THE 6TH GENERATION FIGHTER RACE THE WAY FORWARD FOR INDIA

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In December 2007, the Lockheed Martin F-22 Raptor of the United States Air Force (USAF) got fully operationalised and so far, only three countries have managed to develop and successfully induct fifth-generation fighter aircraft: US, Russia and China yet only one country has so far been able to operationally deploy fifth-generation fighter which is U.S. leading with not one but two successful fifth-generation fighter programmes, the Lockheed Martin F-22 Raptor and F-35 Lightning II. Yet, at least a dozen of countries are now working towards developing 6th generation fighters, a quantum generational leap to say the least.

There are five universally accepted features that characterise a fifth-generation fighter aircraft: stealth, manoeuvrability, advanced avionics, multi-role capabilities, and advanced sensors. The F-22 had long reigned as the undisputed 5th-generation fighter, much ahead of its Russian and Chinese counterparts. The F-22 success is being followed by the F-35 Lightening II the first advanced fighter aircraft ever produced on such a large scale. A sixth-generation fighter will include basic features of a fifth-generation fighter with real-time network-centric capabilities, manned-unmanned teaming, greater sensory awareness, a better weapon package with advanced automation, sensor fusion, on-board computing and more.

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The technological know-how achieved in developing the fifth-generation fighter will be used in developing a sixth-generation fighter in addition to technologies that are still not employed yet as they exist or are being worked upon at different levels. Some other key features that a fifth-generation fighter like F-22 and F-35 include are stealth, integrated sensors, super-cruise capability and a helmet-mounted display system that means intelligence and target information displayed on the pilot's helmet visor. While F-35 cannot super-cruise, it is designed as an ambush predator that uses its stealth, it employs advanced sensors and networking capabilities to shoot down opponents before they enter visual—or dogfighting—range at least as per the concept.

Combining the capabilities of the existing fifth-generation fighter aircraft in addition to the new emerging technologies like automated take-off, landing, and air-to-air refuelling using advanced algorithms through AI and ML, with sixth-generation fighters also may have the ability to fire lasers/DEWs and hypersonic missiles, displaying true multirole capabilities with enhanced mission flexibility for all-around mission excellence is what will make a true sixth-generation fighter.

*At least a **dozen of countries** are now working towards developing **6th generation fighters**, a **quantum generational leap** to say the least*

DEFINING SIX KEY FEATURES OF THE 6TH-GENERATION FIGHTER

There is no standardised definition for a sixth-generation fighter aircraft as the concept is still in development and there is no fixed set of requirements or characteristics, yet a sixth-generation fighter can be defined as an aircraft that will bridge the shortcomings posed by the existing stealth fighters to provide all-round mission success. Automated take-off and landing, automated missions and auto air-to-air refuelling, low-probability-of-intercept radar, advanced avionics, agile airframes with supercruise, super manoeuvrability, net-centric computers, are some of the key features that are often discussed in relation to a sixth-generation fighter aircraft.

Increased Stealth

The sixth-generation fighters are expected to have improved stealth technology that will make them harder to detect and track by radar and other sensor systems, the stealth characteristics of the fighter is going beyond just reducing the Radar Cross Section (RCS) of the fighter but also reducing infrared and acoustic signatures to counter advancement in radar technologies such as the introduction of Low-Frequency Radars (LFRs), Over the Horizon (OTH) radars, Multi-static/Bi-static radars, and quantum radars.

