAF's No 78 Mid Air Refueling Squadron (MARS) since 2003.

The IAF has long felt the need to add more FRAs to meet the operational requirements. Since 2006 Request for Proposals (RFP) have been floated on two different occasions and canceled due to their high cost. In a Request For Information (RFI) released in 2018, the IAF expressed interest in acquiring new FRAs, indicating their preference of using twin-engine aircraft and optional use of pre-owned aircraft as cost-cutting measures. The IAF expects that using such aircraft will provide a life span of at least forty (40) years.

IAI addresses the RFI's pre-owned category, offering an FRA based on a B767-300ER commercial aircraft converted into FRA.

Like the current MARS, the aircraft IAI is likely to offer will have three refueling points utilising two under-wing refueling pods and a centerline host drum unit (HDU). In this configuration, each FRA can refuel up to three aircraft simultaneously. These aircraft also have an option to use a single boom unit, supporting aircraft which are equipped with refueling receptacles (the standard aerial refueling method for the US Air Force).

IAI offers its own refueling system which was developed by the company in the last decade and now used on several platforms, including the Colombian Air Force 767-2J6ER Jupiter. The Colombian tanker has been successfully deployed to several Red Flag exercises in the USA. It performed probe refueling effectively for F-18 aircraft of the Canadian Air Force and the US Navy and Kfir C10 of the Colombian Air Force.

IAI claims that the costs will be much lower than an alternative based on a 'green' (new) aircraft with similar performance and operational capabilities.

IAI draws on its experience in air-to-air refueling and cargo conversion to develop and convert the B767 Aircraft into a Multi-Mission Tanker Transport (MMTT). The aircraft is configured to support air refueling, cargo, VIP, passenger flights, and ISR missions.

The refueling system uses a three-point drogue system with two refueling pods and a third centerline host drum unit. Unlike other refueling systems that rely on aircraft power for their operation, these pods use an independent Ram-Air Turbine (RAT) to power the refueling system.

As an option, the aircraft can be converted to full cargo configuration under an existing approved Supplemental Type Certificate (STC) for the 767-300 special freighter. As part of the conversion, IAI provides a modern glass cockpit, and an option of fresh from shop engines. The aircraft can be configured to carry 200 troops or 60 tons of cargo when required. The cargo conversion includes the integration of a special cargo door and built-in cargo pallet with capabilities that can also take additional fuel for the FRA mission. To date, IAI has converted more than 250 passenger aircraft of different types into special freighters and special mission aircraft. This fleet has demonstrated an unbeatable safety record and high utilisation rates.

As high acquisition costs brought previous FRA tenders to a halt, India's Defence Procurement Procedure 2020 Act is considering the leasing of RFA for the IAF, a process that will speed up acquisition and utilise such assets at a lower cost. Leasing plans enable customers to operate the aircraft with their own aircrews or obtain refueling missions as a service. The main benefit of both plans is the large savings associated with logistical infrastructure, modernisation, and support over the life cycle of the program. At the end of the leasing periods, a customer can buy the assets or replace them with new ones.

Besides the cost advantage, the MMTT offers long term and affordable supply of spare parts and certified maintenance services based on the large operational fleet of B767 aircraft in India and worldwide.

IAI has more than 40 years of experience in Air-to-Air refueling (AAR) solutions, having converted, modified dozens of aircraft to AAR for more than 12 customers worldwide, including the Indian and Israeli Air Forces. Aligned with the Indian government's "Make in India" initiative, IAI has established subsidiaries and partnerships throughout India, to support the company's programs and access the local supply chain. SP

STRENGTHENING INDIA TOGETHER

L&T MBDA MISSILE SYSTEMS LIMITED (LTMMSL), A JOINT VENTURE company between Larsen & Toubro (L&T), India's Multinational conglomerate, and MBDA France, a world leader in missile systems, has taken a leap into the future by commencing delivery of MICA missile air-to-air launchers, from its green field facility spanning over 16,000 sq. meters in an SEZ near Coimbatore. This is a dedicated missile integration facility for inert assembly, integration and testing of Missile Launchers and Missile Sub-systems.

