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Image Source: vajiramandravi.com

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"The future of warfare will always be a complex tapestry woven with evolving technologies, shifting alliances and the ever-present threat of conflict. Within this tapestry, aerospace power will always remain vital to the conduct of all military operations."[1]

- Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC

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[1] https://www.firstpost.com/world/given-political-will-air-power-can-be-conducted-beyond-enemy-lines-iaf-chief-13753402.html

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Opinions and Analysis

Mighty 'Flawed' Dragon: IAF Rafales outclass 'overhyped' Chinese J-20 fighter Jet

28 March 2024

Source: Economics Times | https://economictimes.indiatimes.com/news/defence/mighty-flawed-dragon-iaf-rafales-outclass-overhyped-chinese-j-20-fighter-jet/articleshow/108858255.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

In the world of military aviation, the Chengdu J-20, dubbed the "Mighty Dragon," has garnered attention and raised questions regarding its stealth capabilities and market appeal. Operational in the PLA Air Force since 2017, with an estimated 230 units built, the J-20's effectiveness and readiness remain subjects of debate among defense analysts.

Contrary to China's portrayal of the J-20 as a rival to Western 5th-generation fighters, concerns have been raised about its technological maturity. The aircraft's size and contours may not fully meet the stealth criteria associated with 5th-generation fighters. This speculation is fueled by its limited operational exposure and absence from international combat engagements.

The Rafale, a 4.5-generation fighter, stands in stark contrast. With proven stealth characteristics, it operates in multiple air forces and combat zones. Comparisons between the J-20 and the IAF's Rafale, particularly in a potential India-China scenario, emphasize the need to objectively assess each aircraft's capabilities.

Equipped with advanced avionics, including an AESA radar system and a modern cockpit, the J-20 aims to provide superior situational awareness. It features internal weapons bays for long-range missiles and precision-guided munitions. However, its reliance on Russian engine technology and the development of its indigenous WS-15 engine raise questions about its performance and reliability.

Despite these advancements, the J-20 has not gained much international traction, with no reported international sales. Even close allies like Pakistan have shown little interest, possibly due to its size, cost, and ongoing developmental challenges. The aircraft's lack of combat exposure and participation in international air exercises further raise doubts about its operational effectiveness.

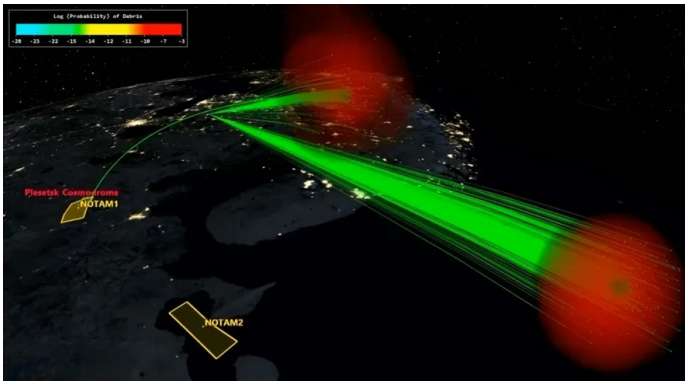
In contrast, the Rafale's operational history, advanced sensor suite, and combat performance position it as a formidable opponent. Its AESA radar, reliable engines, and electronic warfare systems provide a comprehensive capability tested in various environments.

As the debate over the J-20's classification as a true 5th-generation fighter continues, the Rafale's established record in air superiority and multi-role capabilities underscores the advantages of proven technology and operational flexibility.

Final Frontier or Final countdown?

Sandra Erwin | 11 March 2024

Source: Space News | https://spacenews.com/final-frontier-or-final-countdown/



A simulation of the Russian ASAT demonstration in November 2021. Credit: COMSPOC

The recent disclosure of intelligence indicating that Russia is perhaps developing a nuclear weapon to target satellites in space sent shock waves through Washington. While details remain scarce, the threat scenarios could be real causes for concern.

Possible developments believed to have alarmed U.S. officials include Russia launching a nuclear weapon from the ground into space, releasing a weapon into orbit from another satellite, or deploying a nuclear-powered electronic warfare satellite.

A wave of theories and conjectures began Feb 14, following a cryptic social media post from Republican Mike Turner, chair of the House Permanent Select Committee on Intelligence. He warned of a grave national security threat and urged the Biden administration to declassify and discuss the information publicly.

The following day, the White House only confirmed that it had seen intelligence about an anti-satellite threat and that it was not an operational system. But if deployed, the administration said, this weapon would contravene the 1967 Outer Space Treaty, which bans the placement of nuclear weapons into Earth's orbit.

The treaty does not prohibit the use of nuclear-powered spacecraft, so the White House's comments suggest the U.S. is worried about a nuclear weapon in orbit, said Laura Grego, research director at the Union of Concerned Scientists.

She noted that Russian capabilities to put a nuclear weapon in space to target satellites have been known since the 1960s, but such a threat has been held in check by global consensus and international law.

Trying to Counter Starlink?

Some analysts believe Russia may be contemplating the nuclear option in response to the growing prominence of SpaceX's Starlink system, which has provided vital communications assistance to Ukrainian defense forces.

A nuclear attack on satellites would cause significant radiation damage and degrade vast numbers of civilian and military satellites, making it a true weapon of mass destruction, said Charles Galbreath, military space analyst and senior fellow at the Mitchell Institute for Aerospace Studies.

"In lower orbit, you're going to impact more capabilities, more systems with a single blast," he said. "As you go further and further into higher orbits, the effects are going to become less significant as satellites are more dispersed and more hardened against radiation."

It's hard to fathom why Russia would stage such an attack, which would harm its own assets in space and those of its strategic partner, China.

It would also endanger humans living in LEO at the International Space Station and China's Tiangong space station, Galbreath pointed out. An electromagnetic pulse (EMP) attack would impair their life support systems, as well as critical communications and navigation systems.

But another way to look at this is through the lens of a declining space power striving to remain relevant, Galbreath said. "We can't underestimate how devastating it is for [Vladimir] Putin personally to see the use of Starlink by the Ukrainians to great effect to coordinate and communicate … And he might be thinking of ways to counter that."

Russia also likely feels left behind in the race to leverage low Earth orbit for defense and commercial advantage, he noted. While U.S. companies continue to grow their presence in LEO, the U.S. Space Force's Space Development Agency (SDA) is moving forward with plans for its own vast data transport and missile tracking satellite network. China also aims to deploy two massive LEO broadband constellations in the coming years.

"That may drive Russia to try to go after a whole bunch of satellites in one fell swoop," said Galbreath.

SDA director Derek Tournear on Feb. 27 said the agency would not be deterred from pursuing its LEO satellite infrastructure regardless of Russia's nuclear posturing.

Speaking at the Defense and Intelligence Space Conference in Reston, Virginia, Tournear said a widespread EMP attack in space would be a rare "black swan" event rather than an everyday threat scenario. Instead, the Space Force's new satellite architectures are designed to be resilient against more likely dangers like cyber intrusions or compromised supply chains.

The prevailing view among experts is that the United States should work closely with allies to firmly dissuade Russia from even contemplating such a reckless and destabilizing attack that would indiscriminately cripple critical satellites from all spacefaring nations.

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Air Power

Given Political will, Air Power can be Conducted Beyond Enemy lines: IAF Chief

27 March 2024

Source: First Post | https://www.firstpost.com/world/given-political-will-air-power-can-be-conducted-beyond-enemy-lines-iaf-chief-13753402.html

The IAF chief also said that aerial superiority has shaped the destiny of many nations and determined the outcome of many wars, adding that aerial superiority would play a pivotal role and also serve as a symbol of national strength Image Courtesy PTI

Indian Air Force (IAF) chief Air Chief Marshal VR Chaudhari, stated on Wednesday that actions like to Balakot have demonstrated that, with political will, aerospace power can be deployed successfully beyond enemy lines in a scenario of no war, no peace, without spiraling into a full-scale confrontation.

This was stated by the Chief of the Indian Air Force during his inaugural speech on Wednesday at the 15th Jumbo Majumdar International Seminar on Aerospace Power in Future Conflicts in New Delhi.

"Balakot-like operations have shown that, given the political will, aerospace power can be effectively carried out beyond enemy lines, in a no-war, no-peace scenario, under a nuclear overhang without escalating into a full-blown conflict. Ongoing conflicts across the globe have brought out significant lessons for nations in general and air power in particular. Fora such as this are crucial towards developing a better understanding of the nuances of air power application in modern battlespaces," he said.

He also asserted that aerospace power will always remain vital to the conduct of all military operations in the future of warfare.

"The future of warfare will always be a complex tapestry woven with evolving technologies, shifting alliances and the ever-present threat of conflict. Within this tapestry, aerospace power will always remain vital to the conduct of all military operations," he said.

Chaudhari also said that aerial superiority has shaped the destiny of many nations and determined the outcome of many wars, adding that aerial superiority would play a pivotal role and also serve as a symbol of national strength, a tool for peace and cooperation.

"Through the annals of human history, the skies have often been regarded as realms of wonder and exploration, where dreams take flight and boundaries dissolve in the vast blue expanse. Yet, beneath this veneer of calmness lies a domain fraught with competition, where the contest for aerial superiority has shaped the destiny of many nations and decided the outcome of many wars. As we navigate these uncharted skies, air power being a key component of national power would undoubtedly play a pivotal role and also serve as a symbol of national strength, a tool for peace and cooperation," he said.

"Future conflicts will be characterised by a blend of simultaneous application of kinetic and non-kinetic forces, high levels of battlespace transparency, multi-domain operations, high degree of precision, enhanced lethality, a compressed sensor-to-shooter cycle and intense media scrutiny. Coupled with that is the convergence of niche technology like AI, big data, additive manufacturing, block chain and quantum communication making existing weapons and inventories redundant. To be able to fight effectively in such an environment, there is a need to reimagine, realign and reform conventional war fighting ways and means," he said.

He further asserted that as nations increasingly rely on space-based assets for building strategic advantage, militarization and weaponization of space have become an inevitable reality.

"Evolution of aerospace power is not merely a matter of technological prowess but also a testament to the ingenuity and adaptability of human innovation in the face of emerging threats and challenges. Space has emerged as a critical domain for conduct of military operations, wherein, seamless communication, navigation and surveillance capabilities would enhance survivability of modern military forces. As nations increasingly rely on space-

based assets for building strategic advantage, militarization and weaponisation of space has become an inevitable reality," he said.