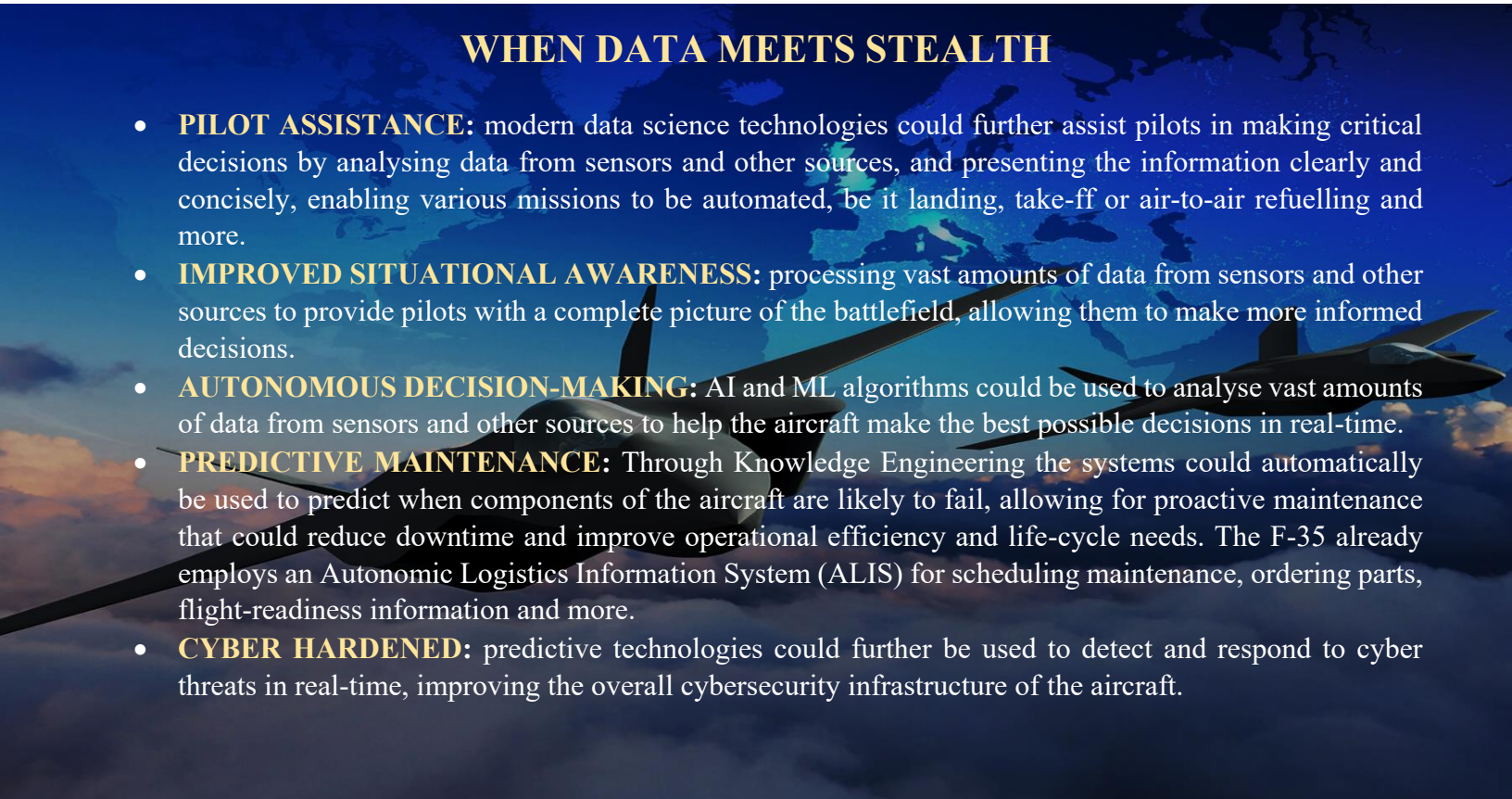
Network-Centric Warfare

These fighters are expected to provide a complete picture of the battlefield environment through advanced sensors providing real-time situational awareness on the pilot's virtual cockpit or HUD enabling net-centric computing capabilities onboard. For E.g., the 5th generation F-35 fighter provides 360-degree situation awareness through its advanced sensors and information fusion, similarly, the Su-57 of Russia is armed with 06 radars, with a higher detection range – these technologies can further be matured and integrated on a 6th-generation fighter. Therefore, 6th generation fighters are expected to be part of a larger network-centric

system, allowing them to share data with not only nearby aircraft but also ground-based systems in real time with the help of advanced satellite communications.

Autonomous

The 6th-generation fighters are expected to use artificial intelligence (AI) to help pilots make better decisions and to enhance their situational awareness with the help of advanced analytical tools enabling next-generation human-machine interfacing. Better use of software relied on systems can also enable better, more frequent and flexible mission upgrades, enhancing the fighter's durability, and keeping it in the air for a long-time. The design is expected to include open architecture to adapt and enhance capabilities in future. The DARPA is already testing how human pilots interact with AI to examine how well they trust machines to automatically conduct dogfights. Some key features to further the concept of autonomous fighters with the help of AI/ML applications could be automated take-off and landing, automated missions, auto air-to-air refuelling combined with intelligent adaptive engines for better fuel efficiency, advanced computing for data fusion onboard, automatic mission profiling with cyber-hardened secured communications.



WHEN DATA MEETS STEALTH

- **PILOT ASSISTANCE:** modern data science technologies could further assist pilots in making critical decisions by analysing data from sensors and other sources, and presenting the information clearly and concisely, enabling various missions to be automated, be it landing, take-ff or air-to-air refuelling and more.
- **IMPROVED SITUATIONAL AWARENESS:** processing vast amounts of data from sensors and other sources to provide pilots with a complete picture of the battlefield, allowing them to make more informed decisions.
- **AUTONOMOUS DECISION-MAKING:** AI and ML algorithms could be used to analyse vast amounts of data from sensors and other sources to help the aircraft make the best possible decisions in real-time.
- **PREDICTIVE MAINTENANCE:** Through Knowledge Engineering the systems could automatically be used to predict when components of the aircraft are likely to fail, allowing for proactive maintenance that could reduce downtime and improve operational efficiency and life-cycle needs. The F-35 already employs an Autonomic Logistics Information System (ALIS) for scheduling maintenance, ordering parts, flight-readiness information and more.
- **CYBER HARDENED:** predictive technologies could further be used to detect and respond to cyber threats in real-time, improving the overall cybersecurity infrastructure of the aircraft.

High-Performance Fighter

Combat range, payload, speed, stealth, manoeuvrability, avionics, sensors and weapons systems are some of the basic characteristics that define the advancement of a fighter aircraft by generation. Each of these factors plays a role in determining the overall combat capability of a fighter and a 6th-generation fighter would showcase an increase in capabilities in all these parameters, especially with regards to combat range and payload capacity, in general, the present fifth-generation fighters tend to have comparatively lower combat range and payload capacities like the F-22 and F-35 have a shorter range and carrying capacity than their 4th-generation predecessors.