This facility is a result of a deliberate and well thought-out strategy which involves developing capabilities within LTMMSL, enhancing the technology spectrum, and building capacities ahead of time so that when the opportunity arises, LTMMSL is firmly positioned to deliver missiles and missile systems. The facility is equipped with state-of-the-art Security systems and climate controlled dust free clean rooms.

On time deliveries, and first-time-right-every-time-right have been the driving forces of LTMMSL. This belief ensured delivery to the customer in shortest possible time in spite of pandemic by embracing change management & digitalisation. During the year, LTMMSL flagged-off the initial batch of MICA missile air-to-air launchers from its SEZ Coimbatore facility. It will be a moment of pride for us that the MICA air-to-air launcher would be fitted onto the Rafale aircrafts.

LTMMSL, will continue to leverage its strong parentage to bring in world class guided weapon systems technology for the Indian Armed Forces and will target prospects under the Buy (Indian – IDDM), Buy (Indian) and Buy & Make (Indian) categories of DAP-2020.

LTMMSL INERT INTEGRATION FACILITY AT SEZ IN COIMBATORE

LTMMSL has offered the next generation local and point missile Air Defence system (Sea Ceptor) to equip the in-service warships of Indian Navy and is poised to respond to Indian Armed Forces' requirements of Missile systems including Anti-Ship Missiles and other Missile Systems including Anti-Tank Guided Missile (ATGM 5). The company has also identified a wide range of areas which will be explored in the medium to long term.

Aligning with the Make in India initiative, the creation of this joint venture is a commitment to India's long-standing goals of achieving self-sufficiency in defence machinery and strengthening India together to safeguard its geopolitical interests. SP

CHIEF OF THE AIR STAFF INTERVIEW... *continued from page 13*

ensure joint operations in true sense, so as to bring to bear the desired effect, when required.

Air Power would play a very significant and critical role. Future threat scenarios would also be shaped by low cost disruptive technologies. Therefore, over and above the requirement of maintaining robust conventional capabilities for conventional conflicts, we have to prepare adequately to fight timeless and borderless wars against faceless enemies jointly. This requires the three services and the other security agencies to 'train, equip and fight together'.

(b): What sort of involvement of space is to be expected in coming times?

CAS: Over a period of time, military capability has become heavily dependent on space based assets. Space based applications are used for enhancing accuracy of weapons, Electronic Warfare, ISR, navigation and communication to name a few. Space domain which includes Anti-Satellite weapons, jamming, spoofing and other non destructive weapons like DEWs, EMP etc will play a major role in future conflict scenarios. With the formation of Defence Space Agency (DSA) and Directorate of Special Projects (DSP), space based military operations, in addition to space based communications, cartography and weather monitoring will get more impetus. Safeguarding our own space assets from any adversary action (covert or overt) will be the key area of focus, towards which having a robust Space Situational Awareness (SSA) setup is an in-escapable necessity. The latest reforms by Government of India in the space sector will aid in ensuring that the interests of armed forces are met through greater participation from private sector.

(c): How long have we progressed towards space wars?

CAS: With the formation of DSA and DSP, fundamental foundation has been laid down by Government of India. These agencies will strive towards establishing a robust space security arrangement for meeting any space based contingencies that arises in future. Success of Mission Shakti in March 2019 has demonstrated India's prowess with respect to Direct Ascent Anti-Satellite capability and highlighted the fact we are at par with other space faring nations in terms of orchestrating space based fire power. Notwithstanding, the domain is ever evolving and efforts are underway to seamlessly integrate the existing three mediums (land, sea & air) with space and cyber to weave a secure and robust web of net centric operations. Current Geo-political situations demand us to accelerate our space related projects. The indigenous capability of our space programme is a strength that needs to be rapidly translated into capability to bridge the gap with our adversaries. SP

CHUCK YEAGER (1923 - 2020)

On October 12, 1944, Chuck Yeager became the first pilot in his group to shoot down five enemy aircraft in one day, making him "Ace in a Day"

WHEN CHUCK YEAGER FIRST CROSSED THE SOUND BARRIER in 1947, the flight was fraught with danger. Hence it is often ranked with epic feats such as the first flight by the Wright brothers at Kitty Hawk in 1903 and solo flight by Charles Lindbergh across the Atlantic in 1927. Yeager went on to break several other records during his illustrious career.

