



CENTRE FOR AIR POWER STUDIES (CAPS)

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Indian Air Force MiG-29, Jaguar and Mirage 2000 in formation

Image Source: reddit.com

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“From multi-domain operations to hybrid warfare, the IAF needs to recognise that modern warfare transcends traditional boundaries”¹

- Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC

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¹ <https://www.hindustantimes.com/india-news/mission-is-to-make-iaf-one-of-the-best-by-2032-air-chief-marshal-vr-chaudhari-101696759341137.html>

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Opinions and Analysis

Aerospace Command or Air and Space Force? Whither India's Integrated Defence

Air Vice Marshal Anil Golani (Retd)

Additional Director General, Centre for Air Power Studies | 26 January 2024

Source: Bharat Shakti | <https://bharatshakti.in/aerospace-command-or-air-and-space-force-whither-indias-integrated-defence/>



The ongoing discussion centres around the emerging need for an Aerospace Command. Our aerial platforms rely heavily on space assets for their operational functions. As space assets become more integral, the prospect of consolidating the Air and Space domains into a unified architecture is gaining traction for enhanced optimisation. As space assets become increasingly intertwined with elements in other domains, a necessity for space awareness arises. It involves safeguarding our assets in space and preventing hostile forces from exploiting space resources.

Transformational technologies in the recent past have increased congestion, contestation, and conflict in the space domain. It has been further exacerbated by the fact that these technologies are dual-use and could be utilised against space-faring nations by adversaries when needed. Rendezvous

and Proximity Operations (RPO) have resulted in spin-offs that enable On-Orbit Servicing (OOS), refuelling, and inspection, activities that facilitate operations in close proximity to any satellite and pose a security threat. Active debris removal is another technology that could also be exploited for military use.

The increasing use of reusable and flexible launch capability, space planes like X-37B, quantum communications, laser satellites, mega-constellations and manoeuvring satellites have all ensured that freedom of operations in space is critical for military functioning, which also necessitates the security of these assets in space.

The space domain, therefore, performs an enabling function for services and applications and a securing function with the assistance of the technologies mentioned above. The securing function has to be performed by an aerospace force that is well-trained and equipped to ensure the security of its assets in space. Space services are essential, not only for military functioning but also for the socio-economic well-being of the nation, and therefore securing our national interests in space comes under the ambit of 'space security' and the onus of ensuring space security rests with the armed forces.

Space defence strategies, which form the basis of counter-space techniques, involve protecting space infrastructure and space-based assets from disruption or damage by an adversary or any other agency, knowingly or otherwise. It comprises three major components: space protection, space denial and space situational awareness. Space situational awareness should be a prerequisite for any space operation or mission, more so for space defence. Space protection, space denial and space situational

awareness are, therefore, primary requirements towards space security through military means, which need to be adopted by an aerospace force and need a doctrinal approach for planning, training and execution.

Space denial, however, is an active space defence option that needs to be achieved by denying the use of space to the adversary while simultaneously having an acceptable degree of freedom of operation in space. Space denial could be achieved through hard kill as well as soft kill measures and could involve disruption, degradation, denial and destruction in sequence.

The expanding space domain has diminished the boundary between airspace and outer space. As is the case with most modern air forces, efficient space exploitation is critical to IAF operations at all levels. At closer orbital ranges, satellites are being positioned for Very Low Earth Orbits (VLEO), and high-altitude pseudo Satellites (HAPS), along with high-altitude drones, are being used to exploit the near-space region.

The ambiguity between airspace and near space is even more predominant with the proliferation of aerial platforms in the near space region, which could be in an adversary's airspace and yet would not violate its sovereignty. It could be operating in the region of ambiguity, i.e., near space, where detection and targeting capabilities are yet to mature. This domain is well within the operating jurisdiction of an aerospace force, and the IAF must develop capabilities to operate in the near space region for ISR, communications, real-time data links and radar tracking of aircraft. The near-space region is very lucrative as it encompasses the best of both worlds, with no regulations presently being imposed upon its use.

An increasingly large component of IAF operations is conducted using a net-centric architecture that exploits space-based assets. These critical assets include the Integrated Air Command and Control System (IACCS), Operational Data Link (ODL) and Air Force Net or AFNET. Collectively, these systems form the backbone of the IAF's net-centric approach to warfare. Space-linked capabilities like C4I2SR, PNTT, SatMet, etc., further exploit this backbone. Space has become critical for warfighting as C4I2SR gives information dominance, satellites with navigation provide precision targeting, weather forecast gives mission go/no go criteria, battle damage assessment provides mission success/failure details and real-time targeting is enabled by space-based C4I2SR.

In addition, space-based assets enable UAV/AWACS data relay and strategic communications for command and control overseas. Any conflict over the traditional air, sea, or land domains, including the cyber domain, will invariably spill over into space. Air defence, which is the IAF's responsibility, has to expand beyond traditional boundaries into sub-orbital space. Higher missile ranges and higher altitudes of aircraft would lead to higher detection ranges of radars and intercepts, including BMD, necessitating the transition of air defence to aerospace defence.

Merging air and space systems would provide a comprehensive view of the aerospace domain. It will facilitate resource decisions based on capabilities that produce the desired military effects regardless of the platform's domain. The IAF strategy, therefore, should be to fully integrate the air and space capabilities to have a common picture of the aerospace medium. The IAF is primarily responsible for air defence. In addition to integrating the use of

satellite services and applications into its overall strategy, which is a common goal for all three services, the IAF also needs to integrate space defence strategies with air defence to ensure a seamless transition between the air and space mediums for all physical platforms transiting between the mediums, including the tracking of space-based objects and earthbound objects as well as for missile defence requirements.

The establishment of the Defence Space Agency in 2019 and the articulation of the Indian Space Policy earlier this year are steps that need to be followed up with a Military Space Strategy and the formation of an Aerospace Command that would comprise all stakeholders in the space domain, military and civil, to ensure a whole of government approach. Forming an Aerospace Command with the necessary architecture and capabilities is considered more important than renaming the Indian Air Force. This evolution of an aerospace force would also be in keeping with the statement made by the Defence Minister, Rajnath Singh, during his keynote address delivered at the Air Chief Marshal PC Lal Memorial Lecture on 5 May 2022. While delivering this address, Singh exhorted the IAF to become an aerospace force and be prepared to protect the country from future challenges.

Emerging Concerns in Near Space

Air Marshal GS Bedi Retd | 24 January 2024

Source: SIA India | <https://www.sia-india.com/corner/emerging-concerns-in-near-space/>

The Indian Air Force is responsible for protecting Indian skies at all times within its geographical boundaries, up to a height of 100 kilometres known as the Karman Line. Above 100 km, it is free space; below that, termed as sovereign space, an intrusion is regarded an act of hostility, hence no one should fly its assets there other than the country it belongs to. However, as the Chinese balloon violation revealed, it is not a hallowed zone after all. It produced a lot of controversy in the United States, raised a lot of concerns, and eventually needed an advanced aircraft to fire a \$400,000 missile to shoot down an insignificantly low-cost balloon. Of course, there is no cost comparison when national security is involved. But the point is, this threat geometry does pose significant amount of risk and one may not be able to deal with a threat in this regime all the time the way it was done in the above stated case. After cheap drones, such objects in near space, above the standard atmosphere and below the Karman line, may impose an extremely adverse exchange ratio for any nation. Another concern must be that unlike drones, which can be addressed quickly, by the time such objects are detected and brought down, significant amount of intelligence would have flown out. What is it like operating in the near space and what are the concerns that such operations pose? Is it enough to develop only capability in near space or should counter capabilities be also looked at in parallel? These are some of the valid questions that must be addressed by the military powers and academia to provide a meaningful direction to the industry.

The influence zone of conventional aircraft is limited to around 20 kilometers in altitude, beyond which the rarefied atmosphere cannot generate sufficient aerodynamic forces for the aircraft to sustain normal speeds in the air. Even High Altitude Long Endurance (HALE) unmanned platforms, such as the Global Hawk and Reaper, are restricted to this altitude. It's not that space above 20 KM has never been exploited, but an aircraft operating significantly higher than 20 KM altitude must move extremely fast. Following the downing of the Gary Powers-piloted U-2 over the USSR, the U.S. built the SR-71 Blackbird, capable of flying at 85,000 feet (25.9 kilometers). However, since an aircraft at that altitude needs to travel extremely fast to generate the necessary aerodynamic forces to stay airborne, as mentioned earlier, it flew at Mach 3+, which is three times the speed of sound.

An aircraft at those speeds, such as the SR-71, is best suited for strategic ISR (Intelligence, Surveillance, and Reconnaissance) operations but has very little maneuverability to undertake conventional fighter aircraft missions. Moreover, intelligence gathering through space sensors wasn't really developed as much as it is today. An aircraft like SR-71 was extremely difficult to operate and maintain. According to reports, getting an SR-71 into the air required a significant amount of effort. Aviation historian Peter Merlin remarked, "it took a small army to prepare the aircraft". Interestingly, no SR-71s were lost to enemy action, while 12 out of 32 were destroyed due to mishaps. In 2001, the United States cancelled the programme. To be fair to the programme, in the absence of adequate and timely space surveillance there was no choice perhaps, but may not make much sense

with abundance of EO/SAR satellites, claiming almost hourly revisits, finding difficult to find enough consumers. But, if no aircraft can, or not considered viable to operate in near space, can a satellite be operated in that zone? Probably not because it is impossible to operate a satellite in this zone due to the incredible orbital speeds required to make it circle the earth below 100 kilometers altitude. Just to bring home the point, a Geo Stationary satellite placed over equator, orbits at the speed of earth's rotation, which is approximately 463 m/s. In comparison, a satellite at 500 Km orbit almost travels at 7.5 KM/sec. Even the VLEO is planned to be above 100-150 Km, and would need almost constant thrusters to keep it in the orbit. Assuming that even if it were made possible by further technological advances, the satellite operating below 100 Km would essentially have to trespass another country's sovereign space, which is clearly not an option, unless the definition of sovereign space undergoes a change just to develop a form of technology. Obviously, this can never happen unless it was for the common good of humanity.