This is due to the fact that these aircraft are designed to engage the targets from beyond visual range, using advanced sensor suites and long-range weapons. In this regard, a 6th-generation fighter can deliver results while not only operating from far-off distances but also engaging opponents in line-of-sight with its better fuel efficiency, higher speed, advanced sensors, greater weapon payload, with higher energy generation onboard to fire DEWs while the super-manoeuvrability characteristics providing a better chance of survival in intense A2/AD environment/contested airspace.

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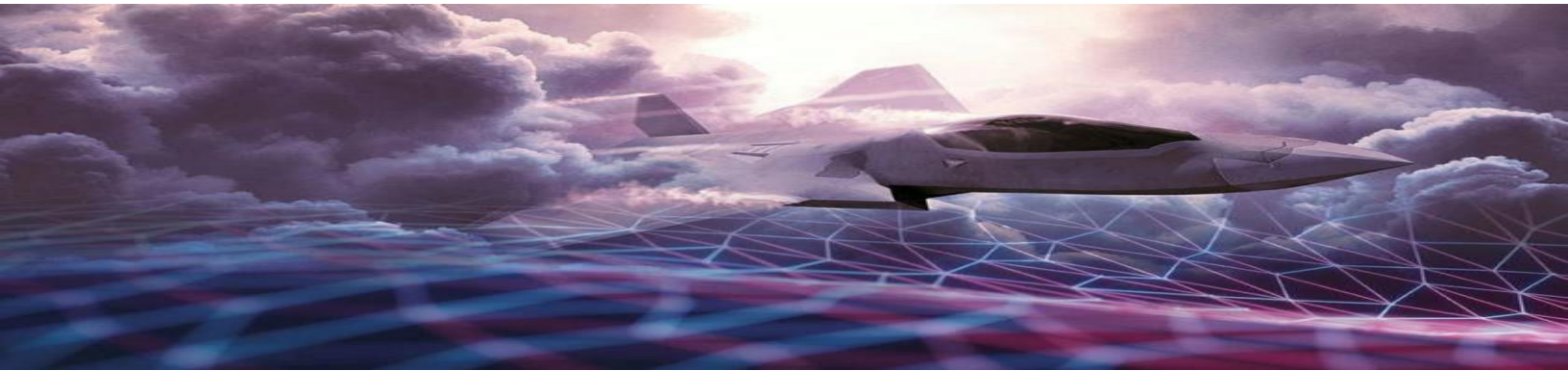

Directed Energy Weapons (DEWs)

The 6th-generation fighters may use DEWs, such as lasers, or high-powered microwaves for both defensive and offensive roles including missile defence, anti-satellite operations, and even ground-based anti-personnel weapons. However, the development and deployment of DEWs are still limited by technological and logistical challenges, including power requirements, targeting accuracy, and cost-effectiveness. The US Navy has been testing the Laser Weapons System (LaWS) installed on the USS Ponce and the US Air Force is also working on such a platform for air-to-air and air-to-ground operations. China has also been developing such a system and there have been reports that PLA has deployed such DEWs on its naval ships and has developed land-mobile HEL-based DEW.

Manned Unmanned Teaming (MUM-T)

Traditional air combat introduced the concept of a wingman as the pilot of a second aircraft providing support or protection to a primary aircraft. Now the next generation of fighters will come with multiple wingmen of unmanned aircraft or drones that are controlled by the pilot of the manned aircraft, unmanned wingmen and remote carriers will form the primary feature of a 6th-generation fighter with the system of systems approach.

ADVANTAGE OF MUM-T IN TOMORROW'S CONFLICT

- **FORCE MULTIPLIERS**: Wingmen can serve as force multipliers, allowing a single manned aircraft to control multiple unmanned wingmen, effectively expanding the capabilities of the pilot. The wingmen and remote carriers with 6th-generation fighters are expected to provide increased autonomy in air combat missions, by flying in formation with a manned aircraft, a wingman can enhance the capability of the manned aircraft by providing additional sensors, weapons, or communication capabilities allowing them to operate independently of the manned aircraft and carry out missions on their own. This will allow the manned aircraft to focus on more complex tasks, such as air-to-air combat.

- **IMPROVED SITUATIONAL AWARENESS**: By combining the sensors and capabilities of manned and unmanned aircraft, the wingmen and remote carriers can provide a more comprehensive view of the battlefield, improving situational awareness for the pilot hence enabling informed decision-making. The unmanned platforms can perform extended ISR missions, Electronic Warfare, and other combat support missions beyond the reach of a fighter aircraft hence by using wingmen for high-risk missions, 6th-generation fighters can reduce the risk to the manned aircraft and the pilot(s)

- **DISTRIBUTED LETHALITY**: Wingmen in 6th-generation fighters could be able to carry a range of weapons, this will enable the wingman to engage targets independently, effectively multiplying the firepower of the manned aircraft, the arsenal may also include directed energy weapons and hypersonic missiles. The distributed lethality gives the effective option for swarming over the targeted and overwhelming the AD environment.