Speaking about the next step in the development of air power, The IAF Chief emphasised that the focus should be on man and unmanned teaming.

"When we talk of aerospace power in future conflicts, one very important element is the design, development and production of the next generation of fighter aircraft. I am aware that there are many discussions being held on the relevance of manned aircraft in the future. In my opinion, reliance solely on unmanned aircraft is a little farfetched. The next step in development of air power would be man and unmanned teaming. The CATS programme and other such initiatives will go a long way in realizing this capability. Technology like pure stealth, super cruise technology, cross domain integration, advanced long range precision weapons, counter stealth technology, enhanced electronic warfare for full spectrum ops and the capability to deliver a wide array of weapons are some key constituents of fifth and sixth generation aircraft," he said.

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India Test-Fires Agni-V Ballistic missile with Multiple Warhead Technology Under Mission Divyastra

Dinakar Peri | 11 March 2024

Source: The Hindu | https://www.thehindu.com/sci-tech/science/proud-of-our-drdo-scientists-pm-modi-on-first-flight-test-of-agni-5-missile/article67939113.ece/amp/

A file photo of Agni 5 missile. | Photo Credit: The Hindu

In a major technological breakthrough and building in redundancy into the country's nuclear weapons programme, Prime Minister Narendra Modi on Monday announced the successful test firing of Agni-V ballistic missile with Multiple Independently Targetable Re-entry Vehicle (MIRV) technology by the Defence Research and Development Organisation (DRDO) under Mission Divyastra. The MIRV technology means a single missile can carry multiple warheads.

The flight test named Mission Divyastra was carried out from Dr A. P. J. Abdul Kalam Island in Odisha, DRDO said in a statement adding, "Various telemetry and radar stations tracked and monitored multiple re-entry vehicles. The mission accomplished the designed parameters."

"Proud of our DRDO scientists for Mission Divyastra, the first flight test of indigenously

developed Agni-5 missile with Multiple Independently Targetable Re-entry Vehicle (MIRV) technology," Mr. Modi announced on social media platform 'X'. Noting that with this test India has joined the select group of nations who have MIRV capability, Defence Minister Rajnath Singh too joined the PM in congratulating team DRDO.

This technology will ensure that a single missile can deploy multiple war heads at different locations, Government sources said noting that with Mission Divyastra, Government sources said. "This system is equipped with indigenous avionics systems and high accuracy sensor packages, which ensured that the re-entry vehicles reached the target points within the desired accuracy. The capability is an enunciator of India's growing technological prowess," sources said. "The project director is a woman and has significant women contribution."

The maiden flight test of Agni-V, India's longest range ballistic missile with a "range of more than 5000 kms" was conducted in April 2012 and has since been tested multiple times. It has also been canistered, which improves ease of handling and operation. Agni-V uses a three-stage solid fuelled engine and is capable of striking targets at ranges of over 5,000 Kms and can reach most parts of China. DRDO officials had stated over the last several years that MIRV tech was under development.

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IAF Approaches Russia to Examine the Feasibility of Life Extension for IL-76 Heavy-Lift Aircraft

Vijay Mohan | 14 March 2024

Source: Tribune India | https://www.tribuneindia.com/news/chandigarh/iaf-approaches-russia-to-examine-feasibility-of-life-extension-for-il-76-heavy-lift-aircraft-600520

An IL-76 over Chandigarh. Photo by writer

The Indian Air Force (IAF) has approached Russia to examine the feasibility of extending the technical life of its ageing fleet of IL-76 strategic heavy-lift aircraft that have been in service for almost 40 years.

In a request for proposal (RFP) issued to National Aviation Service Company in Moscow this month, the IAF has sought a review of the 'time between overhaul' and 'total technical life' of 11 IL-76MD aircraft.

The exercise is to be carried out at Chandigarh, where the IL-76 fleet is primarily based with No. 44 Squadron. This is unlike as in the past, when the IL-76 used to be sent to Russia for major overhaul and inspections.

According to the RFP, the Russian firm will be required to depute a team of technical specialists to India for undertaking detailed in-depth inspection of the aircraft towards assessment of their technical condition and prepare a detailed

inspection report for each aircraft.

IAF sources said that the proposed upgrading programme would enable the fleet to continue up to the year 2050 from the current stipulated time frame of 2035, besides the possibility of replacing the existing D-30KP engines with the more efficient PS-90a engines and incorporating contemporary avionics suites and control systems.

The fleet has already undergone limited upgrade with the addition of modern electronics and navigational aids and some structural modifications like removal of the rear turret and tail-mounted self-defence cannons.

The IL-76 fleet was procured by the IAF from 1985 to 1989 at a cost of Rs 46 crore per aircraft. These were first inducted with No. 44 Squadron, initially raised at Chandigarh in 1961 and then moved to Agra and Nagpur. One flight of No. 25 Squadron, based at Chandigarh was also equipped with these aircraft.

A total of 17 IL-76s had been procured, but after the collapse of the Soviet Union, serviceability and availability of spares became an issue. A report by the Comptroller and Auditor General, while stating that the IAF now has 14 IL-76 aircraft, revealed that availability of the fleet during the last decade had touched a low of 32.16 per cent.

With its fleet strength declining due to decommissioning a few airframes and cannibalisation of spares, a few years ago, the IAF decided to merge the remaining aircraft into a single squadron. Consequently, the IL-76s from No. 25 Squadron, which relocated with its flight of AN-32s to Baroda from Chandigarh, were reassigned to No. 44 Squadron, which then moved from Nagpur to Chandigarh.

Till the US-made Boeing C-17 Globemaster was inducted into the IAF in 2013, the IL-76 was the mainstay of the IAF's heavy-lift capability. These aircraft have rendered yeoman's service, both in peace and war-like situations as well as in disaster management operations.

These aircraft have been instrumental in airlifting heavy equipment, including tanks and artillery guns to the northern frontier and played a key role during Operation Pawan in Sri Lanka, Operation Cactus in Maldives and Operation Vijay in Kargil. They have also been extensively used in evacuation of Indians from crisis hit areas overseas, joint military exercise with foreign nations and ferrying critical medical supplies during the Covid.

In addition to the IL-76, the IAF also operates six IL-78 aerial refuelling aircraft, which can double up as a cargo aircraft with its fuselage tanks removed, and the A-50 AWACS. Both these aircraft are based on the IL-76 airframe.

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Japan is Bolstering Airpower Capabilities to Deter China

Dr Joshy M Paul | 14 February 2024

Source: CAPS India | https://capsindia.org/japan-is-bolstering-airpower-capabilities-to-deter-china/

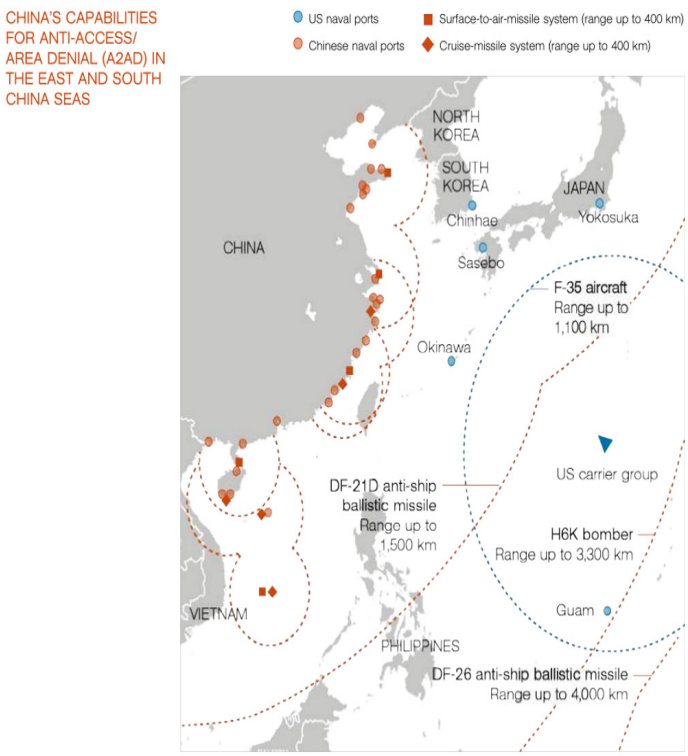
File Image: Patriot missile defense systems.

As a country under the US security umbrella, Japan has been able to continue its pacifist-oriented security policy for a long time, however, this is now changing due to regional and extra-regional circumstances. Japan's security partner the US is now not in a position to provide a full-spectrum security umbrella for Tokyo because of the US' other security commitments as well as its 'inward-looking' economic and security policies, apart from China's military might in East Asia. China's military might and its assertiveness on territorial disputes is a concern for Japan and other regional countries, while Beijing's ability to prevent the US Navy's manoeuvrability in the western Pacific is a challenge to the US military dominance in the Indo-Pacific. In this regard, the US has adopted an 'active denial' strategy- denying the Chinese military's manoeuvrability from going beyond its periphery- while Japan is looking for being a 'normal' military power. In this regard, Tokyo is increasingly focusing on strengthening airpower capabilities to deter China.

China's Airpower Might in East Asia

Through the military modernisation program launched more than two decades ago, China has strengthened its aerial capabilities and has attained a level of maturity both quantitatively and qualitatively to challenge the mighty US military in the East Asian theatre. China's offensive/defensive strategy against the US has been a combination of cruise missiles, surface-to-air and air-to-air missiles, short-to-intermediate range ballistic missiles, and fourth/fifth generation fighter aircraft and bombers. According to the US Department of Defence's report of 2023, China possesses around 2000 theatre missiles (short and medium range) and 500 Intermediate Range (3000-5500 km) Ballistic Missiles (IRBM). The IRBMs of DF-21 and DF-26 are specifically developed to neutralise the US Carrier Strike Groups (CSGs) from approaching the striking range in the western Pacific (Figure 1). The People's Liberation Army Air Force (PLAAF) and the People's Liberation Army Navy (PLAN) together possess a total of 1,900 fighter aircraft of which 1300 are fourth-generation fighters. China has already built three aircraft carriers and may acquire a minimum of six carriers by 2035. The PLAAF's fifth-generation fighter inventories are around 100 J-20 A stealth fighters, and plans to induct 500 J-20s by 2035-38 period. Besides, Beijing is reportedly developing beyond-visual-range air-to-air missiles and exploring missile capabilities that improve target-selection and make the missiles more resistant to countermeasures.