Near space has come into focus because steered balloons are now a reality. They do have their challenges, but definitely far less than operating an aircraft or a satellite in that space. Any platform hoisted even at about 40-45 KM altitude, with different payloads can pose serious security concern. It's also not easy, if not impossible, to target an object at that altitude by any means other than the ASAT weapons probably. It will be prohibitively expensive to use such a weapon against a low cost threat in near space and that's how like drones, even they would pose an extremely adverse exchange ratio for the defender. Capability is being built in near space by different players at a fairly fast pace.

At the same time, focus should not be lost on how to tackle them. When drones had become a craze, the industry continued to indulge in their mass scale production without anyone paying much attention on potent anti drone capabilities. It was believed that some jammers or Lasers would be enough to stop them, which clearly has not turned into a very reliable solution. Efforts are now on to develop kinetic kill alternatives. Interestingly, an article in Defense One dated October 6, 2023 states that, “Dangling from the ceiling and laid flat on display stands, sleek drones of every shape and size were ubiquitous at last month’s DSEI arms show. Far less common were weapons to stop them”. This invariably becomes the case with every development. The capability building in near space must not lose sight of this very important aspect.

India needs a Military Space Doctrine and Strategy

Commodore JS Shergill (Retd) | 29 January 2024

Source: SIA India | <https://www.sia-india.com/corner/india-needs-a-military-space-doctrine-and-strategy/>

India’s Anti-Satellite Test on 27 March 2019 amply demonstrated the Nation’s capability to primarily defend/protect its assets in the Outer Space, if so threatened. The Space based assets are ready to embrace new horizons. It needs no elaboration that India has always advocated peaceful use of Space and is a signatory to all the major international treaties and continues to abide by them in ‘letter and spirit’.

In India, Military is comparatively a late entrant in the arena of Space due to ISRO’s dedication to the civilian sector. The non-military stakeholders are well conversant as to what and why the nation needs to enhance private

participation in Space activities, especially concerning civilian applications, architecture, etc. However, due to the confidential nature of the military domain, their requirements in Space (including Near Space – an even lesser familiar area) are not fully grasped by the private players/commercial operators. Furthermore, the newcomers and start-ups, post liberalization of the Space Economy in India, are quite zealous but need mentorship in military use cases and specifications to research and manufacture mil-standards. This mentorship falls short even though ISRO has opened the labs for incubation of high and deep tech companies.

The nomenclature used by the Military and doctrinal tenets are relatively unknown to the private/commercial industry and therefore can hinder their work/delivery leading to an inordinate delay in the privatization of players in the Military domain such as Elon Musk’s SpaceX in support of US and western militaries. Considering that Space, the fourth domain of warfare has emerged as a “game changer” in warfare, the current processes/procedures must evolve/adopt for which a “Military Space Doctrine” is considered essential for formulation, jointly by the three Armed Forces and placed in ‘open domain’ for use of Military Space Industrial Complex at an early date. This will go a long way in understanding the Military Space objectives, concepts/tenets/principles, interests in space, application of space power, international treaties/laws, glossary of terms used, etc. This should be linked to Multi-Domain and Mosaic Warfare concepts applicable to the three domains as also integrating tri-service needs. Such a capstone document in the ‘open domain’ will assist in research, innovation, technology development, safe operations,

maintenance, etc. so that the developments in the Private sector work in tandem with the Military. This document will also spur scientific curiosity amongst youth and encourage them to look towards academic pursuits in STEM as per Prime Minister's Vision. The document will also assist the policymakers, scientists, industry, military personnel, academia, diplomats, etc in understanding the nuances of Doctrinal tenets and fundamentals.

Having understood the Doctrine, which would have then provided a "bedrock", the document shall make way and act as a precursor for the "Military Space Strategy". The Strategy will be an actionable document leading to a "plan of action" envisaged to achieve the Military Space Objectives by developing/building requisite capability and capacity within a defined roadmap in a cohesive manner within budgetary allocations. Unlike a Doctrine, a Strategy will bring out solutions/remedies to enforce net-centric operations depending on the threat perception in real-time. The private players will have a crucial role to play. Even while Strategies are usually in a "closed domain", in the case of Space, a generic Strategy document is recommended to be placed in 'the open domain' considering our exploits in this multi-domain would need a 'Whole of Nation' approach. Certain capacities can be made available to friendly foreign countries who can access our global outreach in Space. It may be noted that the Indian Navy's "Maritime Military Security Strategy" issued in the year 2015 is in 'open domain'.

Needless to state, Space is the new Frontier which is rapidly changing the rules of the game in warfare. It is incumbent upon us to remain prepared to meet the ensuing challenges in our

relentless pursuit to use the "Space for Security" as well as "Security of Space" in consonance with the existing international treaties that India respects.

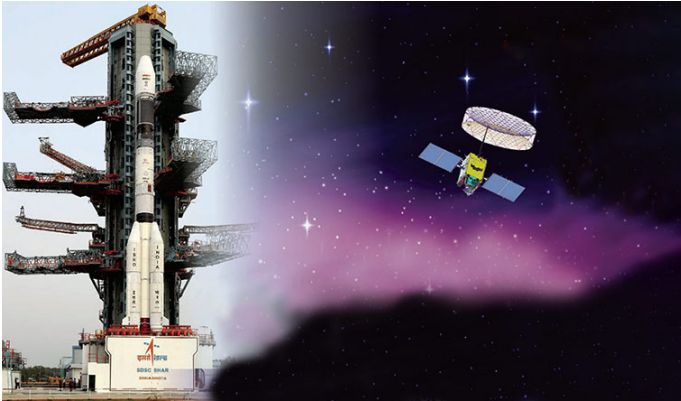
The upcoming second edition of the DefSAT Conference, Expo and Exercise from 07-09 February 2024, in New Delhi could not have come at a better time. This Conference will provide us with an ideal platform to brainstorm for formulating the "Military Space Strategy" duly aligned with the Prime Minister's Vision / Policy Statements of the Government of India in order to provide the 'right direction' to the space stakeholders. This assumes even greater importance considering our pursuits in using Space for a Military role have been rather limited in comparison to the private/commercial sector since the inception of Space research activities of more than six decades.

The esteemed presence and inputs of the decision makers, scientists, space lawyers, uniformed fraternity, technocrats, private players, academia, etc., 'under one roof' will indeed immensely contribute to the drafting of the "Military Space Doctrine" and "Military Space Strategy" in a comprehensive and cohesive manner.

India Playing Catchup in Military Exploitation of Space

*Air Vice Marshal Arjun Subramaniam (Retd) |
28 January 2024*

Source: The Week | <https://www.theweek.in/theweek/cover/2024/01/27/india-is-playing-catchup-in-the-military-exploitation-of-space-in-a-fragile-global-security-environment.html>



*The latest frontier: India's GSAT 6-A communications satellite and the GSLV rocket that launched it |
Courtesy ISRO*

Though an emerging leader in leveraging the potential of space for peaceful use such as remote sensing and unmanned exploration, and possessing significant launch capability, India surprisingly lags behind even Israel and Japan in exploiting space for military use and is constantly playing catchup in a fragile global security environment.

Contrary to what most people think, militarisation of space is as old as exploration of space. The US and Soviet Union sparked off the space race during the Cold War in the 1950s by first launching military satellites that would help them see further and better, and communicate better over the horizon and beyond the line of sight. Peaceful applications then followed, and both have grown in parallel over the years.

Militarisation of space and weaponisation

of space are not the same. Militarisation is considered an essential step for furthering one's strategies of deterrence by acquiring limited capabilities that enable offensive military operations across domains (land, maritime and air). On the other hand, weaponisation directly involves development, deployment and use of weapons positioned in space against targets located in space and on the ground. Directed Energy Weapons (DEW) and satellites with offensive capability (which can destroy enemy's satellites or space vehicles) fall in this category.

Most countries have accepted the inevitability of the militarisation of space, but are vigorously opposed to its weaponisation. However, all the big powers and even some of the smaller space-faring nations have made significant progress in developing directed energy weapons and in deploying co-orbital satellites which have offensive capability. This move, in a way, may be considered an emerging paradigm of 'coercion in space' and possibly 'Star Wars'.

Breaching The Karman Line

It is commonly agreed that the Karman line marks the transition from the earth's atmosphere, or air space as aviators call it, to space. It is about 100km from the earth's surface. The difficulties of crossing this line by conventional aircraft made the region a 'dark beyond'. It needed a special breed of people to generate ideas, and create technologies and vehicles to breach it. Thus came finally the astronauts, or the cosmonauts as the Russians call them, who would don their claustrophobic space suits, defy gravity and leap off into the unknown, reassured that the space scientist would get them back safely.