- **COMBAT TRAINING**: Wingmen can be used for training purposes, allowing pilots to practice and develop new tactics and strategies without risking the safety of a manned aircraft., and they can be used to simulate various scenarios, such as enemy aircraft or ground targets, without the risks associated with live combat

THE 6TH - GENERATION FIGHTERS UNDER DEVELOPMENT

Global Combat Air Program (GCAP), Aka Tempest

Participating countries: UK, Japan, Italy

Announced in December 2022, the Global Combat Air Programme (GCAP), Aka. Tempest GCAP aircraft is a part of the UK's Combat Air Strategy launched in July 2018. In The year 2021, the U.K. announced a £2 billion investment in the GCAP programme for up to 2025, the project formerly known as FCAS. The main partners in Team Tempest are UK MoD, BAE Systems, MBDA UK, Rolls-Royce, and the RAF while the JV include IHI Corporation, Mitsubishi Electric and Mitsubishi Heavy Industries in Japan

which were previously working on F-X stealth fighter programme now merged with the Tempest and Avio Aero, Elettronica, Leonardo and MBDA in Italy with almost 600 other organisations on contract, including SMEs and academic institutions. According to BAE Systems, the Tempest consortium is working on over 60 technology demonstrations in the fields of sensing, data management, and autonomy, and is using new collaborative methods that have brought down the cost of developing the new radar technology by 25 per cent.

Since 2003, the Eurofighter Typhoon has been at the forefront of RAF operations, therefore the Tempest is designed to complement current combat aircraft like the F-35 Lightning II and the Typhoon fighters starting in the mid-2030s until the older warplanes are retired in the 2040s. The stealth fighter will be capable of carrying hypersonic missiles and controlling drone swarms, as well as producing large amounts of electricity, allowing it to power laser weapons. The first flight demonstration of the Tempest 6th-generation fighter is expected by 2035 and is expected to be unveiled by 2027. The Tempest GCAP aircraft is expected to be in service with the British RAF by 2035.

The twin-engine, supersonic, delta-wing Tempest will have reconfigurable artificial intelligence and cyber-hardened communications that allow it to act as a flying command and control centre, where the pilot acts more as an executive officer than a dogfighter, flanked by smaller, less costly, less capable planes known at this stage as Lightweight Affordable Novel Combat Aircraft (LANCA), which could act as decoys. The Tempest designs are examining the use of a software reconfigurable wearable cockpit, employing the use of a hi-tech 'Striker II' helmet – without a single physical dial or screen in the cockpit.

Tempest will be modular, both to be easily role-adapted to fit the particular mission as well as have easily upgradeable components during its lifetime. The aircraft's two generators are able to provide 10 times more electrical power than the Eurofighter Typhoon. The pilot's helmet will monitor brain signals and other medical data, amassing a unique biometric and psychometric information database for each pilot, that will grow the more the pilot flies. The aircraft's AI will work in conjunction with the database to assist the pilot.

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Future Combat Air System (FCAS), Aka NGF

Participating countries: France, Germany, Spain

The Future Combat Air System FCAS is a sixth-gen jet project announced by France and Germany in 2017 and joined by Spain in 2019. The FCAS program of France is an ambitious collaborative effort between France, Germany, and Spain it intends to develop a family of systems for air dominance, with a sixth-generation fighter known as the Next Generation Fighter (NGF) at its centre. The NGF will have a new engine, new weapon systems, advanced sensors and stealth technology, and the ability to link with unmanned aircraft and connect to an air-combat cloud network.

With an estimated cost of about $106 billion, the first NGF flight was expected in 2027-2029, with manufacturing starting in 2030 and full introduction in 2040. The jet is meant to replace France's Rafales and the Eurofighter Typhoons flown by Germany and Spain. There are also plans for a carrier-based variant for use on France's future aircraft carrier. It is said that the FCAS will also utilise remote carrier drones for a variety of purposes, such as long-range reconnaissance, electronic warfare, and combat support. Thales also is working to improve the multi-ship data link capability of the Rafale as part of the upgrade with the aim of maturing connectivity technologies for FCAS.

Airbus, Dassault and other partners were applying a digital design, manufacturing and services approach. At least Eighteen partners including start-ups, small and medium companies, and research institutes, applied themselves in the pilot phase to work on 14 FCAS projects, including combat cloud, connectivity, the 6TH-generation fighter and remote carriers Etc.

*The FCAS **open system architecture** permits the **integration** of existing systems across other **dimensions** like land, sea, space and cyber*

PROVIDED BY AIRBUS

Dassault, and Airbus, together with their partners MTU Aero Engines, Safran, Indra Systems of Spain, MBDA and Thales now have the contract to demonstrate the initial prortype. The Next Generation Fighter (NGF), with Dassault Aviation as prime contractor and Airbus as the main partner, for Unmanned Systems Remote Carrier (RC) with Airbus as prime contractor and MBDA as the main partner, for Combat Cloud (CC) with Airbus as prime contractor and Thales as the main partner for developing the engine with Safran and MTU Aero Engines as main partner. Spain's Indra Sistemas will lead the avionics pillar of FCAS in partnership with France's Thales and Germany's Future Combat Mission System (FCMS) consortium – consisting of Hensoldt, ESG, Diehl Defence and Rohde & Schwarz.