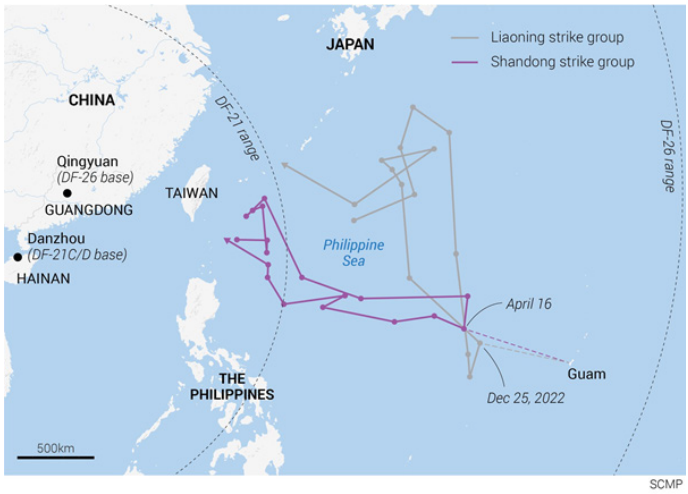
Figure 1: China's A2/AD Capabilities and the Operational range of US CSGs



Source: Luigi Laffranchi," Chinese Strategy in the South China Sea: The A2/AD Bubbles" December 5, 2022, https://iari.site/2022/12/05/la-strategia-cinese-nel-mar-cinese-meridionale-le-bolle-a2-ad/. Accessed on February 14, 2024.

China's airpower has now become a formidable one in East Asia. It can deter the CSGs from approaching the second island chain area and also can strike the US base of Guam. China's H-6 bombers have a combat range of 3000 km and in 2022 three H-6 bombers (two H-6J and one H-6K) flew past Miyako Strait into the Pacific Ocean, to take part in PLA's coordinated air and naval exercise in the western Pacific. Demonstrating China's ability to strike the US base of Guam, in April 2023, the PLA conducted a coordinated exercise of its Rocket Force and the Shandong carrier strike group in the western Pacific, about 400 nautical miles (741km) northwest of Guam (figure-2).

Figure 2: China's Carrier Strike Groups' Exercises off Guam



Source: Minnie Chan, "China says PLA Rocket Force joined Shandong carrier group in drills near US base in western Pacific", South China Morning Post, May 10, 2023, https://www.scmp.com/news/china/military/article/3219989/china-says-pla-rocket-force-joined-shandong-carrier-group-drills-near-us-base-western-pacific-

Besides, in December 2023 China set up its fifth command, the Near-Space Command, under the Central Military Commission, alongside the Army, Navy, Air Force, and Rocket Force of the PLA for high-latitude surveillance and intelligence gathering. The command will use solar-powered drones, robotics, and spy balloons for intelligence gathering. This will enable the PLA to get an early warning about the launch of missiles and fighter aircraft against China and can conduct pre-emptive strikes against US military assets in East Asia and the Pacific.

US' 'Active Denial' Strategy Against China

An aircraft carrier, the most powerful system on surface water, is the main weaponry of the US military in the western Pacific theatre but is now vulnerable to China's anti-access area-denial (A2/AD) capabilities, especially the 'carrier killer' DF-21/26 missiles. To counter the Chinese challenge, Washington has adopted a two-pronged approach: a long-range attack

against Chinese bases and command and control centres from Guam, and helping bolster the regional ally's offensive capabilities, known as the 'active denial' strategy. The 'active denial' or 'deterrence by denial' strategy emphasises maintaining the US military's forward presence in the region and leveraging allies strengths, including geographic position, as well as current or potential niche military capabilities. Australia is getting nuclear-powered attack submarine under the AUKUS (Australia-United Kingdom-United States) deal, and Japan is developing a 6th generation stealth fighter aircraft. Even though the US is not a participant in the Global Combat Air Program (GCAP), Italy and the UK, both NATO members, are involved in the program. South Korea also intends to bolster its aerial strike capabilities with additional 20 F-35A fighter aircraft by 2028, albeit to counter the North Korean threat but would be an added aerial capacity against China, given the strong US-South Korea defence partnerships. The US seeks to constrain China within its periphery by bolstering the aerial capabilities of its allies, especially Japan. It is also developing an anti-hypersonic missile defence system to be placed in Guam and land-based long-range attacking weapons, as well as enhancing the range of Tomahawk cruise missiles.

6th Generation Fighter Program to Bolster Japan's Airpower Capabilities

In its efforts to bolster airpower capabilities, Japan, joined with the United Kingdom and Italy, is developing 6th generation stealth fighter aircraft, named GCAP. For a long time, Japan has been attempting to induct a new generation of fighter aircraft into the Japanese Self Defence Air Force (JSDFAF), replacing the decades-old F-2 developed with the United States in the mid-to-late 1980s. A decade back, Japan had approached the US to purchase its fifth generation stealth fighter aircraft F-22 Raptor but US politics denied permission to the export of F-22, citing the reason "to keep the technology exclusive with the US." Tokyo then, in 2020, planned to develop a home-grown designed and developed stealth aircraft on a hybrid model of the F-22 and F-35 through a collaboration between the US' Lockheed Martin and Japan's Mitsubishi Heavy Industries, at the cost of US $40 billion. However, this proposal was also shot down by the US, citing the reason that sharing of the F-35's technologies with states outside the NATO (North Atlantic Treaty Organisation) and Five Eyes alliance systems is prohibited.

Now, these three countries have divided the top positions, with the UK hosting the governmental and commercial headquarters. The first chief executive officer of the government body will come from Japan, and the first head of the industry organisation will be from Italy. Japan is likely to be the major customer of the aircraft as well as the finance contributor and may also host the assembling units, however, engine and technology will come from the European countries. From the commercial side, Japan's Mitsubishi Heavy Industry, Britain's BAE Systems PLC, and Italy's Leonardo are the partners to build the new aircraft. This comes after shelving individual programs of Japan and the UK-Japan's Mitsubishi F-X to succeed the retiring F-2s and the UK's Tempest. The new aircraft will be ready for deployment by 2035. The new aircraft most likely will be a fighter for air superiority like the US Air Force's F-22 Raptor because Japan has already ordered 105 multirole F-35s (63 F-35As, 42s F-35Bs) with a total cost of US$23 billion and the deployment

will begin this year itself. Currently, Japanese Air Self Defence Force possess 519 combat capable fighter aircraft, while 63 F-35As will be inducted within few years. Besides, Japan's Maritime Self Defence Force operates four aircraft carrier type destroyers, and the F-35Bs will be operating from these vessels.

By releasing the latest National Security Strategy in December 2022, Fumio Kishida administration revealed its plan to spend 2 per cent of the GDP on defence, double the self-imposed cap it has maintained since the 1960s. The government has earmarked nearly US$320 billion for a five-year plan through 2027 to bolster deterrence against armed attack on Japan. Out of the defence budget of US$56 billion for the financial year 2024-25, Japan plans to spend more than US$5 billion for building a fleet of standoff missiles, nearly US$9 billion will go toward enhancing the country's air and missile defence systems, and around US$500 million will be invested as the first instalment of the GCAP. Tokyo also plans to set up a Space-based missile defence system with 50 satellites in a low Earth orbit to track next-generation hypersonic missiles capable of evading current missile defence systems. The satellite system will be useful for gathering information for precision strikes on enemy bases.

The five-year plan for defence spending will also go for developing longer-range missiles, such as improved Mitsubishi Heavy Industries Type 12s, Kongsberg Joint Strike Missiles, and Lockheed Martin Joint Air-to-Surface Standoff Missiles, that can strike distant warships and land targets in China or North Korea. Besides, Japan is acquiring 400 improved US-made Tomahawk Land Attack Cruise Missiles (LACM), consisting of 200 Block IV and 200 Block V, while also designing its own hypersonic rockets. Tomahawk's latest version Block V has a range of 1600 kilometres which can hit Chinese and North Korean bases and the missile will be deployed by 2025. In a US-China confrontation, Japanese military bases, airports, seaports, and other logistical hubs could also be tempting targets for Chinese air and missile strikes because they would be staging grounds for the US forces.

Moreover, policymakers and security analysts in Japan believe that the year 2027 will be a defining moment in the East Asian security landscape. China celebrates the centennial of the founding of the PLA in 2027, and on 15 July 2023, President Xi, in an address to party members within the military, called for the CCP leadership "to provide a strong political guarantee for achieving the centennial goal of the PLA." Even though the centennial goals have not been revealed, analysts believe that it could be an invasion of Taiwan by China. In this regard, Japan needs to prepare to face the contingency in a post-2027 scenario, given the context of a territorial dispute between Tokyo and Beijing over the Senkaku islands and PLA's provocations in the East China Sea.

Options for India

India and Japan are secondary states in the hierarchy of the military power index in which China is an emerging great power. Balance of power in international relations theory propounds that secondary states necessarily collaborate and balance against the rising power. Both India and Japan already have a strong defence engagement through military exercises like Malabar and JIMEX for the navy and Veer Guardian for the air force, as well

as bilateral Coast Guard exercises. However, defence technology cooperation is the one area the relationship is lacking. In this regard, New Delhi should leverage the strong India-Japan defence partnership to enhance Indian Air Force's offensive capabilities. Currently, Japan cannot export its military equipment other than to the licensees, but it is mulling changing the laws, ostensibly to sell the 6th generation fighters to third countries. Japan has a strong ecosystem in the defence manufacturing sector, involving about 1,100 companies in the manufacture of fighter aircraft, about 1,300 companies in the production of tanks, and about 8,300 companies in building destroyers. New Delhi should seek technical collaboration with these Japanese sub-contractors in the production of defence equipment and create a strong defence ecosystem in India.

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Aerospace Power in Future Conflicts

27 March 2024

Source: Bharat Shakti | https://bharatshakti.in/aerospace-power-in-future-conflicts-challenges-transformation-and-strategic-implications/

The 15th Jumbo Majumdar International Seminar, is a prestigious event in the calendar of the defence and strategic community. Thematically, it's focused on Aerospace Power in Future Conflicts. This edition of the seminar brought together veterans, experts, and members of the strategic community to discuss the evolving role of air power in modern warfare.