Aeronautical engineers, scientists from a few specialised disciplines and military pilots have emerged as core constituents of the military space community, albeit with a pronounced tilt towards air forces. Consequently, command and control of military space capabilities were largely entrusted to air forces, till China placed its military space assets under the Strategic Support Force (SSF) in 2015, and the US created a Space Force in 2019.

Military Satellites

Military space assets largely comprise satellites that have sensors, radars, arrays, transponders and more, which are used (a) to support and enhance secure communications, (b) aid in navigation in the air and on the surface, (c) collect intelligence through surveillance and reconnaissance using different mediums (photo, infrared and hyperspectral are the most common), and (d) provide last-mile connectivity through data relays and links that has made targeting accurate. Today, it is all because of space assets that militaries are finding, fixing, engaging and destroying targets with extreme accuracy.

Communications

Military communications satellites with sophisticated encryption are by far the heaviest and the most complex to design. Highly vulnerable and difficult to replace, their placement in space is largely in Medium Earth Orbit (MEO) and Geostationary Orbit (GEO), which is between 2,000km and 36,000km above the earth. Till date, India has launched 25 GSAT series of satellites, but only three of them (GSAT 6-A, GSAT-7 & GSAT-7A) are meant exclusively for military use. The main reason for India's military shyness in space has

been the fear of global sanctions that might affect our civilian space programme. The fear has not been misplaced. The nuclear tests in both 1974 and 1998 did entail sanctions on our civil space programme as well as our civil nuclear programme, forcing our scientists often to reinvent the wheel.

The nuclear deal with the US, which largely took India out of the sanctions regime, has unshackled the Indian Space Research Organisation's military space programme, which had taken baby steps in 2001 with the launch of a dual-use Technology Experiment Satellite (TES). India should now seek to have an inventory of a minimum of one main and one standby communications satellite (to cater for redundancies and contingencies) for each of the three defence services. Considering the average life of a satellite is just 12 to 15 years, and that it takes a year from the planning stage to the launch, it will take about 10 years to meet this aspirational requirement. A concurrent challenge for ISRO will be to make available heavy launcher vehicles such as the enhanced GSLV (Geosynchronous Satellite Launch Vehicle) in an expedited time-frame.

Position, Navigation and Timing

The NAVSTAR GPS, an American constellation of 24 satellites placed in geostationary and geosynchronous orbits, about 20,000km from earth, revolutionised and simplified navigation. It operates on two distinct frequencies, one for civilian use and the other for secure military use of the US and its allies across the world. Not to be left behind, the Russians launched their own GLONASS network of 24 satellites; the European Union followed suit with their Galileo System, and the Chinese with their

Beidou constellation. In 2017, ISRO placed its own constellation of seven Position, Navigation and Timing (PNT) satellites with a set of secure frequencies for strategic applications, called NAVIC, in geostationary and geosynchronous orbits at a height of 36,000km, well above the NAVSTAR GPS constellation. NAVIC was idle for three years because of teething problems, but is now up and running with reasonable efficiency. The coverage of the NAVIC stretches from the Gulf of Aden to the Malacca Strait, which has been stated to be the zone of India's strategic interest. Indeed, there will be a strategic imperative to expand its coverage in the decades ahead.

Intelligence, Surveillance and Reconnaissance

The third and most critical of all space assets in modern warfare are satellites that offer nations a 'persistent stare capability' that makes battlespace transparency possible through effective intelligence, surveillance and reconnaissance. It is in this area that China has a commanding lead over India with its constellation of Yaogan, Ludikancha and Gaofen satellites. These satellites have Electronic Intelligence (ELINT) capability to monitor enemy radar transmissions and communications; and electro-optical, synthetic aperture radar and infrared capabilities to accurately map enemy territory and locate even constantly moving targets in real time. For these purposes, India uses fewer than 15 dual-use CARTOSAT, RISAT and EROS satellites, which are smaller than communications satellites, and are placed in a Low Earth Orbit (LEO) of 200-500km. This is against an assessed Chinese inventory of over 100 satellites that includes the recently launched data relay satellites with sufficient bandwidth to support the streaming of voice, data and images.

Policymakers have recognised this shortfall. Statements from the government and the ISRO chief indicate the opening of this sector to private players who can produce this family of satellites. It is projected that 50 such military and dual-use satellites, armed with a variety of sensors and radars, will be launched over the next five years. This should significantly shrink the space asymmetry with China over the next decade. Of course, it is important not to get into a costly space race with China, but to resort to a strategy that will support robust deterrence and responsive offensive operations.

Space Situational Awareness

The last and emerging segment in the militarisation of space is the one that provides Space Situational Awareness (SSA). In simple terms, SSA is the ability to keep track of everything in space including space debris, rogue satellite behaviour, anti-collision mechanisms and possible signs of weaponisation by others. With only nascent capabilities in this realm, India largely relies on friendly countries and strategic partners such as the US with its famed North American Aerospace Defense Command (NORAD) facility. However, there are plans to install multi-object tracking radars and optical telescopes on the Indian mainland to enhance this capability.

Training, Structures and Challenges

By no yardstick is it going to be a smooth ride towards building a credible military space capacity. There are several elephants in the room—India's fractured organisational culture, existence of multiple stakeholders and turf battles among them for command and control of the 'high ground.' After decades of monopoly, ISRO has wisely ceded some space to private

players, who have shown much enthusiasm in building and launching military satellites. The users will be many—the three services, the Coast Guard, Central Armed Police Forces and the National Disaster Response Force, a segment of India’s intelligence agencies represented by the National Technical Research Organisation and the Aviation Research Centre.

Just as navies across the world have succeeded in merging their surface and sub-surface operational domains after the advent of submarines into one contiguous zone, the IAF, too, has been focusing on the contiguous nature of air and space, and has been ambitiously seeking an aerospace command since 2009. India’s entry into the Ballistic Missile Defence (BMD) club with its ASAT (anti-satellite) test in 2019 presents fresh challenges in command and control issues. The IAF feels that it is only logical that BMD blends into the existing air defence architecture to avoid duplication of command and control structures. It has now stepped up training in space-related disciplines, and is building competencies for the future in concert with knowledge partners such as ISRO, DRDO, NALSAR and National Institute of Advanced Studies. This includes training pilots for India’s first manned space flight, studying propulsion and understanding space laws and regulations.

However, the diverse inventory of stakeholders in space has resulted in the domain emerging as among the three integrated segments, the others being cyber and special forces. All three have been assigned to the chief of defence staff currently. There is also a reluctance to club the military requirements for space capabilities with the strategic requirements, since the latter

has separate stakeholder organisations such as Defence Space Research Organisation (the space arm of DRDO), Strategic Forces Command and the intelligence agencies. The Defence Space Agency, the current nodal agency for military space assets, is lightweight in its structure and will not meet the requirements for India’s future military space requirements. Given all this, it would be interesting to see how the command and control over military space assets emerge in the coming years and when an aerospace/space command comes up. Suffice to say, too many chefs will spoil the broth.

The US is Failing to Quickly Field Hypersonic Missile Defense

Rear Adm. Mark Montgomery (Retd.) and Bradley Bowman | 20 January 2024

Source: Defense News | https://www.defensenews.com/opinion/2024/01/19/the-us-is-failing-to-quickly-field-hypersonic-missile-defense/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch



Vehicles carry DF-17 ballistic missiles during a parade in Beijing, China, on Oct. 1, 2019. (Mark Schiefelbein/AP)

The Pentagon warned in its annual report to Congress last year that China already possesses “the world’s leading hypersonic arsenal” and is

sprinting to field even more advanced offensive capabilities. These weapons would give Beijing a capability to conduct a prompt strike that paralyzes America's command-and-control and missile-defense capabilities.

The good news is that the United States is making progress on its own offensive hypersonic weapons. The bad news is that American efforts to develop systems that can defend against Chinese hypersonic capabilities are not keeping pace. If Washington does not act quickly to expedite the Pentagon's fielding of hypersonic missile defense capabilities, deterrence may fail in the Pacific.

A hypersonic weapon is a missile that travels at speeds above Mach 5, or greater than 1 mile per second. There are many existing ballistic missile systems that travel at hypersonic speeds, but Chinese hypersonic missiles present an additional challenge. In addition to their high speeds, these systems include hypersonic glide vehicles, which maneuver through the atmosphere after an initial ballistic launch phase. To make matters worse, Beijing is also developing hypersonic cruise missiles that use air-breathing engines such as scramjets to reach high speeds and maneuver.

That combination of speed and maneuverability presents a daunting challenge for existing U.S. ballistic and cruise missile defense radars and interceptors, making it difficult to track and destroy the adversary's incoming glide vehicle or cruise missile. The fact that hypersonic glide vehicles can also operate at unusual altitudes — well above cruise missiles but below ballistic missiles — adds an additional layer of complexity.

China has several hypersonic variants that leverage their extensive work in both intercontinental and intermediate-range

ballistic missiles. That includes, for example, the deployed DF-17, a medium-range ballistic missile with a hypersonic glide vehicle that has a reported range of 1,600 kilometers. Beijing could use that system to target American and allied military bases and fleets in the Pacific.