NGF is expected to be a large, LO design with significant range, internal weapons capacity and networked multi-spectral sensors. The NGF is expected to be compatible with the ASN4G hypersonic air-to-surface nuclear missile currently in development. Various air-to-surface munitions are expected to be added at a later date such as the MBDA Future Cruise/Anti-Ship Weapon (FC/ASW), SmartGlider and SmartCruiser munitions which are under development. The program aims to incorporate renewable energy technologies such as hybrid engines, fuel cells, and electric power systems. Safran will explore variable cycle engine

technology with the goal of maintaining high thrust at supersonic speeds and reducing fuel consumption when cruising at low altitudes.

The FCAS is referred to as a system of systems because of its complex digital network. A combat cloud ensures that all information within the corresponding network is available in real-time to all units involved in a mission. The FACS includes a protected IT system that serves as a digital backbone connecting the combat aircraft and the unmanned components for the exchange of information. The FCAS open system architecture permits the integration of existing systems across other dimensions like land, sea, space and cyber.

Next Generation Air Dominance (NGAD) Fighter, Aka F/A-XX

Country of Origin: US

The US is working on two next-generation fighter aircraft, one for the U.S. Air Force (USAF) and another for the Navy. Both are officially referred to as Next Generation Air Dominance or NGAD, but the Navy's aircraft is often referred to as the F/A-XX, it is intended to complement the smaller Lockheed Martin F-35C Lightning II and replace its existing aircraft such as the Boeing F/A-18E/F Super Hornet fighters. U.S. top companies like Lockheed Martin, Northrup Grumman, and Boeing are believed to be

competing to build the jets, and all have released illustrations of sixth-gen aircraft.

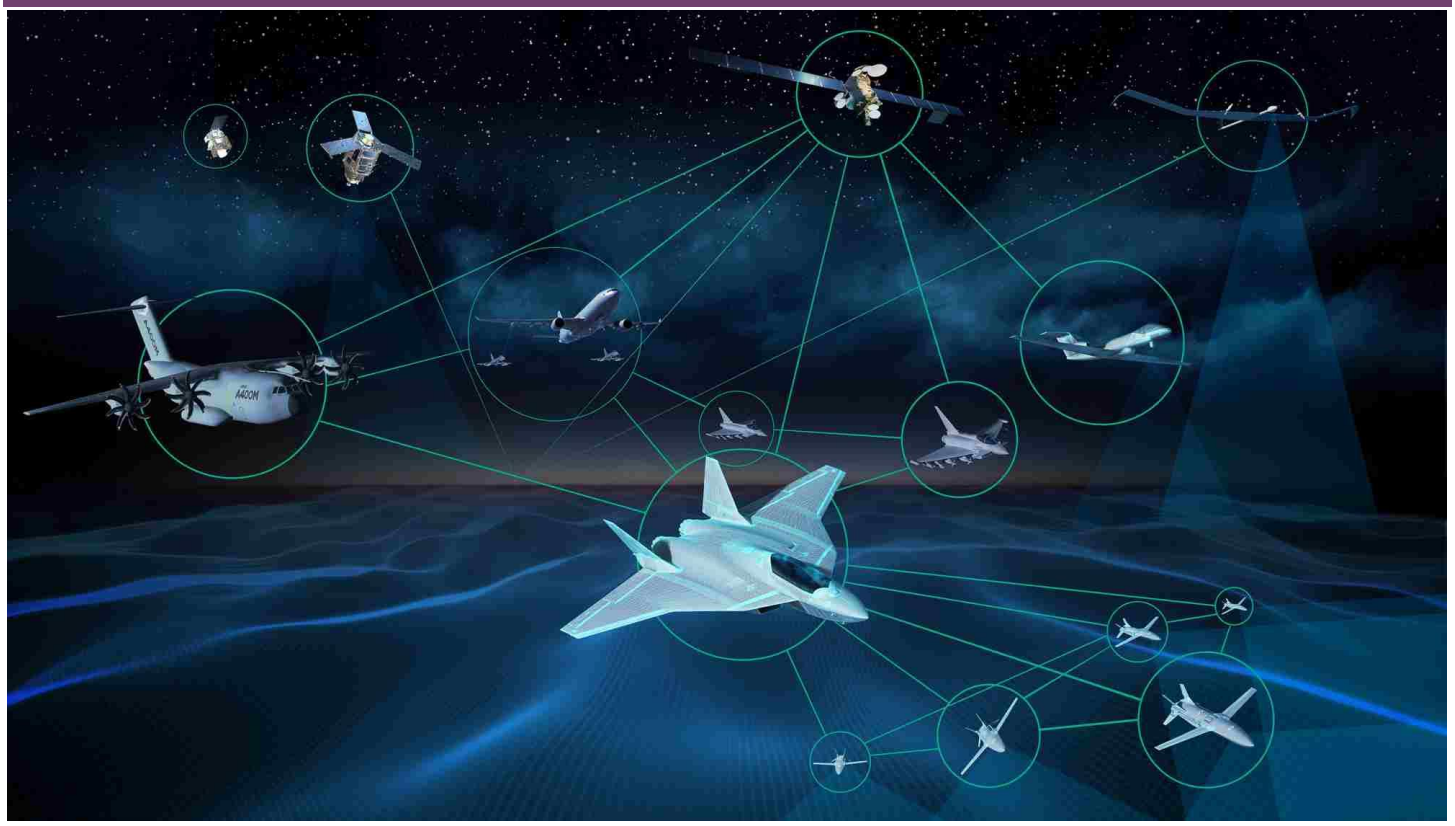
NGAD also includes unmanned aircraft being designed to complement the sixth-gen fighter. Dubbed Collaborative Combat Aircraft, the drones will be networked to the fighter and can be assigned missions, allowing the jet to deploy them while it engages other targets using new long-range weapons like the AIM-260. The U.S. Air Force has acknowledged developing four technologies for the program, including variable cycle engines, new composite materials, and a new suite of sensors, including advanced radar, infrared sensors, and improved electro-optical cameras.