Charles (Chuck) Yeager was born on February 13, 1923, in Myra, West Virginia. Apart from hunting, he excelled at anything requiring mathematical ability, physical coordination or manual dexterity. He had unusually sharp vision that once helped him shoot a deer at 550m. Chuck's career began in World War II as a private in the United States Army, assigned to the Army Air Forces in 1941. After serving as an aircraft mechanic, in September 1942, he entered enlisted pilot training and upon graduation as a fighter pilot was promoted to the rank of flight officer and was stationed in England flying P-51 Mustangs. He scored one victory before being shot down over France in March 1944. He was captured by the Germans, but managed to escape. Such escaped pilots were normally barred from combat flying, but Yeager put in an earnest appeal to fly again. His petition finally reached General Dwight Eisenhower who accepted his request. On October 12, 1944, Yeager became the first pilot in his group to shoot down five enemy aircraft in one day, making him "Ace in a Day".

After the War, Yeager became a flight instructor and then a test pilot. It was a period when engineers were struggling to make aircraft fly supersonic. During World War II, many pilots had experienced unstable controls and structural mishaps as their jets approached Mach 1. It was almost as if a physical barrier prevented flight beyond the speed of sound. In fact, British test pilot Geoffrey de Havilland died when his DH108 jet disintegrated close to the sound barrier. In the US, Bell Aircraft Company's secret X-1 aircraft was specially designed and built to test the capabilities of human beings and aircraft to withstand the severe aerodynamic stresses of high speed. It was shaped like a .50-calibre bullet for stability in transonic flight. Bell modified a huge B-29 Superfortress to lift an X-1 in its bomb bay to the planned launch altitude.

Chuck was chosen from among several volunteers for his flying skill and cool-headedness under extreme stress. At altitude, he had to get in through the X-1's tiny side door, drop free of the B-29 and fire the rocket engines. He had only a few minutes' worth of fuel (a mixture of liquid oxygen and alcohol). Then he would glide back to the Earth and land at Rogers Dry Lake in southern California. So the trials began, gradually increasing the speed. On the seventh powered flight, the controls suddenly ceased to function at .94 Mach due to shock waves. Chuck decelerated and landed safely. Jack Ridley, the Chief Engineer, advised him to control the aircraft using the horizontal stabilizer.

Two nights before the final flight, Yeager broke two ribs when he fell from a horse. However, he persuaded a doctor to tape up his ribs and kept quiet. On October 14, 1947, after being released from the B-29 at an altitude of 25,000 feet, Yeager flew the X-1 Glamorous Glennis (named after his wife) to Mach 1.05 at an altitude of 45,000 feet. He described it thus: "Suddenly the Mach needle began to fluctuate. It went up to .965 Mach – then tipped right off the scale… We were flying supersonic. And it was as smooth as a baby's bottom; Grandma could be sitting up there sipping lemonade." Yeager later said, "It took a damned instrument to tell me what I'd done. There should have been a bump in the road, something to let you know you'd just punched a nice clean hole through the sound barrier." The ground control operators heard the first sonic boom ever produced on the Earth. When the achievement was publicized, Yeager gained worldwide fame and was awarded several prestigious flying trophies.