The 15th Jumbo Majumdar International Seminar was conducted at the Air Force Auditorium in New Delhi, today. The Seminars are dedicated to the memory of Jumbo Majumdar, the first Indian to attain the prestigious rank of Wing Commander in the Indian Air Force. He was an officer who exhibited remarkable professionalism and adherence to military standards throughout his remarkable career.

The seminar's focus was on the decisive influence of Aerospace Power would have on future conflicts. The seminar brought together veterans, experts, and members of the strategic community to discuss the evolving role of air power in modern warfare. The inaugural address was delivered by Air Chief Marshal V.R. Choudhari, Chief of Air Staff (CAS).

As nations confront the challenges of contested skies and space domains, the seminar emphasized the significance of aerospace capabilities in shaping national security and maintaining strategic advantages. Certain issues highlighted by the CAS in his remarks and also discussed during the seminar require to be highlighted.

The Relevance of Aerospace Power in Future Conflicts

Future wars will be characterized by a blend of simultaneous application of kinetic and non-kinetic forces, high levels of battlespace transparency, multi-domain operations, precision, enhanced lethality, compressed sensor-to-shooter cycles, and intense media scrutiny.

Aerospace power will play a pivotal role in

these conflicts, serving as a symbol of national strength, a tool for peace and cooperation, and a means to maintain national security. The evolution of aerospace power is not merely a matter of technological prowess. Its growth has been spurred by human innovation in the face of emerging threats and challenges.

Space as a Critical Domain in Future Conflicts

As nations increasingly rely on space-based assets for strategic advantage, the militarization and weaponization of space have become inevitable realities. Space has emerged as a critical domain for the conduct of military operations, wherein seamless communication, navigation, and surveillance capabilities will enhance the survivability of modern military forces. To gain and maintain decision superiority, nations must invest in emerging technologies such as CMOS (complementary metal oxide semiconductor) sensors, smart decision support matrices, manned-unmanned teaming, and robust command, control, communications, computers, and intelligence (C4&I) networks.

The Role of Manned and Unmanned Aircraft in Future Conflicts

There is an ongoing debate on the relevance of manned aircraft in the future. The next step in the development of air power will be manned-unmanned teaming. with initiatives like the Combat Air Training System program playing a crucial role in realizing this capability. The next generation of fighter aircraft should incorporate features such as pure stealth, super cruise technology, cross-domain integration, advanced long-range precision weapons, counter-stealth technology, and enhanced electronic warfare for full-spectrum operations.

Sustainability of Small Fleet of Modern Aircrafts in Future Conflicts

A small fleet of modern aircraft risks becoming too stretched to generate meaningful effects, affecting aircraft readiness and availability. This situation may limit the operational capacity of some air forces and the missions they could support. The reduction in aircraft availability could contest numerical depth, thereby negatively affecting the readiness and availability of platforms for operations. Nations should aim for a balanced mix of high-end and mid-tier capabilities to ensure operational capacity and maintain numerical depth in the face of emerging challenges.

Lesson from Balakot Operations

Balakot operations have shown that given the political will, aerospace power can be effectively carried out beyond enemy lines, in a no-war, no-peace scenario, under a nuclear overhang without escalating into a full-blown conflict. Ongoing conflicts across the globe have brought out significant lessons for nations in general and air power in particular.

Prognosis: Aerospace Power

The future of warfare will always be a complex tapestry woven with evolving technologies, shifting alliances and the ever-present threat of conflict. Within this tapestry, aerospace power will always remain vital to conduct of all military operations.

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Space

ISRO Achieves Yet Another Success in the RLV Landing Experiment

22 March 2024

Source: ISRO | https://www.isro.gov.in/RLV_Landing_Experiment.html

ISRO has achieved a major milestone in the area of Reusable launch vehicle (RLV) technology, through the RLV LEX-02 landing experiment, the second of the series, conducted at Aeronautical Test Range (ATR), Chitradurga in Karnataka 22 March 2024 morning at 7:10 hrs IST.

After the RLV-LEX-01 mission was accomplished last year, RLV-LEX-02 demonstrated the autonomous landing capability of RLV from off-nominal initial conditions at release from Helicopter. The RLV was made to undertake more difficult manoeuvres with dispersions, correct both cross-range and downrange and land on the runway in a fully autonomous mode. The winged vehicle, called Pushpak, was lifted by an Indian Airforce Chinook helicopter and was released from 4.5 km altitude. After release at a distance of 4 km from the runway, Pushpak autonomously approached the runway along with cross-range corrections. It landed precisely on the runway and came to a halt using its brake parachute, landing gear brakes and nose wheel steering system.

This mission successfully simulated the approach and high-speed landing conditions of RLV returning from space. With this second mission, ISRO has re-validated the indigenously developed technologies in the areas of navigation, control systems, landing gear and deceleration systems essential for performing a high-speed autonomous landing of a space-returning vehicle. The winged body and all flight systems used in RLV-LEX-01 were reused in the RLV-LEX-02 mission after due certification/clearances. Hence reuse capability of flight hardware and flight systems is also demonstrated in this mission. Based on the observations from RLV-LEX-01, the airframe structure and landing gear were strengthened to tolerate higher landing loads.

The mission was accomplished by Vikram Sarabhai Space Centre (VSSC) along with the Liquid Propulsion System Centre (LPSC) and the ISRO Inertial Systems Unit (IISU). Collaboration from various agencies including IAF, ADE, ADRDE and CEMILAC contributed to the success of this mission. Shri S Somanath, Chairman, ISRO / Secretary, DOS, congratulated the team for the flawless execution of this complex mission. On the success of the landing experiment, Director VSSC Dr S Unnikrishnan Nair mentioned that through this repeated success, ISRO could master the terminal phase manouvering, landing and energy management in a fully autonomous mode, which is a critical step towards the future Orbital Re-entry missions

The team was guided by Shri Sunil P, Programme Director, Advanced Technology and Systems Programme, VSSC. Shri J Muthupandian, Project Director, RLV was the Mission Director and Shri B Karthik, Deputy

Project Director, RLV was the Vehicle Director for this mission.

For the success of this experiment, ISTRAC provided tracking support, SAC provided a Pseudolite system and a Ka-band Radar Altimeter, LPSC offered all pressure sensors on the wing body, IISU provided navigation hardware/software and an integrated solution. Metrological and wind measurement support was provided by SDSC-SHAR, and URSC offered ground power support.

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Space Force, Space Command Seek Over $2 Billion for Unfunded Programs to Counter Anti-Satellite Threats

Sandra Erwin | 25 March 2024

Source: Space News | https://spacenews.com/space-force-space-command-seek-over-2-billion-for-unfunded-programs-to-counter-anti-satellite-threats/

Satellite antennas used in the Counter Communications System 10.2 electronic jammer developed by L3Harris under contract to the U.S. Space Force. Credit: L3Harris

Washington — The U.S. Space Force and U.S. Space Command submitted a combined $2.3 billion in "unfunded requirements" to Congress last week, with the vast majority of the funds requested for classified programs aimed at space control, space superiority, and space domain awareness. These are broad categories of technologies sought by the military to protect U.S. assets in orbit from anti-satellite weapons being developed by China and Russia.

The unfunded priorities list is an annual ritual in which the military services detail important priorities and capabilities left out of the president's official budget request. The items in the Space Force's $1.1 billion and Space Command's $1.2 billion lists did not make it into the fiscal year 2025 budget proposal the Pentagon submitted to Congress on March 11, which included $29.4 billion for the Space Force. Space Command is a combatant organization that relies on the Space Force to acquire the space hardware and systems needed for operations in the space domain.

Funds Needed To Improve Satellite Defense

Gen. Stephen Whiting, head of U.S. Space Command, said in a memo to congressional committees that the funding is crucial to defend U.S. satellites from threats posed by anti-satellite weapons being developed by China and Russia. These weapons, if used, could disrupt Global Positioning System satellite navigation, communications, and intelligence gathering capabilities vital to the U.S. military.

"Chinese and Russian threats in the space domain pose a dangerous challenge to the American military instrument of national power and our modern way of life," Whiting wrote. "Their increasingly assertive actions have created threats to our critical space infrastructure and national space power, putting all branches of the military at risk."

He noted that Russia "presents an acute threat as it becomes increasingly focused in its cyber, nuclear and space capabilities."

The requests for space control, space superiority

and space domain awareness technologies did not provide specifics due to classification.

Space control involves measures to ensure U.S. military operations in space while denying adversaries the same. Space superiority is the capability to maintain freedom of operation in space for the United States and its allies. And space domain awareness refers to tracking objects and activities in orbit to avoid collisions and detect potential hostile actions.

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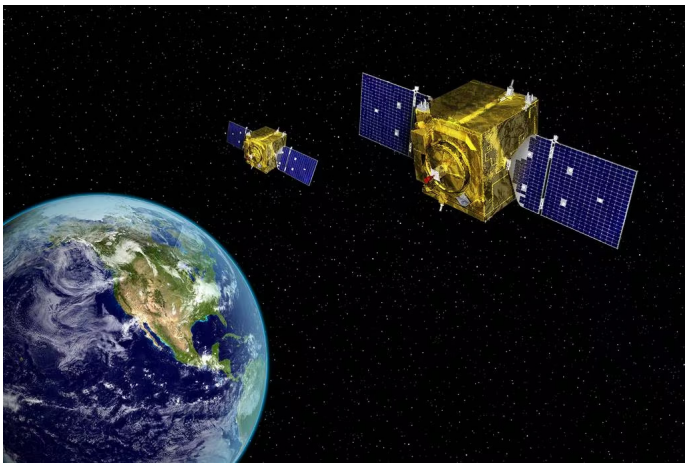
Space Force Eyes Expanded Network of 'Neighbourhood Watch' Satellites

Courtney Albon | 08 March 2024

Source: C4ISRNET| https://www.c4isrnet.com/battlefield-tech/space/2024/03/08/space-force-eyes-expanded-network-of-neighborhood-watch-satellites/



The Space Force's Geosynchronous Space Situational Awareness Program satellites, depicted here, serve a neighborhood watch function. (U.S. Air Force)

The Space Force said it may develop a new constellation of domain awareness satellites to detect and track objects in geosynchronous orbit, about 22,000 miles above Earth.

Space Systems Command — the service's acquisition arm — is in the early phases of planning for the capability, according to March 05 notice, and is seeking industry feedback as it studies the prospect of increasing its portfolio of observation satellites.