The U.S. Navy launched its sixth-generation F/A-XX program for the first time in 2008. The F/A-XX will have similar features, including the ability to network with unmanned systems, which fits into the Navy's goal of having 60% of its future carrier air wings be unmanned aircraft. The NGAD programme is expected to be inducted into service by 2030. On September 14, 2020, the USAF announced that a prototype aircraft component of the Next-Generation Air Dominance (NGAD) program had flown for the first time.

The NGAD is envisioned to get theatre-wide integration of diverse systems beginning with the primary airborne sensory suite and further including real-time data linking of ground-based detection and ranging technology with sensors aboard primary and support aircraft(s), utilising AI for real-time data translation and rendering geared toward optimising pilot situational awareness. With sensors outreach leading to the extension of existing strike/standoff ranges that may also include the use of lasers, seamless cooperation with ground-to-air defence assets and the ability to deploy aircraft in manned, optionally manned, unmanned and stand-in options are some of the highlighted features of the U.S. NGAD programme. The US is also working on the next-generation bomber B-21, Northrop Grumman describes the newly unveiled B-21 as "the world's first sixth-generation aircraft."

*The NGAD is envisioned to get **theatre-wide integration** of diverse **systems***

MAPPING TECHNOLOGICAL BREAKTHROUGHS FOR DEVELOPING 6TH-GENERATION FIGHTER



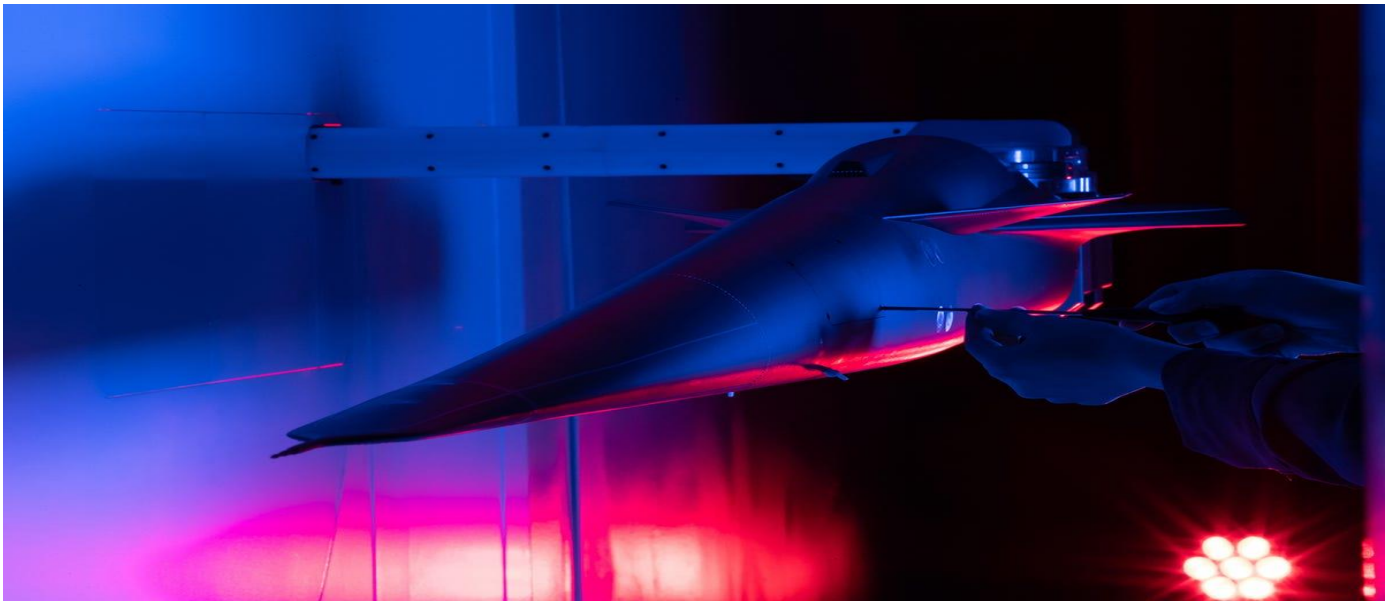
- In December 2019, Leonardo UK demonstrated a next-generation radar warning receiver (RWR) platform it is currently developing for the Tempest, a joint European sixth-generation fighter. RWRs are passive electronic support measures (ESM) systems that enable combat aircraft to recognize as well as identify the source of radar emissions. Leonardo UK's press release says the new RWR technology is "four times as accurate as existing sensors in a package 1/10 the size."