On December 12, 1953, Yeager set a new speed record of Mach 2.44. However, shortly after reaching this speed, he lost control of his jet at 80,000 feet due to inertia coupling. He dropped 51,000 feet in less than a minute before regaining control and landing. In 1969, Yeager was promoted to Brigadier General. He thus became one of the few who had risen from the ranks all the way to the top as a General in the USAF. He was inducted into the National Aviation Hall of Fame in 1973 and retired on March 1, 1975. Chuck's flying career spanned more than 30 years and he flew more than 360 different types of aircraft. On October 14, 1997, at the age of 74, he flew a McDonnell Douglas F-15 Eagle past Mach 1 to mark the 50th anniversary of his epochal flight. And on October 14, 2012, on the 65th anniversary of the feat, he did it again at the age of 89, this time as co-pilot. Chuck Yeager died on December 7, 2020, at the age of 97. SP

— JOSEPH NORONHA

MILITARY

ASIA PACIFIC

TRI-SERVICE EXERCISE KAVACH AND AMPHEX-21 IN THE ANDAMAN SEA AND BAY OF BENGAL

The Tri-Service Exercise Kavach and Amphex-21 was conducted under the aegis of Andaman and Nicobar Command (ANC) involving assets of Army, Navy, Air Force and the Indian Coast Guard and involved participation and deployment of all forces of ANC, elements of Amphibious Brigade of Army's Southern Command along with corvettes, submarine and amphibious landing ships of Navy's Eastern Fleet and Marine Commandos. Jaguar Maritime Strike and transport aircraft from IAF and assets of the Indian Coast Guard also participated. Prior to amphibious landing operations, troops of the Indian Army, the Indian Navy and the IAF were mobilised and transported by sea and air in close coordination with all agencies. The exercise culminated with the beach landing operations by elements of Amphibious Brigade from INS Jalashwa, Airavat, Guldar and LCU MK-4 class of ships with 600 troops along with tanks, troop carrier vehicles and other heavy weapons. The areas in which the exercise was conducted holds strategic significance for India.

DEFENCE MINISTER RAJNATH SINGH HANDS OVER DRDO SYSTEMS TO ARMED FORCES CHIEFS

On December 18, 2020, Defence Minister Rajnath Singh handed over three indigenously developed Defence Research and Development Organisation (DRDO) systems to the Armed Forces Chiefs which included the Indian Maritime Situational Awareness System (IMSAS) to the Chief of the Naval Staff, Border Surveillance System (BOSS) to the Chief of the Army Staff and ASTRA Mk-I Missile to the Chief of the Air Staff.

CABINET NOD TO DEAL FOR 83 LCA TEJAS MK1A WITH HAL

On January 13 this year, the Cabinet Committee on Security headed by Prime Minister Narendra Modi cleared a ₹48,000-crore deal for 83 light combat aircraft (LCA) with HAL for the IAF in the biggest-ever deal in the indigenous military aviation sector. The HAL has already set up second line manufacturing facilities at its Nasik and Bengaluru Divisions. Equipped with the augmented infrastructure, HAL will steer LCA Tejas Mk1A production for timely deliveries to the IAF. The deliveries will begin three to four years after the contract is signed.

FIFTH INDIA-SINGAPORE DEFENCE MINISTERS DIALOGUE

On January 20, 2021, Defence Minister Rajnath Singh co-chaired the fifth India-Singapore Defence Ministers Dialogue along with Dr Ng Eng Hen, Minister for Defence, Republic of Singapore. During their virtual interaction, both Ministers expressed satisfaction at the progress of ongoing defence cooperation engagements between the two countries despite limitations imposed by ongoing COVID-19 pandemic. Defence Minister Rajnath Singh conveyed his compliments on effectiveness of pandemic mitigation measures implemented in Singapore. He also highlighted the role of the Indian Armed Forces in combating COVID-19 and various missions undertaken to assist in repatriation of Indians stranded overseas. Both Ministers also expressed satisfaction at the growing defence ties between the two countries. The Ministers witnessed the Signing of the Implementing Agreement on Submarine Rescue Support and Cooperation signed between the Indian Navy and Republic of Singapore Navy. Defence Secretary Dr Ajay Kumar was present during the meeting.