Domain awareness is a top priority both for the Space Force and U.S. Space Command as they look to better characterize and deter threats from adversaries like Russia and China. As the service prepares to release its budget request for fiscal 2025 next week, Vice Chief of Space Operations Gen. Michael Guetlein on March 7 called for more funding for space domain awareness capabilities, among other areas.

"We must invest more in test and training, space domain awareness, command and control, and in the ability to control the domain," he said in a March 7 speech at the McAleese & Associates annual defense forum in Washington.

The service already operates a fleet of Geosynchronous Space Situation Awareness Program, or GSSAP, satellites that serve a kind of neighborhood watch function. They also perform rendezvous and proximity operations, drawing close to other satellites to observe and provide data on them.

Details on GSSAP's full suite of capabilities are slim as the program is largely classified. The service first launched the Northrop Grumman-built spacecraft in 2014 and in 2022 fielded two more to replenish the constellation. Last year, it deactivated one of the six GSSAP satellites in orbit.

It's not immediately clear how the additional GEO satellites would be distinct from GSSAP. However, one key difference is that the service wants the spacecraft to carry carry a Space Force-supported, in-orbit refueling port that would allow them to extend missions.

In recent years, Space Command leaders have pushed for the service to field more refuelable spacecraft to support more dynamic operations, noting that satellites like GSSAP are somewhat limited due to their fixed fuel supply.

Last year, then-deputy Space Command commander Lt. Gen. John Shaw called on the Space Force to equip all space observation satellites to be equipped for refueling by the end of the decade.

The notice indicates the satellites would be highly maneuverable and would carry an electro-optical payload. The service is also looking for low-cost systems that require minimal development and could be quickly built and launched.

The spacecraft wouldn't need bespoke ground systems or operational units but would instead rely on existing capabilities.

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As Space Security Scares Mount, India Works on Military Space Capabilities

Neelam Mathews | 29 March 2024

Source: The Wire | https://thewire.in/space/as-space-security-scares-mount-india-works-on-military-space-capabilities

Photo: Unsplash

New Delhi: Recent US intelligence suggesting Russia may be proposing to locate a nuclear weapon in space to target satellites, resulted in panic not just in the US, but the rest of the world, not geared to counter the new threat. The reality of China with colossal budgets, being far ahead in the race, is bringing attention to India's steps towards its defence space efforts led by the Defence Space Agency (DSA) formed in 2019 to create a tri-service integrated Aerospace Command led by the Indian Air Force.

Serious discussions on the strategy and blueprint of the much-needed command are underway. Being a complex technological challenge, the Aerospace Command will become fully operational in a decade or more. Not having a command does not imply India has no defence space assets or no activity in progress.

There is no cause for concern, (Retd) Air Vice Marshal D.V. Khot, former Director General DSA, told The Wire. "This is not a sudden activity kicking off. It is more of a rolling evolution of capability."

"The defence space command will be a nodal agency in a wholesome fashion that will look after the requirements of space for the military. It will be an upgradation of DSA. Our mandate is to upscale capabilities," he added.

"Space being space requires a gestation period and budgets," he explained. The road is complex as next-gen technology upgrade needs of the military for Command, Control, Positioning Navigation and Timing System, Communications, Intelligence, Information, Surveillance, and Reconnaissance will change along the way. "It is better to have some information than no information at all," a military space-related official said.

The Aerospace Command is likely to pick up learnings from the US Space Command that has been morphed according to changing requirements of world events. It recently released its updated strategic vision affirming the need to "ensure a safe, secure, and sustainable domain amid increasing threats". "By 2027, USSPACECOM (will) enable Joint Force lethality …. protecting it from space-enabled attack."

As space gets crowded, the risk of collision among satellites and debris increases. India, like many other nations, may also have to deal with hostile counterspace attacks.

"We want more (money)" is the constant refrain of those involved. Recently, Chief of Defence Staff Gen Anil Chauhan announced at the DefSat conference held in New Delhi: "Indian armed forces have earmarked funds of Rs 25,000 crore to meet defence space requirements, ranging from building a constellation of surveillance satellites to secure communications networks."

Chauhan welcomed the participation of the private sector to help fasten the process of launching and constructing defence satellites. While this is a generous start, it is a tedious journey as the military moves towards a fully operationalised Aerospace Command. The Space Policy 2023, for instance, will need to be enacted as an act for the private sector to participate and invest in space-based applications and services in defence.

A beginning has been made. Tata Advanced Systems Ltd (TASL) and US-based Satellogic will collaborate on the development of a new satellite design and work together to integrate multiple payloads on a single satellite that will generate a diverse range of data over India – the first of which is planned to be launched as TSAT-1A, according to a joint statement. "The focus will be on manufacturing satellites and developing imagery in India for national defence and commercial applications," it added.

The emergent need is apparent. China has at least 140 military satellites and a space program that is miles ahead, having conducted an Anti-satellite weapon (ASAT) test 12 years before India did in March 2019. According to NBC News, the most worrisome development has been China's advances in hypersonic manoeuvre missiles. Launched from a rocket, hypersonic missiles pose a risk to satellites, fly at least 20 times the speed of sound, can circle the Earth and strike a target while evading most ground-based air defences.

India has around 15 military-application satellites but only two dedicated ones. The Indian Navy GSAT-7R, an Indian Navy communications satellite, delayed by two years already, is expected to be launched later in the year to replace the aged GSAT-7, called Rukmini that gives the Navy real time communication link between its land stations, surface ships, submarines, and aircraft. GSAT-7A (Angry Bird) is used by the Air Force. GSAT 7B, first in the five-tonne category, for advanced communication needs of the army cleared last year for acquisition to be developed by ISRO, has yet to take off.

Price Waterhouse Coopers in a recent report reiterated: "India has made good progress in the space domain…… with good capabilities in civilian satellite applications. However, due to the changing nature of space use and a concerted move towards non-kinetic warfare,

there is a need to increase focus on the military applications of space technologies."

India has been slow to utilise space for military benefit as the Indian Space Research Organisation (ISRO) through the decades insisted it was only a civil space organisation. This was due to US sanctions. It was only in 2016 that India became a member of the Missile Technology Control Regime (MTCR), a multilateral export control body with an informal political understanding to limit proliferation of missiles and missile technology. But the mindset of ISRO through time, remains till date.

Given the slow progress of military satellites being launched and the need for large volumes of nano satellites in low earth orbit that have a shorter shelf life and require faster replacement, the military has said it would like the private sector to enter the field. For this it has suggested a launch – on-demand – that would be overseen by the Aerospace Command, The Wire has learnt.

Only time will tell whether, and when, this fructifies.

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Global Aerospace Industry

Indian Committee OKs $4 Billion Buy of BrahMos Missiles, More Tech

Gordon Arthur | 01 March 2024

Source: Defence News | https://www.defensenews.com/global/asia-pacific/2024/02/29/indian-committee-oks-4-billion-buy-of-brahmos-missiles-more-tech/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch

A quad launcher for BrahMos supersonic cruise missiles is seen mounted aboard the Indian Navy's guided-missile destroyer INS Delhi. (Gordon Arthur/Staff)

Christchurch, New Zealand — The Indian government is closer to buying a multibillion-dollar package of cruise missiles, air defense weapons, surveillance radars and fighter jet engines following approval from the country's highest decision-making body on security affairs.

At a Feb. 21 meeting, the Cabinet Committee on Security approved the four procurement projects cumulatively worth about 350 billion rupees (U.S. $4 billion).

According to local media reports quoting government sources, the approved items were BrahMos cruise missiles for the Navy, air defense guns for the Army, ground-based air surveillance radars and new engines for the Air Force's MiG-29 fighters.

Approval by the committee, which Prime Minister Narendra Modi chairs, is a necessary step along the Defence Ministry's contractual pathway.

Local media reported the BrahMos missile deal would be signed in March. The consolidated contract would include some 220 weapons to arm Indian frigates and destroyers — the largest-ever individual BrahMos order for India.

The contract will reportedly involve a mix of standard 290-kilometer-range (180-mile-range) and extended 450-kilometer-range (280-mile-range) BrahMos missiles, of which 75% is locally made.

"The BrahMos is expected to considerably enhance the potential for surface-to-surface attacks by Indian Navy ships, especially with extended-range missiles," Rahul Bhonsle, a director of the New Delhi-based consultancy Security Risks Asia, told Defense News.

India is also exporting BrahMos missiles to the Philippines under a deal worth about $375 million signed in January 2022. Atul Rane, who leads the missile manufacturer BrahMos Aerospace, said last year the company has set a goal of exporting $5 billion worth of BrahMos weapons by 2025.

The committee also approved the purchase of Sudarshan air defense systems from private firm Larsen & Toubro — an acquisition worth approximately $844 million. The Army would use the systems, which feature radars and 40mm guns, to protect its installations and the country's border areas.

The Sudarshan approval followed an October 2022 request for procurement seeking 141,576 ammunition rounds to accompany 220 guns, including pre-fragmented, programmable proximity fuses and smart rounds.

The Sudarshan is also competing in an Air Force competition for 244 close-in weapon systems.

"Air defense guns have assumed importance because of the overall weak air and missile defense profile with dated equipment, with the Indian Army in particular, and the add-on threat from drones," Bhonsle explained.

The Indian Army relies on antiquated Bofors L/70 and ZU-23-2B towed guns, and their replacement has become urgent given the emerging threat of drones and loitering munitions.

Larsen & Toubro is also set to provide the air surveillance radars, worth about $723 million. India is prioritizing better radar coverage of its northern and western borders to guard against Chinese and Pakistani aircraft, respectively. Augmenting the existing radar network in phases, the Air Force will operate the new indigenous sensors.

And Hindustan Aeronautics Ltd. is to manufacture new RD-33MK engines for MiG-29 fighters in collaboration with Russia, with the project worth about $639 million.

These projects underscore India's attempts to maximize indigenous input. The Make in India economic policy seems to be gaining groud, Bhonsle said.

"However, it should be noted there is also considerable foreign collaboration involved in many of the projects, as up to 50% or more is permissible under existing rules for acquisition," Bhonsle added.

Air India Changes Aircraft Order with Airbus, Cites 'Business Requirements'

Deepak Patel | 06 December 2023

Source: Business Standard | https://www.business-standard.com/companies/news/air-india-changes-aircraft-order-with-airbus-cites-business-requirements-123120600484_1.html

Air India

Air India significantly altered the composition of the aircraft order it placed earlier this year with Airbus, the European plane manufacturer has said.