- One of these is a new radar system being developed by Leonardo UK. Called the Multi-Function Radio Frequency System, it is claimed to be able to handle 10,000 times more data than existing systems, processing as much data per second as the entire internet traffic of a city the size of Edinburgh. A number of its subsystems have already been built and it's expected to see airborne testing in a few years.

- Wearable cockpit from BAE Systems replaces most of the physical controls with augmented and virtual reality displays inside the visor of a helmet. Such a cockpit not only reduces the weight and complexity of the pilot area, but it also allows it to be quickly configured to suit a particular mission. When it's fully developed, it may even include a virtual co-pilot that appears as an avatar to interact with the pilot. The gesture-control and eye-tracking feature in the cockpit will enable the measurement of the pilot's workload and the identification of his fatigue and mental stress.

- Leonardo is working on an integrated sensing and non-kinetic effects (ISANKE) and integrated communications system (ICS) for Tempest. It formed a partnership with Mitsubishi Electric to work on the development of JAGUAR sensor technology, which is expected to be used in the development of ISANKE and ICS for the Tempest programme. ISANKE will provide a sensor network across the airframe while ICS will enable the connection of the ISANKE system into the wider system-of-systems within the FCAS. The effectors integrated into the aircraft's sensors will allow the aircraft to engage with a range of non-kinetic effectors such as electronic warfare jamming and directed-energy weapons. The effectors will help in assessing and evaluating incoming threats, and then in managing the deployment of the appropriate method to defeat them.

- Rolls-Royce is working on a new combustion system for the jet engine that will power the Tempest, which will burn hotter than previous designs. This will increase the engine's efficiency and cut down on carbon dioxide emissions. In addition, the company is exploring the use of 3D-printed parts and advanced composite materials that will make the engine lighter, more power-dense, and able to operate at higher temperatures. It will be powered by an efficient power system for increased electrical power generation capability coupled with an intelligent power management system and efficient thermal management to minimise the aircraft's thermal signature.



- 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 enables 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. US-based Collins Aerospace is already providing customised service and sustainment solutions specific to the selected sixth-generation fighters life cycle needs.

- The US Department of Defense's research agency, DARPA, announced on February 13 that a modified F-16 fighter jet had completed an Artificial Intelligence-controlled test flight for the first time in history under the US Air Combat Evolution (ACE) programme. It is believed that the AI will fly the jet and offer real-time flight data, ensuring that the "human pilot focuses on larger battle management tasks in the cockpit." The focus, thus, is still on creating more harmony between human pilots and AI instead of outsourcing combat flight entirely to machines. In 2021 it was reported that an AI agent beat a real US Air Force instructor in a virtual dogfight conducted in flight simulation. 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.

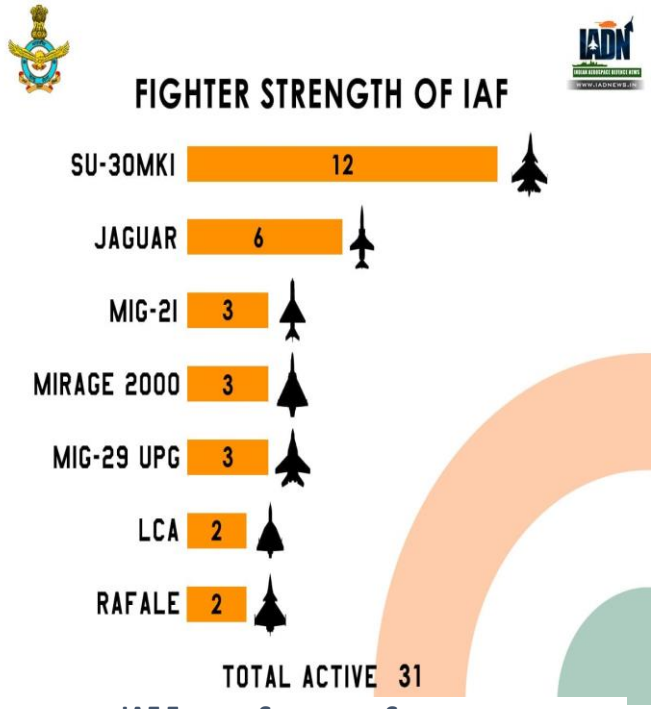
- Airbus demonstrated a successful co-operation of DT-25 target drones and a LearJet aircraft in October 2018, confirming that it had mastered some of the key challenges related to Manned Unmanned Teaming (MUM-T). Airbus subsequently conducted a dual mission group demonstration in 2019. In February 2021, it launched a conceptual loyal wingman (actually a DT-25) UAV from an A400M 'mother ship' aircraft. Last month Airbus showcased automated refuelling of the DT-25 drone.