DEFENCE MINISTER RAJNATH SINGH APPROVES PROPOSALS TO PROCURE EQUIPMENT WORTH ₹27,000 CRORE FROM DOMESTIC INDUSTRY

On December 17 last year, a meeting of the Defence Acquisition Council (DAC) held under the Chairmanship of the Defence Minister approved Capital Acquisition proposals of various Weapons/Platforms/Equipment/Systems for the Defence Forces for an approximate overall cost of ₹28,000 crore. This is the first meeting of the DAC under the new regime of Defence Acquisition Procedure 2020 and these are the first set of Acceptance of Necessity (AoNs) accorded with majority AoNs being accorded in the highest categorisation of Buy Indian (IDDM). Six of the seven proposals, that is, ₹27,000 crore (about $3.6 billion) out of ₹28,000 crore will be sourced from the Indian industry. Modular Bridges are being acquired for the Indian Army and the rest is for the Indian Navy and the IAF.

QUICKROUNDUP

BOEING

Boeing is setting an ambitious target to advance the long-term sustainability of commercial aviation, committing that its commercial airplanes are capable and certified to fly on 100 per cent sustainable aviation fuels by 2030. Boeing has previously conducted successful test flights replacing petroleum jet fuel with 100 per cent sustainable fuels to address the urgent challenge of climate change.

Boeing and BBAM Limited Partnership have announced that the lessor is expanding its 737-800 Boeing Converted Freighter fleet with six firm orders and six options. The agreement brings BBAM's 737-800BCF orders and commitments to 15 and highlights the continued strength of the e-commerce and express cargo market.

The US Air Force has awarded Boeing a $2.1 billion contract for 15 KC-46A tankers, expanding its fleet of aircraft that will not only set the standard for aerial refuelling, but will also help enable the integrated digital battlespace. The KC-46 is a widebody, multirole tanker designed for state-of-the-art air refuelling, cargo and medical transport. Boeing now has a contract for 94 KC-46A tankers.

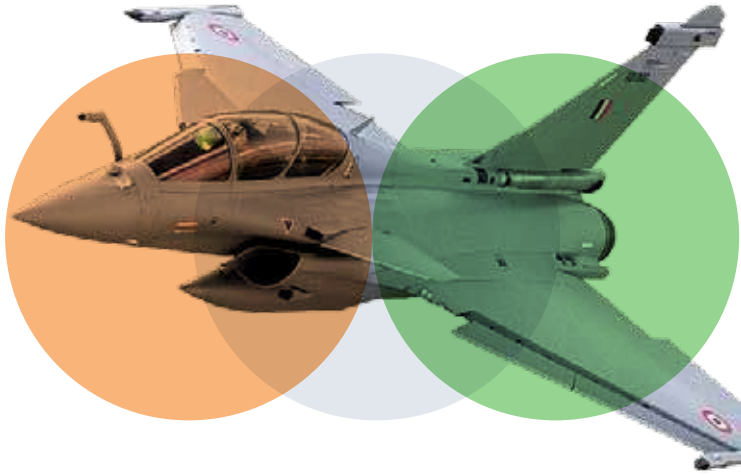
NORTHROP GRUMMAN

Northrop Grumman Corporation successfully completed the first flight for the Global Hawk Ground Station Modernisation Programme (GSMP) at Edwards Air Force Base. Leveraging agile development and an open architecture design, the GSMP team transformed both the human-machine interface and the underlying software, paving the way for interoperability with other Air Force systems.

SPACEX

US' SpaceX is all set to launch the very first of its dedicated rideshare missions, which allows small satellite operators to book a portion of a payload on the company's Falcon 9 launch. The cargo capsule on top of the Falcon 9 launch on January 24,2021 held a total of 143 satellites according to SpaceX, which is a new record for the highest number of satellites being launched on a single rocket - beating out a payload of 104 spacecraft delivered by Indian Space Research Organisation.