To match China's effort, the United States has spent more than \$8 billion on offensive hypersonic missile development over the past two years alone. Despite delays and challenges, some of these efforts are making headway. The Army's Long-Range Hypersonic Weapon, the Air Force's Hypersonic Attack Cruise Missile, and the Navy's Conventional Prompt Strike and Hypersonic Air-Launched Offensive Anti-Surface Warfare programs could all field weapons this decade.

Unfortunately, America's hypersonic defense efforts are not nearly as impressive.

The Missile Defense Agency has invested in developing a glide-phase interceptor to destroy adversarial missiles in their vulnerable glide phase, before they start complex maneuvering in the terminal phase. But the Biden administration only asked for \$209 million for hypersonic defense programs in its fiscal 2024 budget request, and the Pentagon requested less than \$515 million in funding in fiscal 2022 and fiscal 2023 combined.

These requests are a fraction of the funding dedicated to offensive capabilities and well short of what is required. This failure to prioritize hypersonic defense has consequences: The Department of Defense said in April that it did not expect to field a hypersonic defense system until fiscal 2034.

That delay creates unacceptable risk for American forces and invites aggression.

So what's going on?

In part, it appears that out of an abundance of caution dissonant with the urgency of the threat that Americans confront, as well as a perennial fear of acquisition failure, the Pentagon has delayed a decision to select one defense company to begin an operational test and development effort that could lead to a functional deployed system before the end of the decade.

The Pentagon may be delaying this so-called downselect decision until a second program can be brought into a full competition, adding years of delay. That's a mistake. If there is any current research and development effort that warrants risk taking, hypersonic missile defense is it.

Deputy Secretary of Defense Kathleen Hicks has emphasized in recent months that the Pentagon is prioritizing efforts to field key combat capabilities, especially when it comes to closing the gap with China in key emerging technology areas. But some are concerned that is more rhetorical than reality.

Thankfully, Congress has stepped in to begin to address this challenge. In this year's National Defense Authorization Act, Congress directed MDA to achieve an initial operating capability for a glide-phase intercept system by 2029 and authorized an additional \$225 million in research and development funding for 2024, more than doubling the amount the administration requested.

As the congressional appropriators conference their different versions of the defense bill, they should appropriate the full authorized amount. Then the DoD needs to quickly select one company for a rapid acquisition effort as soon as feasible. If the Pentagon believes that decision alone is too risky, it could also fund

a second research and development effort that delivers in the 2030s.

As the DoD develops its 2025 missile defense budget request, it should reflect these increased investments and not rely once again on congressional intervention, which would only cause additional delay.

Most strategists understand that a military can best deter aggression by fielding both capable offensive and defensive systems. After all, offensive capabilities force the potential aggressor to consider costly counterpunches the aggression may invite, and defensive capabilities create uncertainty as to whether the aggression can achieve its military objectives. Individually, these offensive and defensive capabilities are significant deterrents, but together they are much more effective. That's why Washington should prioritize hypersonic missile defense before it is too late.

Air Power

Exclusive: 'Space the Ultimate High Ground for all Operations', says Air Chief Marshal V.R. Chaudhari

28 January 2024

Source: *The Week* | <https://www.theweek.in/theweek/cover/2024/01/27/air-chief-marshal-vr-chaudhari-chief-of-the-air-staff-interview.html>



AFP

From Ukraine to the Middle East, multiple conflict theatres continue to demonstrate the importance of air power in every aspect of contemporary warfare. While the Indian Air Force is unlikely to face the type of air wars being fought in the Russia-Ukraine and Israel-Hamas conflicts, its leadership is aware of the challenges that a two-front war could throw up in its backyard. It will have to work together with air assets of the Army and the Navy to transform, integrate and support each other better and rise up to the challenges of the 21st century. In the face of mounting challenges, the next frontier for the IAF could be the exploitation of space-based assets. In an exclusive interview, Air Chief Marshal V.R. Chaudhari, chief of the air staff, shared his views on several important issues related to aerospace power by responding to this set of questions curated by Air Vice Marshal Arjun Subramaniam (retd). He says that the IAF has revised its

existing doctrine and has recognised space as the ultimate high ground for all operations. He also says the IAF is in constant touch with the Indian space ecosystem that would provide the force with accurate and timely intelligence, precise navigation, reliable communications and accurate delivery of weapons. Excerpts from the interview:

Q Though the profile of the air wars in the Russia-Ukraine and Israel-Hamas conflicts are different from what we can expect, what are the important takeaways from an Indian perspective?

You rightly mentioned that the trajectory of the two ongoing air wars is different from what we are likely to encounter against either one of our adversaries. The main reason for this is the steep asymmetry between contending sides in these wars as compared with the Indian scenario where the aerial domain is likely to be evenly contested.

One of the main takeaways from the Russia-Ukraine war is the importance of a sustained campaign to suppress and destroy enemy air defences, and the need for a resilient and full-spectrum air defence capability with a wide range of weapons, from shoulder-launched missiles to long-range, surface-to-air-missiles. Even the Israel-Hamas conflict, with totally different dynamics, brings out the importance of air defence against the entire spectrum, ranging from rockets to ballistic missiles. It is imperative that all intelligence assets, including air and space assets, be harnessed and fused to prevent an adversary or a non-state actor from springing a surprise.

Another important takeaway from both conflicts is the difficulty to predict the duration of a conflict, be it between states or between a state and a non-state actor. India's armed forces

must be able to calibrate their response to a wide variety of conflicts, ranging from short, high-intensity conflicts to protracted ones of varying intensity. While short and swift conflicts would require a sharp and rapid offensive force, force preservation and sustenance would greatly influence the outcome of a protracted conflict. One thing both conflicts have substantiated is the need for flexibility and resilience of airpower.

Q For all these years, the IAF has strategised about airpower from a position of strength vis-à-vis the Pakistan air force. Now, you are faced with a principal adversary who enjoys a significant advantage in many segments of aerospace power. How is the IAF adapting to thinking asymmetrically, particularly in terms of changing existing mindsets?

The IAF is cognisant of the undergoing expansion of the PLAAF (People's Liberation Army Air Force). Today, the PLAAF is among the largest air forces in the world and the trend in equipment and technology development is similar. There is a requirement to invest in enhancing our capabilities to thwart the threats from a strong and aggressive adversary. Towards this, induction and procurement of fighter aircraft, force multipliers like AWACS/AEW&C (Airborne Warning and Control System/Airborne Early Warning and Control) and tankers, and unmanned platforms need to be expedited. At least five or six fighter squadrons need to be inducted in shorter time frames. Future inductions including MRFA (Multi-Role Fighter Aircraft), LCA (Light Combat Aircraft) Mk II, AMCA (Advanced Medium Combat Aircraft) and AEW&C will further add to our capability.

Q In past conflicts, the IAF has generally commenced operations with 'deterrence by denial' as the cornerstone of its doctrinal philosophy. Will this still serve us well in case of short and high-intensity limited conflicts with our principal adversary?

Aerospace power in general provides a unique and credible capability of pursuing deterrence by denial as well as deterrence by punishment. The IAF has the operational capability and intent to apply aerospace power towards either denial or punishment, in a calibrated manner, keeping the escalation matrix in mind. For that, we must embark on capability-based force planning and force structuring, develop both conventional and asymmetric capabilities, induct and adopt latest technology, prepare innovative plans and retain adequate flexibility in execution to ensure that we understand the type of war that we are embarking on and fight it accordingly. The words of [Prussian general Carl von] Clausewitz apply even today—"The first, the supreme, the most far-reaching act of judgment that the statesman and commander have to make is to establish by that test the kind of war on which they are embarking, neither mistaking it for, nor trying to turn it into, something that is alien to its nature."

Q The IAF is right up there among the best air forces in the world when it comes to leveraging its non-kinetic (not direct action) capabilities as an effective instrument of statecraft. What more would you like to see in this area in terms of capability accretion?

The IAF, over the years, has proved itself as an effective instrument of statecraft. We have been at the forefront of HADR (Humanitarian Assistance and Disaster Relief) operations both within and outside the country. In the recent

past, meticulously planned and executed IAF operations have evacuated Indian citizens from conflict zones in Afghanistan, Ukraine and Sudan. Our transport and helicopter fleets have risen to the occasion on every instance and performed exceedingly well. Induction of fleets like C-17 and C-130 has given a boost to our capability to conduct these operations and [helped] leverage our non-kinetic capabilities as an effective instrument of statecraft. Induction of the C-295 aircraft will further add to our tactical airlift capabilities while improving connectivity to remote parts of our country. As far as capability accretion for the future is concerned, we are looking at replacing our AN-32 and IL-76 fleets in a timely manner.

Q How are you ensuring that policy and strategic decision makers do not get carried away by the visible successes of the IAF's HADR and evacuation operations, and take their eyes off the inescapable reality that offensive operations and the capabilities associated with them are as critical even if they carry the baggage of risk?

Airpower is inherently offensive and its criticality in the nation's security cannot be over-emphasised. The vision of the IAF as specified in the doctrine is 'To be an agile and adaptable Air Force that provides decisive aerospace power in furtherance of our national interests.' Agility and adaptability refer to our capability to optimally use our resources based on the need of the hour to further national interests. The latest doctrine of the IAF clearly specifies the role of the IAF in the entire spectrum of conflict from 'peace', 'no war, no peace' and 'war'. The inherent flexibility of airpower allows air assets to be utilised in multiple roles and situations, but their utilisation in one role does not compromise the capability to undertake other roles.