In February, Air India had placed the world's second-largest single-tranche aircraft order for 470 planes: 250 with Airbus and 220 with Boeing.

In July, Airbus disclosed an order comprising 70 A321neo, 140 A320neo, 34 A350-1000, and six A350-900 aircraft for Air India.

Late on Tuesday, Airbus revealed that Air India's order was now for 140 A321neo, 70 A320neo, 20 A350-1000, and 20 A350-900.

"We regularly review our orderbook based on business requirements and opportunities, and exercise contractual flexibilities as appropriate," an Air India spokesperson said in response to queries by Business Standard.

Aviation industry sources said that the aircraft order could have been altered considering the need for planes and supply chain issues affecting the delivery schedule. Air India has 127 aircraft in its fleet and 15 of them are grounded.

The A321neo, Airbus' longest-fuselage member in the best-selling A320 narrow-body aircraft family, can accommodate 180 to 220 passengers in a standard two-class layout and up to 244 in a higher-density arrangement.

While the A320neo has a range of 6,300 kilometers, the A321neo has a range of up to 8,700 kilometers. The extensive range of the A321neo could facilitate the airline in reaching a broader array of international destinations, aligning with Air India's primary focus on the international market.

Air India has already received four out of the 20 A350-900s from Airbus, but they are undergoing painting in the airline's livery. Sources indicate that the airline may have chosen more A350-900s as it believes that the aircraft adequately fulfils its requirements. Although the A350-1000s offer a longer range, they also entail additional costs.

Furthermore, supply chain disruptions are impacting the entire aviation industry, and each airline is striving to secure a reliable delivery schedule. Air India's decision to modify the aircraft order may align with this consideration, according to sources.

Campbell Wilson, Air India's chief executive officer and managing director, last month told Business Standard in an interview that India was a huge travel market but much of the international market was not traveling on Indian carriers, in part because Air India and other Indian carriers either haven't had the capacity investment or product investment or

haven't built the reputation.

"Therefore, so much of the market is travelling via somewhere else. And if we can get better, all that market will come back to us because I think there is a great desire for an Indian carrier to be good enough. That market size is there. If we do our job better, we can capture it," he had said.

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SpaceX's Starship and the New Space Race: Reshaping the Future of Satellite Launches

Theresa Cross | 28 March2024

Source: Space Explored | https://spaceexplored.com/2024/03/28/spacexs-starship-and-the-new-space-race-reshaping-the-future-of-satellite-launches/

Image: SpaceX

In an evolving space industry landscape marked by both innovation and competition, the emergence of SpaceX's Starship launch vehicle stands out as a pivotal development. Designed to place over 100 metric tons into low Earth orbit, Starship has garnered significant attention from companies specializing in the deployment of smaller payloads of about one metric ton or less.

The potential for a fully-reusable Starship to reshape the market, a dynamic already influenced by SpaceX's partially-reusable Falcon 9 rocket, is a topic of considerable discussion among industry leaders and stakeholders. At the Satellite 2024 conference in Washington, D.C., discussions highlighted the disruptive potential of Starship, particularly its impact on the small launch vehicle market.

Arianespace's senior vice president, Marino Fragnito, acknowledged the transformative effect the mega rocket could have, potentially leading to lower prices and a shift toward building larger satellites. This scenario presents both challenges and opportunities for companies in the space launch sector.

The space industry is currently navigating a period of transition, marked by the introduction of new launch vehicles aimed at increasing market capacity and offering competitive advantages amidst a growing field of competitors. Notably, the conference featured panels with representatives from companies that have recently achieved the first successful launches of their new vehicles, as well as those still in the developmental phase. Among these are Relativity Space and Rocket Lab – both are working on medium-class reusable launch vehicles.

Relativity Space is targeting a 2026 launch for its Terran R rocket, emphasizing the ongoing tests of its Aeon R engines and the expansion of its production facilities. Meanwhile, Rocket Lab, known for its Electron small launch vehicle, projects its larger Neutron rocket could be operational by the end of the year, pending full-scale testing of its Archimedes engine.

The discussion also touched upon the broader challenge of capacity in the market. Mark Peller from United Launch Alliance mentioned

the transition phase following the successful inaugural launch of Vulcan Centaur, focusing on achieving a steady launch cadence. Mitsubishi Heavy Industries shared insights from its second H3 rocket launch, marking a recovery from its failed maiden launch last year. Additionally, Arianespace announced the anticipated inaugural flight of its Ariane 6 rocket, set for the latter half of June, signaling a new phase for the European launch service provider.

The space industry's journey toward the next generation of launch vehicles reflects a blend of ambition, technological innovation, and strategic positioning. As companies strive to differentiate themselves and capitalize on emerging opportunities, the landscape continues to evolve, driven by advancements that promise to expand humanity's reach and capabilities in space.

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Indian Aerospace Industry

DefConnect 2024: Raksha Mantri launches ADITI Scheme to Promote Innovations in Critical & Strategic Defence Technologies

04 March 2024

Source: PIB | https://pib.gov.in/PressReleseDetail.aspx?PRID=2011171

Raksha Mantri Shri Rajnath Singh launched Acing Development of Innovative Technologies with iDEX (ADITI) scheme to promote innovations in critical and strategic defence technologies, during DefConnect 2024 in New Delhi on March 04, 2024. Under the scheme, start-ups are eligible to receive grant-in-aid of up to Rs 25 crore for their research, development, and innovation endeavours in defence technology. "The scheme will nurture the innovation of youth, and help the country leap forward in the field of technology," the Raksha Mantri said as he addressed a gathering of industry leaders, entrepreneurs, innovators, and policymakers.

The ADITI scheme worth Rs 750 crore for the period 2023-24 to 2025-26 falls under the iDEX (Innovations for Defence Excellence) framework of Department of Defence Production (DDP), Ministry of Defence. It aims to develop about 30 deep-tech critical and strategic technologies in the proposed timeframe. It also envisages to create a 'Technology Watch Tool' to bridge the gap between the expectations and requirements of the modern Armed Forces and the capabilities of the defence innovation ecosystem. In the first edition of ADITI, 17 challenges – Indian

Army (3), Indian Navy (5), Indian Air Force (5) and Defence Space Agency (4) - have been launched.

Shri Rajnath Singh voiced Prime Minister Shri Narendra Modi-led Government's unwavering commitment to encourage the youth to bring forth innovative ideas. He asserted that to motivate young innovators, iDEX was expanded to iDEX Prime, with the assistance increasing from Rs 1.5 crore to Rs 10 crore. Following the encouraging participation in providing solutions to the challenges given by the Services and DPSUs, ADITI scheme has now been launched, he said.

The Raksha Mantri stated that the idea behind the schemes/initiatives such as ADITI, iDEX, iDEX Prime is to also transform India into a knowledge society. "As times are changing, new technologies are coming into existence. To become a developed country, it is necessary for us to achieve a technological edge. We have to transform our country into a knowledge society," he said.

The event also witnessed the launch of the 11th edition of Defence India Start-up Challenge (DISC), heralding a new chapter in the collaboration between the defence establishment and the start-up ecosystem. The DISC 11 introduces 22 problem statements - Indian Army (4), Indian Navy (5), Indian Air Force (5), Armoured Vehicles Nigam Limited (7) and Hindustan Shipyard Limited (1) - aimed at addressing critical defence challenges, inviting innovators to propose innovative solutions that can enhance the country's defence capabilities and contribute to national security.

Shri Rajnath Singh described 'getting a hold on state-of-the-art defence technology' as the most crucial aspect to achieve self-reliance due to the increasing role of cutting-edge technology in warfare in today's time. He stated that technology can be mastered either by adopting the latest innovation from other countries or by developing our own. The Government is working on both methods, he stressed.

"Under offset, we are acquiring technology from various countries through Foreign Direct Investment (FDI). But, like this, we cannot obtain best technologies as countries never share their latest innovations. This is why there is a need to develop the required technologies on our own. For this, we need research and development (R&D). There are a number of conditions that need to be fulfilled to establish a productive R&D ecosystem. India has a large workforce of energetic and skilled youth who are committed to taking India forward in the field of technology. When we have such a skilled workforce, we should not shy away from setting ambitious goals. Our youth are fully empowered to make India self-reliant in the defence sector, and the government is providing them with the environment to touch greater heights," the Raksha Mantri said.

Highlighting the Government's vision of attaining self-reliance as soon as it came to power, Shri Rajnath Singh said the nation cannot remain dependent on import of weapons/platforms as it can be fatal for strategic autonomy. He stated that without self-reliance, India cannot take independent decisions on global issues in line with its national interests.

"Strategic autonomy can be maintained only when arms and equipment are made in India by our own people. We are working towards this,

and the results are positive. While in 2014 our domestic defence production was around Rs 44,000 crore, today it has crossed the record figure of Rs one lakh crore, and growing continuously. This change took place due to our conistent efforts. Tough decisions had to be taken. Status-quo had to be disrupted," the Raksha Mantri said, while listing out a number of measures taken to promote domestic manufacturing, including earmarking 75% of defence capital procurement budget for Indian companies.

Shri Rajnath Singh emphasised that governance and commerce or business are codependent and the private sector needs a platform to flourish, which is being provided by the Government to achieve the goal of strengthening the economy. "Many aspects such as law & order, healthy & skilled workforce, rule of law and research & development ecosystem are needed to provide a platform for the private sector. Society and the government together provide these requirements so that the private sector moves forward and boosts the productivity & capacity of the economy," he added.

The Raksha Mantri highlighted the efforts being made by the Government to achieve 'Aatmanirbharta' in defence production, including notifying positive indigenisation lists of major platforms & equipment that are being/ will be manufactured in India. He suggested to the DDP that "in the coming 4-5 years, we should come out with a short negative list containing items that will be imported and we should strive to eliminate that list to achieve complete self-reliance".

As part of DefConnect 2024, a technology showcase was also organised by iDEX-Defence Innovation Organisation (DIO) with a diverse range of technology start-ups at the forefront of innovation in the defence sector. These start-ups are revolutionising key areas such as Artificial Intelligence and Robotics, Undersea Detection and Communication, Unmanned Aerial Vehicles, Wearable Technology, Blast & Ballistics Proof Structures and Equipment, smart textiles and cyber security. These start-ups represented cutting-edge technologies and innovations, offering solutions to enhance defence capabilities, strengthen national security, and safeguard national interests. The showcase underscored the immense potential of the Indian innovation ecosystem in contributing to defence technology.