BUILD THE FLEET TO 42 SQNS



The French Defence Minister, Florence Parly, projected the induction of the Rafale jets into the IAF as "A new chapter in bilateral defence ties between France and India"

By **AIR MARSHAL B.K. PANDEY (RETD)**

THE TENDER FOR 126 MEDIUM MULTIROLE COMBAT AIRCRAFT (MMRCA) for which the Rafale from Dassault of France, was identified by the Indian Air Force (IAF) as the most capable amongst the six aircraft in the race, failed in 2014. This was indeed an extremely distressing experience for the IAF and a disquieting setback as the strength of the combat fleet had already dwindled considerably with the retirement from service of the obsolescent fleet of the earlier versions of the MiG-21 that had been inducted beginning in the mid 1960s. Failure of the MMRCA tender was a factor that had an adverse impact on the operational capability of the IAF which in the context of the ominous politico-military developments involving the two enemy nations in the neighbourhood, was particularly disconcerting.

Fortunately, there was partial relief for the IAF when the contract for the direct purchase of 36 Rafale jets consisting of 30 single-seat fighter aircraft and six twin-seat trainer version platforms from the French aerospace major Dassault Aviation, was signed in September 2016 between the governments of India and France. Nearly four years after the inter-governmental agreement was signed, the first batch of five Rafale jets arrived at the IAF airbase in Ambala on July 29, 2020 at a time when the nation was devastated not only by the COVID-19 Pandemic, but was also trying to cope with an escalating conflict on the borders with China in Eastern Ladakh. Under these circumstances, the five Rafale jets were then formally inducted in a much publicised glittering ceremony attended by a host of VIPs from both India and France. The induction ceremony was marked by an aerial display by the Rafale combat jet that featured a variety of breathtaking manoeuvres. In addition, the indigenously-developed Tejas light combat aircraft and the Sarang helicopter aerobatic team of the IAF too displayed a range of aerial manoeuvres demonstrating their agility

The remaining 31 Rafale jets will be delivered in batches every two months and all 36 aircraft should be with the IAF by the end of 2021 or latest by early 2022. These 36 aircraft are meant to equip two fighter squadrons which will be a very minor gain for the IAF as currently, the deficiency in the combat fleet stands at 11 squadrons. The induction of Rafale jets is the first acquisition by the IAF of combat aircraft over two decades after the arrival of the Su-30 MKI, the last major purchase from Russia. Induction of the Rafale is being projected as a major boost to the operational capability of the IAF as also a significant enhancement in the air power of the nation.

In her brief address, the Minister of Defence of France, Florence Parly, projected the induction of the Rafale jets into the IAF as "A new chapter in bilateral defence ties between France and India". She went on to describe the induction of the Rafale combat jets as "A very important step in the light of the prevailing security condition that has been created along India's borders." Rajnath Singh, the Indian Minister of Defence described the induction of the Rafale combat jets as being a game changer and termed it a very important step in the light of the prevailing security situation especially along the borders with China. He also described the induction of the Rafale jets as "A strong message for the entire world, especially those eyeing India's sovereignty".

The acquisition of a fleet of 36 Rafale combat jets for the IAF is undoubtedly a welcome development given the fact that all attempts hitherto by the IAF to revitalise its dwindling fleet of combat aircraft, had failed. However, the national euphoria that has been generated by the public functions and ceremonies related to the induction of the first batch of five Rafale jets, could well mislead the nation to believe that the IAF is now equipped well enough to face the challenges to national security. This is nowhere close to reality as induction of just 36 Rafale jets cannot make up for a deficiency of around 180 combat platforms as of now. Besides, over the next decade or so, the IAF will have to retire from service another 12 squadrons, six of MiG-21 Bison and six of Jaguar, total of 216 aircraft. Dassault wants to manufacture Rafale jets in India provided the order is large enough. But India will take a call after the delivery of the first 36 Rafale jets.