Q Notwithstanding the success of the LCA and its variants, and the potential and aspirations around the AMCA, how important is the Multi-Role Fighter Aircraft in the interim period? Is it on the horizon?

To provide credible deterrence, it is imperative to have indigenous fighter aircraft development and production wherewithal. At the same time, we are aware that projects like AMCA take time and resources to fructify. In the interim, given our not-so-friendly neighbourhood, it is important that the strength of our combat assets is not depleted further. While the IAF fully supports the indigenous fighter development programme, the gestation period of this programme implies that there would be a void in numbers and technology of fighter aircraft, considering the impending drawdown of legacy fleets. To ensure that the IAF retains its edge, acquisition of MRFA is extremely important.

Q IAF fighter aircraft recently flew all the way to the Malacca Strait. Does the IAF plan to base more fighter aircraft in the south or in our island territories as a bulwark against possible adversarial forays into the southern Indian Ocean Region (IOR)?

Given the geopolitical realities of the region, our focus in the IOR is a long-term strategic imperative. The IAF's focus on operational training in the IOR is evident from recent missions. A long-range mission to Malacca was one such mission. The successful conduct of these missions demonstrates force projection and the strategic reach of the IAF and its preparedness to respond to any eventuality in this particular region. It is a well-known fact that airpower, along with the maritime forces, will play a crucial role in any future conflict that may take place in the Indo-Pacific region. The IAF has adequate reach and

responsiveness to influence outcomes anywhere in our area of interest, even while operating from the mainland. The bases available in the southern part of the country provide us the required long arm to operate deep inside the southern IOR. We have also practised and demonstrated the capability to operate detachments from our island territories. The IAF has adequate capability to deter any adversarial forays into the IOR using shore-based aircraft.

Q Compared with the exploitation of space for civilian use that has grown in leaps and bounds, India's military exploitation of space has been slow. What is the IAF doing to sensitise the strategic establishment of the need to step on the gas?

Space is a niche field that requires sophisticated technology and enormous resources. This is the reason that despite its extensive utility, only a few nations in the world have been able to make successful forays in the field. The IAF is a primary user of space-based assets for imagery intelligence, navigation, targeting and communication. Its requirements of modern-day air operations mandate the availability of accurate and timely intelligence, precise navigation, reliable communications and accurate delivery of weapons. Each of these aspects entails the exploitation of space-based assets and the same is gathering pace. We have revised our doctrine and recognised space as the ultimate high ground for all operations. While we have the required capability in this regard, there is a need to be future-ready.

Accordingly, we have formulated our requirements and we are in constant touch with the space ecosystem in the country that would provide these capabilities to us. All other

stakeholders are also aware of these requirements and I am sanguine that the requirements shall soon start fructifying, in keeping with our operational requirements for the future.

Q Is there confusion among stakeholders with regard to leadership and command and control of military space assets? What can we do to infuse greater synergy in this area?

I do not think that there is any confusion. The military leadership is cognisant of its asset allocation and utility. They have been incorporated in our plans, both during peacetime and actual operations. There is a clearcut demarcation between allocations. However, I must add that these allocations are not watertight and we have a functioning mechanism with interoperability as a fundamental. Enhanced interaction and brainstorming among all stakeholders will definitely infuse greater synergy and develop a better understanding of the capability of space assets and help in exploring ways to optimally exploit them.

IAF to Carry Out Three Mega Exercises, Joint Warfighting to be Focus in Biggest Ever Wargames

Ajit Dubey | 28 January 2024

Source: ANI News | <https://www.aninews.in/news/national/general-news/iaf-to-carry-out-three-mega-exercises-joint-warfighting-to-be-focus-in-biggest-ever-wargames20240128210420/>



IAF to carry out three mega exercises, joint warfighting to be focus in biggest ever wargames

New Delhi [India], January 28 (ANI): As the defence forces move to war (/topic/war) ds creating theatre commands, the Indian Air Force will be carrying out three major exercises where the focus will be on showcasing jointness and integration in fighting war (/topic/war)s of future.

The first exercise VayuShakti-2024 would be in the form of a major fire power demonstration in Jaisalmer where all the major fighter aircraft including the Rafale, Su-30MKIs, LCA Tejas, Mirage 2000 and the MiG-29s would be showcasing their firepower by shooting different missiles and bombs at designated targets, defence officials said while speaking to ANI.

The Indian Army and Indian Navy elements including attack helicopters are expected to

demonstrate their prowess in the Vayu Shakti, they said.

The exercise is scheduled to be held on February 17 in Jaisalmer.

The next exercise planned by the Indian Air Force is the Exercise Gaganshakti which would see the entire Indian Air Force getting activated from Ladakh to the Indian Ocean Region and from Bhuj to Arunachal Pradesh, the officials said.

The war (/topic/war)game being planned for April this year would see almost all the fleets of fighter aircraft, transport planes, helicopters and drones getting active along all the frontiers and carrying out both offensive and defensive missions as per the tasks assigned to them, they said.

The S-400 or the Sudarshan long-range air defence system is also expected to be activated on both fronts including the western and the northern side for the war (/topic/war)games.

The pan-India level exercise Gaganshakti, conducted once in five years, is also expected to see the Su-30s and the other maritime role fighter aircraft squadrons flying in close coordination with the naval assets including the P-8I maritime surveillance aircraft and MiG-29K fighter (/topic/fighters).

Chief of Air Staff Air Chief Marshal VR Chaudhari has been working to war (/topic/war) ds increasing jointness in operations with the other two services.

Enhancing integration in operations and day-to-day working of defence forces is the main agenda of Chief of Defence Staff Gen Anil Chauhan.

Several measures and studies have been ordered by the Department of Military Affairs under him and progress has been made in multiple areas inupping jointness.

The third major exercise would be the first-ever multinational exercise Tarang Shakti-2024 being planned with foreign air forces which could see participation from the German, French, Italian, American and other prominent friendly forces from across the globe.

The Indian Air Force had last year focused majorly on multinational and bilateral exercises abroad and sent its aircraft to countries including France, Greece, UAE, Australia, Japan and other places.

The exercise is presently planned to be held in Jodhpur around August this year. The participation by different air forces is expected to be finalised around June. (ANI)

Pakistan's Air Force says it has a Hypersonic-Capable Missile

Usman Ansari | 19 January 2024

Source: *Defense News* | <https://www.defensenews.com/global/asia-pacific/2024/01/18/pakistans-air-force-says-it-has-a-hypersonic-capable-missile/>



(shaadjutt/Getty Images)

ISLAMABAD — The Pakistan Air Force has revealed the existence of a hypersonic missile capability, noting on social media and in a news release that the weapon is part of a wider modernization effort “to counter evolving threats.”

The service said the capability is meant to help create a “potent force and to rebalance the power dynamics in the region” under the leadership of Air Chief Marshal Zaheer Ahmed Baber Sidhu.

Other modernization efforts have included the “acquisition of J-10C fighter jets, Unmanned Aerial Systems, modern electronic warfare platforms, force multipliers, state-of-the-art integrated air defense systems, air mobility platforms, [and High to Medium Air Defence Weapons Systems],” the service said.

The Air Force did not respond to Defense News’ questions by press time for further information about the hypersonic missile.

Pakistan’s main supplier of military

equipment, China, unveiled its air-launched YJ-21E hypersonic missile at the 2022 Zhuhai Airshow. However, a H-6K Badger bomber carried the weapon — an aircraft type not in service with Pakistan.

Timothy Wright, a military analyst the International Institute for Strategic Studies think tank, said Pakistan's hypersonic missile is likely not a new weapon, but rather the CM-400AKG, which the country acquired five years ago for its JF-17 Thunder jets. The service's release included a video featuring the CM-400AKG missile.

"According to the missile's manufacturer [Aviation Industry Corporation of China], the CM-400AKG can travel at hypersonic [Mach 5-plus] speeds," he told Defense News. "However, there has not been an independent assessment of this claim."

"It is possible the missile is instead a high-supersonic system" reaching speeds between Mach 3 and Mach 4.9, he added.

However, he said, Pakistan's claim that it has a hypersonic-capable missile may be due to factors during the specific launch.

"The missile's high speed might be achieved by the missile's supposed flight trajectory, most of which takes place at high altitudes where it will encounter less drag, after which the missile descends toward its target," he explained.

How Iranian Tech Empowers Houthi Drone, and Missile Attacks in the Red Sea

Colin Demarest | 08 January 2024

Source: C4ISRNET | https://www.c4isrnet.com/unmanned/2024/01/08/how-iranian-tech-empowers-houthi-drone-missile-attacks-in-the-red-sea/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch



Members of the Yemeni Coast Guard, affiliated with the Houthi group, patrol the sea as demonstrators march through the Red Sea port city of Hodeida in solidarity with the people of Gaza on Jan. 4, 2024.

(AFP via Getty Images)

WASHINGTON — Houthi rebels harassing crowded shipping lanes in the Greater Middle East, eliciting responses from the U.S. military and other forces, are relying on foreign arsenals for their missiles and drones in the air and on the water.