As part of a broader discourse on diversity and inclusion in defence entrepreneurship, DefConnect 2024 hosted a thought-provoking panel discussion on 'Women as Drivers of Change'. The discussion explored the pivotal role of women in shaping the future of defence innovation and strategies to further promote gender diversity in the sector. The panel witnessed various noted participants from the Department of Space, Indian Air Force, Financial institutions and start-ups. The discussion offered insights on the Indian Defence Landscape, Technology, Future Trends, Innovation, and opportunities for the Indian start-up ecosystem. In recognition of the invaluable contributions of women entrepreneurs to the defence innovation ecosystem, DefConnect 2024 featured a special felicitation ceremony for iDEX women entrepreneurs.

In addition, DefConnect 2024 witnessed the launch of a rolling iDEX internship program, aimed at nurturing young talent and providing

them with hands-on experience and mentorship in defence innovation. This initiative seeks to groom the next generation of innovators and equip them with the skills and knowledge necessary to contribute effectively to the defence innovation ecosystem.

Furthermore, as part of its ongoing efforts to foster investment in defence start-ups, iDEX announced Memoranda of Understanding (MoUs) with new investors under the iDEX Investors Hub (IIH). These partnerships will facilitate increased investment in defence start-ups, providing them with the necessary capital and support to scale their ventures and drive innovation in the sector. These strategic partnerships have now taken the pledge to funds, from Rs 200 crore to more than Rs 500 crore.

Highlighting the success stories of iDEX start-ups, the ceremony also featured the announcement of investments in iDEX winners and the felicitation of iDEX winners, showcasing their innovative solutions and entrepreneurial spirit. Raksha Rajya Mantri Shri Ajay Bhatt, Chief of Defence Staff General Anil Chauhan, Chief of the Air Staff Air Chief Marshal VR Chaudhari, Defence Secretary Shri Giridhar Aramane and other senior officials of Ministry of Defence were present on the occasion.

The launch of the ADITI Scheme, DISC 11, and other initiatives during DefConnect 2024 underscores the Government's unwavering commitment to promote innovation, entrepreneurship, and self-reliance in defence production. These initiatives are poised to accelerate India's journey towards becoming a global leader in defence technology and innovation, ensuring the nation's security and sovereignty in the years to come.

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5 Major Defence Firms Bagging Rs 39,000 Crore Contracts to Boost Aatmnirbharta

Saqib Malik | 02 March 2024

Source: Republic World | https://www.republicworld.com/business/5-major-defence-firms-bagging-rs-39000-crore-contracts-to-boost-aatmnirbharta-sidm/

Aatmnirbharta in Defence | Image: Aatmnirbharta in Defence

MoD Critical Acquisitions: The Ministry of Defense (MoD) on Friday signed five major contractsworth Rs 39,125.39 crore with the country's major defence firms. The defence firms that havebagged MoD contracts include Hindustan Aeronautics Limited, Larsen & Toubro Limited, andBrahMos Aerospace Private Limited (BAPL).

In an exclusive interview with Republic Business, Rajinder Singh Bhatia, President, Society of Indian Defence Manufacturers (SIDM), the apex body of India's defence industry, said companies inIndia are increasingly becoming export-oriented, while efforts to foster startups will help thedefence production industry.

Export-Oriented Companies

As part of the MoD contracts, Larsen & Toubro (L&T) has clinched substantial contracts from theMoD valued within the "major" category in the range of Rs 5,000 to Rs 10,000 crore. The shares ofL&T rose 5.19 per cent to an intraday high of Rs 3685.35 apiece on the National Stock Exchange(NSE) on Friday, March 1.

While domestic defence production is the key focus, SIDM President Rajinder Singh Bhatia saysmost Indian defence firms are now export-oriented. As per Bhatia, Kalyani Group, which is amongthe top most defence production companies in India, will see its 70 per cent of revenue this yearcoming from exports. “Growth in exports is largely on the back of indigenously designed anddeveloped products,” said Bhatia, who is Chairman, Defence Business, Kalyani Group.

L&T Bags Major Contract

The MoD contracts involve the supply of critical equipment to the Indian Air Force (IAF), aimed atboost its operational capabilities. Under these contracts, L&T is tasked with providing High PowerRadars (HPR) and Close-In Weapon Systems (CIWS) to the IAF.

Bhatia says apart from major defence deals and procurements, fostering startups is need of thehour. “IDex the defence startup ecosystem system is an excellent vehicle for providingopportunities to startups for the development of breakthrough technologies,” said Bhatia. “Ibelieve an enhanced startup scheme is in the works. We look forward to that. The technology eco-system along with a vibrant manufacturing ecosystem will help in achieving Atmanirbharata,” said Bhatia.

As per Bhatia, an important platform such as US-India initiative on Critical and EmergingTechnology (iCET) and India-US Defence Acceleration Ecosystem (INDUS-X) Indus X are providing agreat scope for synergy in defence.

“We are hopeful that many proposals for co-design, co-development, and co-production will beformalised,” said Bhatia, adding that IDex the defence startup ecosystem system is an excellentvehicle for providing opportunities to startups for the development of breakthrough technologies. “I believe an enhanced scheme for defence startups is in the works. We look forward to that. Thistechnology eco system along with a vibrant manufacturing ecosystem will help in achievingAtmanirbharata,” the SIDM President further said.

10X Domestic Production

Indian industry has already demonstrated its robust manufacturing capability and there has beena significant increase in the defense production, Bhatia said. “Exports are an important part ofdefence ecosystem. There has been a manifold increase in defence exports. This is an indication ofthe coming of age of the Indian defence industry,” added the SIDM President.

"Kalyani Group has been at the forefront of the development of Indigenous IP and products. Thishas given a unique place to the group with a major export focus," said Bhatia.

“70 per cent of this year's revenue comes from exports on the back of indigenously designed anddeveloped products. Group is fully aligned with the national aim of achieving self-reliance at theearliest,” said Bhatia, who is Chairman,

Defence Business, Kalyani Group.

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Tejas MK-1A Completes Maiden Flight, First Delivery Soon

Chethan Kumar | 28 March 2024

Source: Times of India | https://timesofindia.indiatimes.com/india/tejas-mk-1a-completes-maiden-flight-first-delivery-soon/articleshow/108846208.cms

Bengaluru: The first production series fighter of LCA Tejas Mark-1A, an advanced variant of the LCA Mk-1 that has already been inducted by the Indian Air Force (IAF), Thursday completed its maiden flight in Bengaluru.

Defence PSU HAL, which is manufacturing the Tejas Mk-1A or LCA Mk1A or developed by Bengaluru-based DRDO lab Aeronautical Development Agency (ADA), had been conducting various taxi trials over the past several days.

Thursday's maiden flight lasted 18 minutes and waspiloted by Group Capt (retd) KK Venugopal, HAL chief testpilot (fixed wing).

"The first aircraft LA5033 of the Tejas Mk1A aircraft seriestook to the skies from HAL facility in Bengaluru today (Thursday). It was a successful sortie with a flying time of 18 minutes," HAL said Thursday.

The Mk-1A will come with digital radar warning receivers, a superior AESA (active electronically scanned array) radar, advanced beyond-visual-range (BVR) air-to-air missiles and external self-protection jammer pods, among other improvements.

Tejas

HAL, which has delivered 32 single-seat LCA fighters and two of the eight twin-seat trainers of the 40 Tejas Mk1 order worth Rs 8,802 crore, will now have to begin delivery of 83 Tejas Mk-1A in the March 2024-Feb 2028 timeframe. This is as stipulated by the Rs 46,898 crore contract for 83 improved Tejas Mark-1A jets of 2021.

On Nov 23, 2023, PM Narendra Modi flew in a trainer that was delivered in Oct 2023, Putting his personal stamp of approval on the indigenous Tejas fighter, which will become the mainstay of the IAF in the years ahead instead of foreign jets.

The IAF already has two Tejas squadrons, the 'Flying Daggers' and 'Flying Bullets', one of which is now deployed in the southwestern sector facing Pakistan.

"Successfully completed a sortie on Tejas. The experience was incredibly enriching, significantly bolstering my confidence in our country's indigenous capabilities, and leaving me with a renewed sense of pride and optimism about our national potential," Modi had said, after becoming the first PM to fly in a fighter jet.

In line with making Tejas the mainstay of IAF, the defence acquisition council (DAC) has granted the acceptance of necessity (AON) for 97 more Tejas Mk-1A aircraft and an

order to procure these is expected after the final clearance from the cabinet committee on security (CCS) is received.

Tejas is critical for IAF to stem the depletion in the number of its fighter squadrons, which is down to just 31 when at least 42 are required to tackle China and Pakistan.

From very little confidence from both the IAF and the Centre in the Tejas in its initial years of flying, the fighter has grown to become a platform that is being showcased as a flagbearer by India in multiple defence and aero shows across the world.

It is noteworthy that the IAF reported its first loss of a Tejas Mk 1 fighter aircraft to an air crash on March 12.

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Bharat Shakti Exercise Strengthens India's Standing as Premier Weapon Manufacture

Ravi Shankar | 13 March 2024

Source: Bharat Shakti | https://bharatshakti.in/bharat-shakti-exercise-solidifies-indias-standing-as-premier-weapon-manufacturer/

Fire power at Pokhran firing range

Amidst the thunderous display of Make-in-India tanks, ammunition, and indigenous aircraft, helicopters soaring over the deserts of Pokhran, Rajasthan, during the monumental joint tri-services war game, Exercise Bharat Shakti, on Tuesday, India showcased unprecedented excellence in global military equipment production. Despite a setback with the crash of a Tejas Light Combat Aircraft (LCA) during the exercise, India's reputation as a top-tier producer of world-class military equipment remained unscathed. The world took notice, with delegates from more than 30 countries witnessing as Bharat Shakti showcased India's cutting-edge military equipment. Prime Minister Narendra Modi remarked that Pokhran symbolises the trinity of "India's Atmnirbharta, self-confidence, and glory."