The impediments experienced by the IAF in its attempts to procure modern combat aircraft from foreign sources is a clear indication that unless the indigenous capability in the domain of aerospace and defence industry is developed to an extent that it is able to design and manufacture combat aircraft that qualitatively match global standards and help build up the strength of the combat fleet in the IAF to the authorised level of 42 squadrons from its current level of 32, the IAF will be seriously handicapped and will not be in a position to meet with the operational challenges in the event of a war on both the Western and Northern fronts simultaneously. SP

ILLUSTRATION: SP'S TEAM

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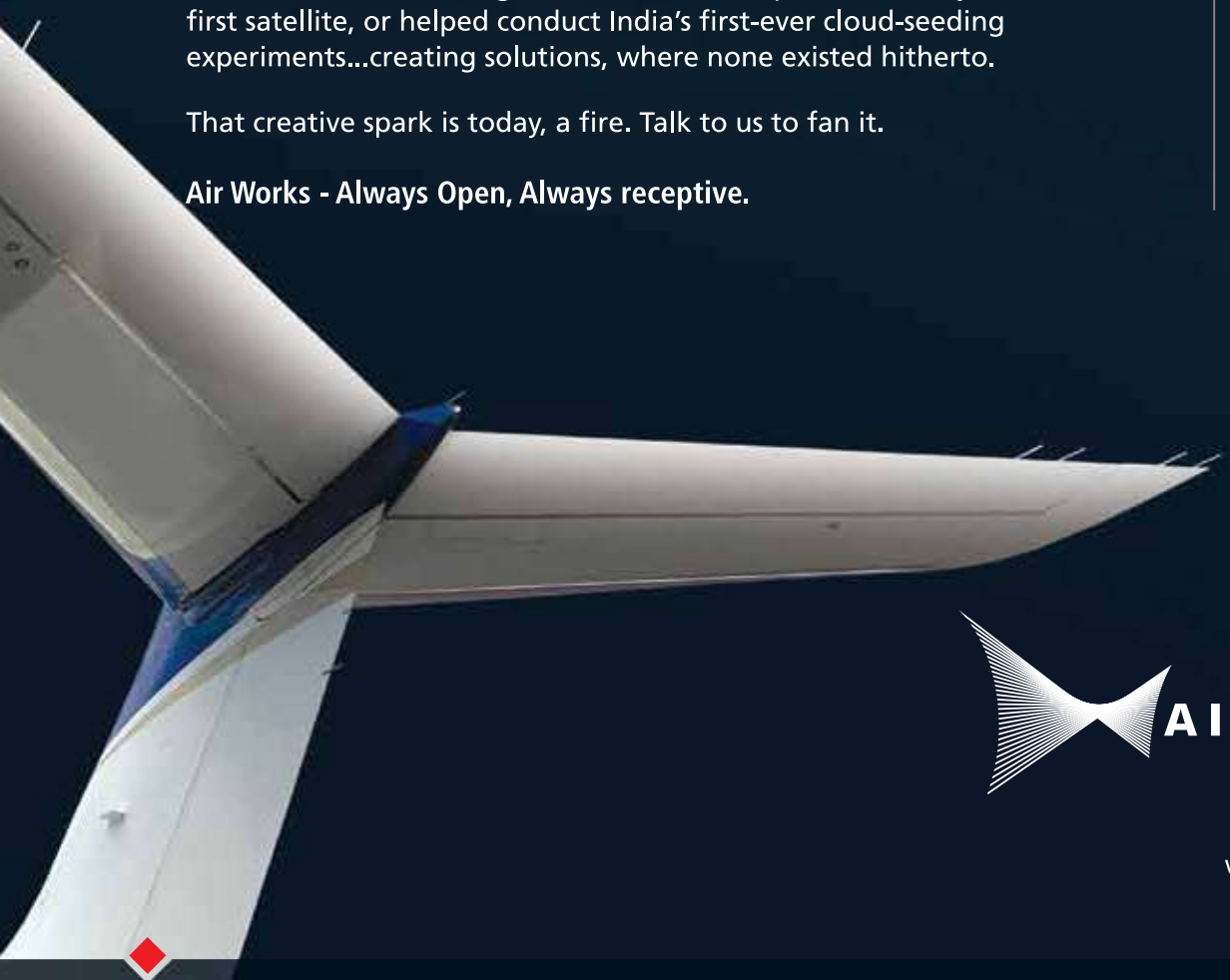

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