Experts interviewed by C4ISRNET said the militant group based in Yemen, from where Red Sea and Gulf of Aden bombardments have sprung, is using Iranian technology and its derivatives. The regime has long propped up a constellation of combatants in advancement of its own goals, with its assets recently recovered in both Ukraine, after Russian use, and Iraq.

"Despite being the latest militia to join Iran's

axis of resistance network, the Houthis are in possession of some of the most sophisticated copies or variants of Iranian weapons,” said Behnam Ben Taleblu, a senior fellow at the the Foundation for Defense of Democracies think tank.

The arms wielded include unmanned aerial vehicles designed for attacks, such as the Wa’eed-2, analogous to Iran’s Shahed-136 and capable of traveling more than 1,000 miles; anti-ship ballistic missiles; and unmanned surface vessels, or USVs, packed with explosives and dispatched for detonation.

“Tehran and its proxies have become increasingly cognizant of the economic costs imposed on their adversaries to intercept drones, rockets, and missiles, and is something they intend to exploit,” Taleblu said.

“Drones are lower and slower flying than ballistic missiles and may be better suited to controlling escalation. Ballistic missiles, which fly high and fast, require different capabilities to intercept,” he added. “Iran is home to the largest ballistic missile arsenal in the Middle East and has increasingly become a drone power as well.”

Houthis have since mid-November launched at least 25 attacks in the Red Sea area, preying on what they say are Israel-affiliated endeavors in a bid to halt the war in Gaza.

The fighting there, sparked by a surprise Hamas offensive, has raged for months with little sign of abatement. It also threatens to further inflame a region already considered a hotbed for extremist activity.

“Between Hezbollah and Houthis, Iran is putting pressure on Israel from both ends, and then they’ve got Hamas inside of Israel providing

pressure internally,” said Bryan Clark, a senior fellow and director of the Center for Defense Concepts and Technology at the Hudson Institute think tank.

The U.S. Navy earlier this month took credit for downing more than 60 missiles and drones, including a flock of the latter encountered by the guided-missile destroyer USS Carney on Dec. 16.

At the service’s disposal are an array of tools, the Standard Missile-2 and 5-inch gun among them, according to Clark. The engagement calculus is complicated by shipboard stockpiles and cost, though. Each SM-2 is worth millions of dollars; Houthi drones are a fraction of that.

“You have to engage them at short range, if you want to do it cost-effectively. So you have to get familiar with, well, how close can that drone get without being a problem? How long does it take to get to me from that place?” Clark said. “That’s probably the biggest thing, is getting that comfort and familiarity with how to engage drones with the best weapons that don’t take up your magazine capacity.”

Leaders from the U.S., U.K., Australia, Bahrain, South Korea and more have condemned Houthi aggression while also promising military retaliation. U.S. troops sunk three Houthi boats and killed their crews after responding Dec. 31 to distress calls from the Maersk Hangzhou container ship.

Vice Adm. Brad Cooper, the head of U.S. Navy operations in the Greater Middle East, described the clashes in the Red Sea as an “international problem that requires an international solution.” Cooper on Jan. 4 briefed reporters about Operation Prosperity Guardian, a defensive coalition assembled to ensure safe

passage of commercial vessels.

Some 1,500 ships have moved through the economically vital waters since the start of the operation.

“Regardless of the vessel’s company ownership or its destination, these Houthi attacks are, for sure, destabilizing and contrary to international law,” Cooper said. “It’s up to the Houthis to halt the attacks. They’re the instigator and initiator.”

India Boosts ‘Military Interoperability’ with West Asia; Looks to Expand Strategic Reach in Indian Ocean

NC Bipindra | 30 January 2024

Source: Eurasian Times | https://www.eurasiantimes.com/india-boosts-military-interoperability-with-west-asia-looks/#google_vignette

India is consciously building its military interoperability with West Asian nations to expand its strategic reach in the Indian Ocean Region.

India is engaging with the militaries of West Asian nations in what seems to be a sense of urgency in building its strong ties with their militaries, even as the conflicts engulf the region.

India sees an opening in the region, even as the US and China vie with each other to build on their influence. Among the nations India is engaging militarily, apart from Israel, are the United Arab Emirates (UAE), Saudi Arabia, and Oman.

There has been some defense-related interaction at different levels with all these nations in recent days, indicating a conscious bid by India to get entrenched in West Asia and expand its influence there.

Exercise Desert Knight Air Force Engagement

The most profound of these engagements has been the Exercise Desert Knight, in which India joined the United Arab Emirates and France in showcasing its out-of-area air force operations.

On January 23, the Indian Air Force (IAF) conducted Exercise Desert Knight along with the French Air and Space Force (FASF) and the United Arab Emirates (UAE) Air Force.

While the French participation included the Rafale fighter aircraft and a multi-role tanker transport, the UAE Air Force fielded the F-16. These aircraft operated from the Al Dhafra air base in the UAE.

The IAF contingent comprised Su-30 MKI, MiG-29, Jaguar fighter jets, Airborne Warning and Control System aircraft, C-130-J special operations aircraft, and a mid-air refueller aircraft.

The exercise in the Indian Flight Information Region (FIR) was conducted over the Arabian Sea, with IAF aircraft operating from bases within India.

Exercise Desert Knight’s main focus was enhancing synergy and interoperability between the three Air Forces. “The interactions during the exercise facilitated the exchange of operational knowledge, experiences, and best practices amongst the participants,” an IAF spokesperson said.

“Such exercises indicate the growing diplomatic and military interactions in the region, apart from showcasing the prowess of the IAF,” the spokesperson said.

India's Strategic Reach in the Region

But what was left unsaid was that Exercise Desert Knight enabled India to showcase its strategic reach to interdict hostiles with its combat, cargo, and mid-air refueling aircraft in an increasingly volatile region.

The Arabian Sea, which is part of the Indian Ocean Region that India has always viewed as its backyard and itself as the regional net security provider, has witnessed the spilling over of the West Asian armed conflict, posing a threat to shipping lanes in the Arabian Sea with drone and missile attacks on commercial vessels.

The region has also faced piracy attacks on cargo vessels, and the Indian Navy has been the first responder to incidents of attacks by both pirates and Houthi rebels, either to rescue the crew members of commercial ships or to ward off pirates.

On January 26, responding to the distress call from MV Marlin Luanda, the Indian Navy's destroyer warship INS Visakhapatnam provided a fire-fighting team of 10 personnel. It doused the fire after battling for six hours. A US and French warship also responded to the distress call.

On January 28, another Indian warship, INS Sumitra, was on Anti-Piracy Operations along the east coast of Somalia & the Gulf of Aden when it responded to the hijacking of an Iranian-flagged Fishing Vessel (FV) Iman. Pirates had boarded the FV & the crew was taken as hostages.

INS Sumitra intercepted the vessel and acted by the established SOPs to coerce the pirates for the safe release of the crew along with the boat. It ensured the successful release of all 17 crew members and the ship. The FV was subsequently sanitized and released for onward transit.

These two are the latest incidents in the Arabian Sea that the Indian Navy responded to, in a series of such interdictions by its warships to either carry out anti-piracy operations or to assist cargo ships hit by drones or missiles.

India's Defense Secretary in Oman

Meanwhile, India's Defense Secretary Giridhar Aramane will visit Oman and will be there on January 30 and 31 to co-chair the 12th Joint Military Cooperation Committee meeting with the Oman Ministry of Defence Secretary General Dr Mohammed bin Naseer bin Ali Al-Zaabi.

During the talks, India and Oman will review defense cooperation between the two countries and explore new initiatives like industry collaboration to strengthen bilateral engagements further. The two sides will also exchange views on regional and global issues of shared interest, including the West Asia conflict and the security of the shipping lanes in the Arabian Sea.

"The visit will further consolidate defense cooperation and strategic partnership between the two countries spanning every sphere of military collaboration, such as bilateral exercises, staff talks, and training as well as new and emerging areas, an Indian Ministry of Defense spokesperson said on January 29.

India and Oman have a robust and multifaceted relationship that has expanded into several strategic areas, including defense and security. Both countries are committed to working under the vision of strategic partnership. The two countries have a common interest in peace and prosperity of the entire region.

India, Saudi Arabia Joint Army Exercise

In a first, India and Saudi Arabia launched their joint Military Exercise ‘SADA TANSEEQ’ on January 29 at the Mahajan Test Ranges in Rajasthan. The joint Army Exercise will continue till February 10, according to an Indian Army spokesperson.

Royal Saudi Land Forces represent the Saudi Arabian contingent, comprising 45 personnel. A battalion from the Brigade of the Guards (Mechanised Infantry) forms the Indian Army contingent, comprising 45 personnel.

The Army Exercise aims to train troops of both sides for Joint Operations in Semi-Desert terrain under Chapter VII of the United Nations Charter.

The Exercise will enable both sides to share their best practices in the tactics, techniques, and procedures of conducting operations in the sub-conventional domain. It will facilitate developing interoperability between troops from both sides.

The Exercise will involve establishing a Mobile Vehicle Check Post, Cordon and Search Operation, House Intervention Drill, Reflex Shooting, Slithering, and Sniper Firing.