Before the commencement of the tri-service exercise 'Bharat Shakti', as lead organiser of the exercise, Indian Army Chief General Manoj Pande emphasised the significance, stating, "Today, we are gathered here to observe the demonstration of the firepower capabilities of indigenous weapons and the operational readiness of all three defence forces. The tri-service event will highlight the critical equipment and weapon systems." Defence Minister Rajnath Singh, Chief of Defence Staff Gen Anil Chauhan, Navy Chief Admiral R Hari Kumar, and IAF Chief Air Chief Marshal V R Chaudhari witnessed the tri-services firepower and manoeuvre exercise, marking a historic first of its magnitude.

The skies resonated with the sounds and fury of LCA Tejas and ALH Mk-IV Dhruv and Prachand helicopters. On the ground, the Main Battle Tank Arjun, K-9 Vajra, and T-90 Bhishma tanks, along with the Dhanush and Sharang artillery gun systems, dominated the

firing ranges. The action-packed display of the Pinaka rocket system drew thunderous applause from the spectators. Also, the mobile anti-drone system, BMP-II and its variants, and a fleet of swam drones showcased remarkable precision striking capabilities throughout the exercise.

The exercise demonstrated India's military strength and the seamless integration of multi-domain operations across the three services. It underscored the "shock and awe" effect the armed forces aim to achieve in operational scenarios through their manoeuvrability and combat capabilities.

During his address following the integrated tri-service firepower and manoeuvre exercise, which lasted around 50 minutes, Modi remarked, "The thunderous aircraft overhead and the valour displayed on the ground during the Bharat Shakti exercise symbolise the spirit of a 'new India' (naye Bharat ka aavhan hai)." He recalled Pokhran's historical significance as the site of India's past nuclear tests, emphasising, "This is Pokhran, where India showcased its nuclear capabilities, and today we witness the strength of 'Swadeshikaran se Sashaktikaran' (empowerment through indigenisation)."

PM Modi highlighted that over the past decade, equipment worth Rs 6 lakh crore has been sourced from Indian companies, while the country's defence production has more than doubled to exceed Rs 1 lakh crore. During this time, over 150 defence startups have emerged, receiving orders worth Rs 1800 crore from the defence forces. He acknowledged the pivotal role played by the youth in these achievements. The Prime Minister also outlined steps toward achieving self-reliance in the defence sector, including policy reforms, engaging the private sector, and fostering MSME startups. He also mentioned the establishment of defence corridors in Uttar Pradesh and Tamil Nadu, with a significant investment of Rs 7000 crore. Moreover, he expressed happiness over the commencement of operations at Asia's largest helicopter factory in India, Karnataka's Tumakuru.

PM Modi emphasized that self-reliance in India's defence sector breeds confidence within the armed forces. He highlighted the significant boost in the morale of the armed forces when utilizing indigenous weapons and equipment during conflicts. Over the past decade, the Prime Minister noted India's achievements in producing its own fighter jets, aircraft carriers, C295 transport aircraft, and advanced flight engines. Pointing to the recent Cabinet decision to design, develop, and manufacture 5th-generation fighter jets domestically, PM Modi envisioned substantial growth in the defence sector, foreseeing abundant employment and self-employment opportunities in the future.

The Prime Minister also visited the area where a static display of equipment and platforms was kept near the live demonstration site. Several cutting-edge platforms, including space and Artificial Intelligence, were also displayed in the exhibition area.

A foreign delegate who attended the exercise remarked that the exercise demonstrated the significant progress made by India's defence industry in recent years.

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Israeli Air Defence System MRSAM Provider IAI Sets Up Indian Subsidiary ASI

Ravi Shankar | 28 March 2024

Source: Bharat Shakti | https://bharatshakti.in/israeli-air-defence-system-mrsam-provider-iai-sets-up-indian-subsidiary-asi/

The proposed CoE signifies a monumental stride in the strategic partnership between CSIO and HAL. Thinkstock

Israel Aerospace Industries (IAI), the provider of the medium-range air defence weapon system MRSAM (medium-range surface-to-air missile) to the Indian Armed Forces, has set up its Indian subsidiary AeroSpace Services India (ASI) and launched a new office in New Delhi on Wednesday. The Israeli aerospace major emphasizes that establishing ASI underscores IAI's robust collaboration with the Indian government's 'Atmanirbhar Bharat' – Make in India – initiative. It further underlines the commitment of the solid partnership between IAI and the Defence Research and Development Organisation (DRDO) in advancing and supporting cutting-edge systems for the Indian armed forces.

"Over the past 30 years, IAI has worked closely with our Indian partners, collaborating on some of the latest technologies. Our new ASI office will allow us to further that commitment," said Danny Lauber, CEO of Aerospace Services India (ASI).

The Israeli company's top official disclosed that besides setting up an Indian subsidiary, IAI is demonstrating its strong commitment to the Indian defence industry by establishing a large-scale hub for maintenance, repair, and overhaul (MRO) of defence equipment in Gurugram.

"We are setting up a large-scale MRO facility in Gurugram, and it will be ready by the end of 2024. Initially, the MRO hub will cover the maintenance and repair aspect for the entire medium-range surface-to-air missile (MRSAM) system," said Oded Jacobowich, AGM Air and Missile Defence Systems and Chairman, ASI.

MRSAM is a supersonic missile that can be launched vertically with a rapid response time. It is intended to intercept various airborne threats, such as guided bombs, aircraft, missiles, and helicopters. The missile has different variations for use by the Indian Army, Navy, and Air Force. MRSAM, also called 'Abhra', is a joint venture of the Defence Research and Development Organisation (DRDO) and Israeli Aerospace Industries. The missile system is produced at Bharat Dynamics Ltd (BDL), with active participation from Indian public and private defence industry partners, including micro, small, and medium enterprises (MSMEs). According to the company's statement, ASI trades in Indian currency and is the sole authorised OEM's Technical Representative for the complete MRSAM system.

"We are already looking to expand beyond the MRSAM programme to other defence programmes and other products that customers require us to do," added Jacobowich.

In 2022, IAI entered into a memorandum of understanding (MoU) with Hindustan Aeronautics Ltd (HAL) to facilitate the conversion of civil (passenger) aircraft into multi-mission tanker transport (MMTT) aircraft within India. Subsequently, in 2023, it forged another MoU with Bharat Electronics Ltd (BEL) to explore prospects within short-range air defence systems.

The new subsidiary, ASI, boasts approximately 50 employees, 97% of whom are Indian nationals. Based in Delhi, ASI's strategically positioned branches ensure comprehensive service coverage throughout the Indian subcontinent. With its new facilities on the ground, ASI hopes to reduce turnaround times for repair and service operations, ensuring prompt and efficient support for its clientele. Furthermore, the ASI is looking to exploit export potential by setting up facilities and operating from India.

MRSAM, an advanced and groundbreaking air and missile defence system, offers comprehensive protection against diverse aerial threats. Deployed by the Indian Army, Air Force, and Navy, the system integrates advanced components such as phased array radar, command and control infrastructure, mobile launchers, and interceptors with sophisticated RF seeker technology. MRSAM, also called 'Abhra', is a joint venture of the Defence Research and Development Organisation (DRDO) and Israeli Aerospace Industries. The missile system is produced at Bharat Dynamics Ltd (BDL), with active participation from Indian public and private defence industry partners, including micro, small, and medium enterprises (MSMEs).

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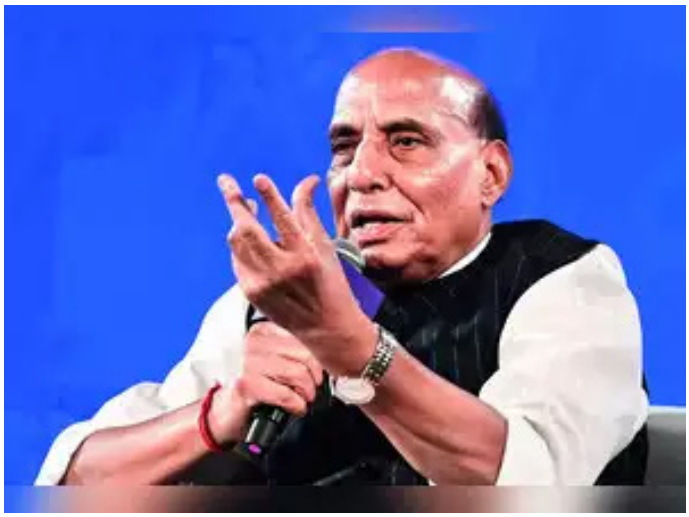
Want to Export Jet Engines in Future, Says Defence Minister Rajnath Singh

Vijay Mohan | 28 February 2024

Source: Economic Times | https://economictimes.indiatimes.com/news/defence/want-to-export-jet-engines-in-future-says-defence-minister-rajnath-singh/articleshow/108859976.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst



The proposed CoE signifies a monumental stride in the strategic partnership between CSIO and HAL. Thinkstock

New Delhi: India is firmly on the path to self-reliance in defence and is even looking to export fighter jet engines in the future, defence minister Rajnath Singh said at the Times Now Summit themed India Unstoppable.

The minister said he has directed officials to look at all possible collaboration opportunities to make India self-reliant. He referred to the engine manufacturing agreement between GE Aerospace and Hindustan Aeronautics for the GE 414 engine that will power future variants of the light combat aircraft (LCA).

He added that he has directed the Defence Research and Development Organisation to explore more such possibilities with Safran from France as well as the UK. "I have asked

them to see what all can be made in India and which nations are ready to transfer technology. We have had enough of imports. We want India to be an exporter when it comes to engines," he said.

He said the government has taken steps to ensure that even after they leave service, Aginveers have a secure future and assured that if any changes are needed, room is open for reforms. "If a need is felt, we can bring changes and reforms in the scheme," he said.

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Commentary

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3. Skyroot Successfully Fires Kalam-250 Engine that will Power Vikram-I to Space - https://www.indiatoday.in/science/story/skyroot-successfully-fires-kalam-250-engine-that-will-power-vikram-i-to-space-2520273-2024-03-28

"The term 'Aerospace' was introduced in 1958 by the USAF Chief of Staff, General Thomas D White, as a new construct that depicted air and space as a seamless continuum stretching from the Earth's surface to infinity."

The Centre for Air Power Studies (CAPS) is an independent, non-profit think tank that undertakes and promotes policy-related research, study and discussion on defence and military issues, trends and developments in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Marshal Anil Chopra, PVSM AVSM VM VSM (Retd).

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