WAY FORWARD FOR INDIA

Air power is an integral part of the country's defence capabilities and plays an important role in making up a country's deterrence against potential adversaries. However, it is of great concern that India's fighter squadron strength is dropping, primarily due to India's inability to develop a productive aviation industry, which has been reducing India's clout in the domain of air power. Against this backdrop, India is not only experiencing a reduction of combat strength but also seemingly losing on the technological front where countries are fast developing the 6th-generation fighter ecosystem, India is still struggling to introduce 4th-generation fighters in the service.

The Parliamentary Committee on Defence has already recommended the government to go for the off-the-shelf purchase of a 5th gen stealth fighter, as China has not only developed but successfully operationalised its first 5th-generation fighter aircraft J-20. The aircraft entered service in March 2017 with the first J-20 combat unit formed in February 2018, making China the second country in the world and the first in Asia to field an operational stealth aircraft. As per the open source, China is well on track to develop an indigenous 6th-generation fighter. Given the geopolitical scenario which surrounds India with the plethora of threats emerging in the

external security domain, India needs to be at the forefront of fostering excellence in the aerospace sector which is key to national security.



IAF FIGHTER SQUADRON STRENGTH

The IAF Combat strength has reduced to 31 squadrons against the sanctioned 42 combat squadron strength. The already low squadron strength of IAF can fall to dangerous levels by 2030 without MRFA and LCA's timely delivery. The frontline fighters like Mig-29UPG, Jaguars and Mirage 2000s inducted in the 1980s will start retiring by the end of this decade. It is time for India to take a generational leap as the world rapidly moves towards achieving next-generation fighter technologies.

The global security environment is rapidly evolving, and new threats are emerging that require new approaches to defence. There is a global competition among major powers to maintain military superiority, especially in the air domain. Developing a new generation of advanced fighter aircraft is seen as an important way to maintain or gain a competitive edge in this context. Over the past few decades, there have been significant advancements in aerospace technology, including materials, propulsion, sensors, and computing. These advancements have created opportunities to develop new aircraft with improved capabilities that were not possible with earlier aircraft generations.

There are three pathways through which a nation's technological sector can advance—implementing indigenous national-level research and development (R&D) programmes, collaborating with a foreign partner to develop the requisite technology and purchasing foreign technology. It can be done by either one of these or a combination of them all. The case of achieving technologies which make 6th-generation fighter requires

multiple-level engagement, as no one country can provide resource excellence to develop a modern fighter.

India still has the option to participate with France or Britain on respective 6th-generation fighter programmes, however, what could India get on the table while collaborating in these programmes would be nothing more than capital and providing a cost-effective manufacturing base. Given the technological advancement these nations have achieved over the years of investment in developing fighter jet ecosystems, India still has a long road to cover. Even though India may choose to be part of such a programme it would be vital to learn from the leading consortiums about the latest technological advancements as well as modern managerial practices which goes into developing such next-generation platforms.

*It is time for India to take a **generational leap** as the world rapidly **moves towards** achieving **next-generation fighter** technologies*

Participating in a 6th-generation programme may not only give India an insight but also help in order to develop its own 5th-generation AMCA programme, keeping up with the changing time and technological advancements, for India taking a generational leap is not possible while relying only on domestic capabilities as it is highly unlikely that India could master 6th generation technologies at least in the near time when countries would have been flying 6th -generation fighters, India is likely to remain at the stage of developing a 5th- generation fighter.

While the IAF remains a 4th-generation combat force at large, the USAF has already acknowledged that the F-22 will actually begin to sunset in 2030, several decades ahead of earlier projections, there is no possibility in the near future when relying on the domestic aerospace ecosystem that India can produce something which comparable to a fighter like F-22 Raptor, yet alone if India in future decides to buy a 6th-generation fighter off the shelf that will get nothing in terms of technical know-how.

Given the lack of a national aerospace development plan under the aegis of a national security strategy, India's combat readiness is being dwindling over the last decade without any significant foresight towards achieving requisite combat squadron strength and technological benchmarks in the aerospace domain. The US on the other hand has a long-term continuous modernisation development program in place for their F-35 and plans to fly it into the 2070s and beyond that means the fighter may be upgraded to 5.5 to 6th gen fighter given the flexible open architecture which these advanced jets provides allowing them to conduct mid-term upgrades.

The older generation fighter is still going to remain operationally relevant which means India needs to continue its journey of developing 4+ generation fighters and related technologies while also keeping up with the pace of achieving higher-end technologies which goes into the making of a 6th-generation fighter, keeping India ahead of generational race.

It is not necessary to have a large number of advanced stealth fighters in inventory, and they are typically used in limited numbers for specific missions where their unique capabilities are required but the development of 6th generation fighter aircraft is seen as a necessary step in order to address emerging threats, take advantage of new technologies, and maintain a competitive edge in the global security environment.

Some say India will start developing its own 6th-generation fighter after the AMCA programme is completed, sometime in 2030 but that remains a distant dream. Therefore, it is time for the top leadership to come up with effective solutions to stay up with the growing competition of developing next-generation fighters which cannot be done by just relying on our own ecosystem, for which India will require to take a lot of steps in order to get support from the like-minded countries for keeping India ahead of the generational leap. **[End]**