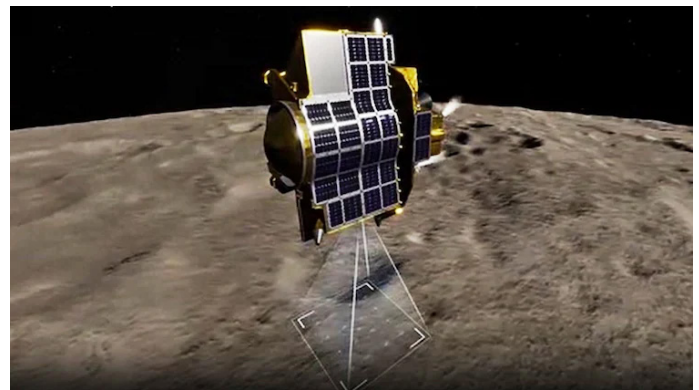
The Exercise will provide an opportunity for both the contingents to strengthen their bond. The spokesperson said it would be a platform to achieve shared security objectives, enhance defense cooperation, and foster bilateral relations between the two friendly nations.

Space

Slim Moon Landing highlights: Japan lands on the Moon, becomes 5th in World to do so

Sibu Kumar Tripathi | 19 January 2024

Source: India Today | <https://www.indiatoday.in/science/story/slim-moon-landing-live-watch-japans-attempt-to-touch-the-moon-2490493-2024-01-19>



Slim mission will attempt to land on a 100 meter landing spot on the Moon. (Photo: Jaxa)

Japan's Smart Lander for Investigating Moon (SLIM) made its historic attempt to land on the Moon. While the telemetry showed the spacecraft to have landed, confirmation came hours later as the spacecraft failed to land in the right orientation.

The Japan Aerospace Exploration Agency (JAXA) completed the landing attempt in 20 minutes after the engines were fired to begin descent. The spacecraft's solar cell failed to generate power forcing the mission to rely on battery life.

The SLIM mission, which began with a launch in September 2023, represents a significant technological leap forward. The spacecraft, roughly the size of a small car, has been navigating space since Christmas Day 2023 when it entered lunar orbit.

After an intricate journey and careful preparations, SLIM attempted a soft landing on the Moon, aiming to become the fifth successful nation to do so after the United States, the former USSR, China, and India.

The landing sequence, referred to by Dr. Kenji as "a breathless, numbing 20 minutes of terror," began at 8:30 pm IST.

SLIM's approach to the lunar surface was fully autonomous, guided by onboard artificial intelligence and cameras designed to navigate the treacherous terrain of the Moon, strewn with rocks, boulders, and craters.

The lander targetted a precise landing within 100 meters of a predetermined point on the slope of the mid-latitude Shioli crater, a site chosen for its potential scientific value, including the presence of olivine, a mineral that could provide insights into the Moon's history and formation.

The lander is equipped with innovative features, such as five crushable, 3D-printed aluminum lattice landing legs to absorb the impact of touchdown, and a suite of instruments including a Multi-Band Camera (MBC) for analysing the lunar surface composition. Additionally, SLIM carries two small rovers, LEV-1 and LEV-2, which will explore the lunar terrain post-landing.

Near Death Experience — Japan's Moon Lander Makes a Comeback

Gemma Conroy | 29 January 2024

Source: [Nature.com](https://www.nature.com/articles/d41586-024-00260-z) | <https://www.nature.com/articles/d41586-024-00260-z>



The lander was photographed upside down on the lunar surface. Credit: JAXA/TOMY Company/Sony Group Corporation/Doshisha

After being stuck without power for more than a week, Japan's Moon lander has woken up and started snapping images of the lunar surface.

On 28 January, the Japan Aerospace Exploration Agency (JAXA) re-established contact with the Smart Lander for Investigating Moon (SLIM), which touched down on the slope of a crater near the Moon's equator on 20 January. "Communication with SLIM was successfully established last night, and operations resumed," JAXA announced in a post on X (formerly Twitter).

SLIM landed on the Moon's surface roughly 55 metres away from its original target, making it the most precise landing ever accomplished. Days later, NASA's Lunar Reconnaissance Orbiter spotted the lander on the Moon from 80 kilometres above.

But the landing wasn't entirely smooth sailing, with one of the probe's two engines

probably losing thrust at just 50 metres above the surface, Jonathan McDowell, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, says. “It started going sideways because the two engines were unbalanced.”

In an image captured by an instrument that SLIM managed to deploy during its descent — a baseball-sized robot with two cameras — the lander could be seen tipped upside down. Its solar cells were also pointing away from the Sun, which meant that they couldn’t generate enough power to run SLIM’s instruments and communications equipment. The lopsided lander was forced to run on battery power for almost three hours. When the lander’s battery reached 12%, JAXA shut off SLIM’s power to increase its chances of recharging when the Sun moved into a more favourable position.

The lander’s charge-up was probably made possible because of the sunlight changing direction and beaming onto the lander’s solar cells, enabling them to start generating power, says McDowell. SLIM’s comeback demonstrates its technological resilience. “The systems are robust enough that they could power down and then wake up again once they got some sunlight.”

Shortly after it woke up, SLIM’s multi-band camera — its only scientific instrument — captured an image of a rock-strewn field. The SLIM team named the rocks after dog breeds, including one nearby that they tagged ‘toy poodle’ and a more distant one they called ‘shiba inu’, a Japanese breed. The camera will scan the lunar surface for traces of a mineral called olivine, which could help to answer questions about the Moon’s origins.

SLIM’s bumpy landing offers lessons for

future missions, such as insights on how to better design propulsion systems, says McDowell. But landing inside 100 metres of its target site is an accomplishment all on its own, he adds. “Even if it hadn’t come back to life, I would have rated this as a super successful mission,” says McDowell.

A JAXA spokesperson said that SLIM will continue to snap images of the lunar surface until daylight on the Moon fades, at the end of January. As well as revealing more clues about the Moon’s chemical composition, the lander’s second wind allows the team to see how long SLIM can survive before lunar night falls, adds McDowell.

For now, the SLIM team will continue analysing data gathered from the probe’s landing. “We believe that the success of the pinpoint Moon landing will be utilized in future lunar-exploration missions,” says JAXA’s spokesperson.

‘Take Down’: Space Force Targeting Unit Develops Strike Options for Joint Force

Theresa Hitchens | 05 January 2024

Source: [Breaking Defense](https://breakingdefense.com/2024/01/take-down-space-force-targeting-unit-develops-strike-options-for-joint-force/) | <https://breakingdefense.com/2024/01/take-down-space-force-targeting-unit-develops-strike-options-for-joint-force/>



Space Force Lt. Gen. DeAnna Burt (Space Force Courtesy Photo)

WASHINGTON — The Space Force’s new(ish) 75th Intelligence, Surveillance and Reconnaissance (ISR) Squadron’s key mission is developing portfolios of strike options, from across all domains, against adversary space systems for potential use by all US combatant commands, according to a senior service official.

“The 75th is building targeting folders across a space architecture that would include the capability to, from an all domain perspective, take down an enemy capability,” Lt. Gen. DeAnna Burt, Space Force deputy chief for operations, cyber, and nuclear, told the Mitchell Institute today.

The 75th ISR Squadron was officially stood up in August, and is located at Peterson SFB in Colorado Springs, Colo. It sits underneath the Space Force’s Delta 7, along with five other ISR squadrons.

“The goal with the 75th is also part of

normalizing as a service with a warfighting domain. Every service has targeting squadrons or targeting elements that focus on targets within their domain,” Burt said.

She explained that the 75th ISR Squadron is looking at not just how to take out enemy satellites on orbit, but also the other dimensions of space systems, including ground facilities and the command and control data links in between.

“So, what I want you to think about is the ground, the satellite or the receiver and the connections either through the electromagnetic spectrum or through cyber or fiber connections. What does that whole architecture look like? And how would you target that capability?” Burt said.

Those digital targeting plans would be crafted according to the Joint Force’s “standardized process” used by all the other services “that include various things that allow you to look at where best to strike and with what types of munitions and what probability of kill,” she elaborated. These target packages are then fed up to combatant commanders, who can decide whether “they want to attack that target network because it’s a threat in their area of responsibility,” and if so, “nominate those targets to a targeting board at the combatant command.”

Burt stressed that the goal is to enable the Joint Force to find the best solution for eliminating space threats during a conflict.

“Every space target does not require space answer. This is an all-domain fight. So some of these may be action by cyber, kinetic, non-kinetic. There could be bombs on target if they’re terrestrial targets,” she said.

But neither did Burt shy away from the idea that enemy satellites could also be hit by space-based systems, noting that the target packages crafted by the 75th could include effects “from air, land, sea and someday space.”

Further, she explained that the targeting information put together by the 75th ISR Squadron is being fed by data from the Space Force’s space domain awareness sensors, as well as intelligence about threats put together by Delta 7’s 76th ISR Squadron.

The 76th, she said, is “an all source intel unit that’s fusing together intelligence across the board about threats, space threats” — including from adversary signals, human and electronic intelligence gathering about US space systems.

The intel gathered by the 76th ISR Squadron also could be used “by other intelligence entities, or just to better educate us on the way [an adversary system] works,” Burt added.

US Space Force needs more to Effectively Deter, and Win Wars

Christopher Stone | 16 January 2024

Source: Defense News | https://www.defensenews.com/opinion/2024/01/16/us-space-force-needs-more-to-effectively-deter-win-wars/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch



Two members of the 216th Space Control Squadron set up antennas during the Black Skies electronic warfare exercise at Vandenberg Space Force Base, Calif., on Sept. 20, 2022. (Tech. Sgt. Luke Kitterman/U.S. Space Force)

One of the oft repeated phrases by political and military leaders during National Defense Authorization Act and defense budget rollout is how important it is to get the bill passed so we give our men and women in uniform everything they need to be successful in deterrence and warfighting. Providing what our armed forces require, given the threats facing our nation, is very important and should be the main focus of Congress and the White House. Unfortunately, the Space Force has not been given all it requires to deter and/or win a war for space superiority in great power conflict.

First, current policy has restrained the Space Force from generating the requirements and resource requests necessary to achieve a credible deterrence and warfighting Space Force. Instead,

current policy and strategic frameworks like the U.S. Space Priorities Framework focuses the service on enable and support missions for the joint force (i.e., terrestrial military operations). As a result, the service has not developed space deterrence and warfighting force postures that enable space superiority against our adversaries, but rather have continued on the path of graceful degradation via under attack.

This type of thinking, while arguably rational for the 1990s, is wholly inadequate for an era of rapidly developing and deploying Chinese, Russian, and Iranian space forces and ongoing counterspace operations against the U.S. and its allies. These operations, while non-kinetic, occur “every single day,” according to former vice chief of space operations, Gen. David Thompson.

Second, due to this mentality of supporting the joint force, the service is not deploying the weapons systems necessary for a credible deterrent against a near peer like China. Regardless of what side of the counter-space continuum you look (non-kinetic or kinetic), the Space Force either does not have the variety of anti-satellite and counter-space weapons systems to match what the adversary is deploying, or lacks sufficient numbers to have any real effect in a major great power conflict.

For example, China has deployed or is expected to deploy in the near term kinetic anti-satellite missile units; jammers of various kinds (satellite communications, GPS, etc.); and on-orbit anti-satellite technology, including those capable of aggressive rendezvous and proximity operations as well as the ability to capture and move U.S. and allied assets from their orbital posts and into disposal orbits.

If that was not enough, China has also

demonstrated its capability and willingness to use a fractional orbital bombardment system equipped with hypersonic glide vehicles with either conventional or nuclear payloads. This provides China with escalation dominance, which is key to credible deterrence in a great power competition environment.

As an example of how we lack credible numbers of counter-space weapons, the Space Force has a few Counter Communications System and Bounty Hunter jamming systems. These weapons systems, while supporting combatant commander requirements over the past few decades, exist in insufficient numbers to have much effect in a great power war in the Pacific. Even if all of these units were deployed to the Indo-Pacific region, there are not enough to address all adversarial orbital targets overflying the operating areas of U.S. terrestrial forces and our allies. As a result, we are putting our guardians in harm’s way without sufficient equipment to achieve meaningful effects in combat, much less the ability to gain space superiority in a high-stakes conflict.

Third is the budget for the service. While many have lauded the largest budget increases for the Space Force, the priorities and resources are insufficient. The majority of the budget is research and development, which is fine, but it is beyond time to move more capability into operational and maintenance lines and deploy capabilities for deterrence and warfighting, not just for continued space-support missions.

Finally, the Space Force is hindered by law from recruiting sufficient military personnel due to congressional limitations imposed before its establishment in 2019. This has led to insufficient numbers of trained personnel to operate space

support, space deterrence and warfighting systems needed to defend American interests in space. Thus, a never-ending cycle of re-optimizing the service or military departments happens every few years to make it look like major changes are being made, when in reality the service is just trying to find ways to do more with less.

This passive and inadequate approach will cede freedom of access and maneuver advantage in space to the adversaries of this nation and its friends. Congress should act quickly to remedy this situation and require the development of true warfighting capabilities necessary for the Space Force to be a fully coequal provider of combat forces in the joint force and not simply a service provider.

The Space Force was established to address the threat in space, not to be the help desk of the other services. The Space Force must have the funding, personnel and, most of all, the weapons to address the threats facing our nation today and into the future.

China, Russia Conceal Military Capabilities of Satellites, Posing Threat to US: Report

Frank Fang | 29 January 2024

Source: [ntd.com](https://www.ntd.com/china-russia-conceal-military-capabilities-of-satellites-posing-threat-to-us-report_969450.html) | https://www.ntd.com/china-russia-conceal-military-capabilities-of-satellites-posing-threat-to-us-report_969450.html

China and Russia are populating space with dual-use satellites while concealing their military applications, according to a new report from the U.S. military.

“China and Russia view the U.S. as overly reliant upon space for military and information superiority. Seeking asymmetric advantages in future conflict, both countries are designing, testing, and demonstrating counterspace weapons to deny, disrupt, or destroy satellites and space services,” the report says. “They often mask or conceal these activities to avoid international condemnation.”

The report, titled “Competing in Space,” was jointly written by the National Space Intelligence Center, a U.S. Space Force unit, and the National Air and Space Intelligence Center, a U.S. Air Force unit.

“The dual-use nature of some spacecraft technologies makes counterspace tests or hostile activity difficult to detect, attribute, or mitigate,” the report adds. “For example, sensors to inspect other satellites and robotic arms for servicing other satellites support peaceful missions, but can also be used to target or attack spacecraft.”

A debris mitigation satellite could function as a weapon system, the report says, pointing to China’s satellite Shijian-21, which in January 2022 towed a defunct Chinese navigation satellite to a graveyard orbit.

The report named another Chinese satellite, Shijian-17, which is equipped with a giant robotic arm. “Space-based robotic arm technology could be used in a future system for grappling other satellites,” the report says.

Russia has deployed several prototype orbital anti-satellites in low Earth orbit (LEO), including Cosmos 2504, 2519, and 2536, for testing “kinetic kill capabilities,” according to the report.

Most Earth-orbiting satellites are located in LEO, which is about 1,200 miles from the surface of the Earth. Other orbits include the medium Earth orbit (MEO), the highly elliptical orbit (HEO), and the geostationary orbit (GEO). GPS satellites are located in the MEO.

Space Capabilities

The report said Chinese military exercises “regularly incorporate jammers against satellite communications” and other targets, thus making Beijing likely to have been developing jammers targeting “a wide range of satellite communications supporting government and military operations.”

Other space capabilities that China and Russia are pursuing include directed-energy weapons.

“China has multiple ground-based laser systems of varying power levels that could blind or damage satellite sensors. By the mid-to-late 2020s, Beijing may have higher-power systems capable of damaging satellites,” the report says.

In 2021, China tested a hypersonic weapon system that, according to some experts, employs a deployment method similar to the Soviet concept known as the fractional orbital bombardment system. The report said the Chinese hypersonic weaponry “could prevent reliable missile warning

and complicate defense engagements.”

Since December 2018, when a previous version of the report was published, there has been a drastic increase in the number of satellites. As of the end of 2022, there were 7,096 satellites, more than triple from 1,880 six years ago, according to the report. The United States led with 4,723 satellites, while China had 647 and Russia 199. The rest of the world had 1,527 satellites.

“Over the past decade, China has rapidly developed into a major international space power, effectively multiplying its number of on-orbit satellites tenfold,” the report says. “More than half of the approximately 200 satellites China launched in 2022 were remote sensing satellites.”

Now, China operates more than 300 remote sensing satellites with diverse sensors, the report said, thus “improving the Chinese military’s ability to observe U.S. aircraft carriers, expeditionary strike groups and deployed air wings.”

Space Norms

Competition pitting the United States against China and Russia extends beyond Earth’s immediate orbits. Asteroids, the moon, Mars, and other celestial bodies could provide countries with valuable resources or strategic advantages, according to the report.

China is aiming to put its astronauts on the moon by 2030. Meanwhile, several nations including Venezuela, Pakistan, South Africa, and Belarus, have signed up for a planned moon base project led by China and Russia. It is officially known as the International Lunar Research Station.

The report highlighted Chinese and Russian activities at the Lagrange Points in space, including China’s Queqiao relay satellite, which

is stationed at one of these five points. Due to these points' relative distance between the Earth and the moon, spacecraft can remain in these regions for a longer period while consuming less fuel. Experts have compared these points to strategic oceanic gateways such as the Strait of Hormuz.

"These regions are uniquely valuable for long-term missions, such as surveillance, space environment monitoring, or data relay, in deep space," the report says.

The key to the future in space is "preserving space access" for all nations, the report said, but there is a lack of international consensus on space norms.

"Despite the substantial increase in new space operators, technologies, and spacecraft, the international community has not achieved consensus on major norms, rules, or principles governing activities in space since the 1970s," the report says.

It noted that China and Russia have endorsed a draft treaty for space that "fails to address a variety of anti-satellite weapons and lacks meaningful verification mechanisms."

As of December 2023, 33 nations have signed up to the U.S.-led Artemis Accords, which commit signatories to a common vision of peaceful, sustainable, and transparent cooperation in space.

"The expanding utility of space systems has extended the boundaries of conflict and exacerbated the world's vulnerability to dangers in the space environment. Actors seeking to challenge international order will have access to systems capable of devastating and lasting impacts on our progress on Earth and in space," the report concludes.

Global Aerospace Industry

In first, UK Downs Aerial Drone with Test Shot from Dragon Fire Laser

Andrew Chuter | 19 January 2024

Source: [CNBC](https://www.defensenews.com/industry/techwatch/2024/01/19/in-first-uk-downs-aerial-drone-with-test-shot-from-dragonfire-laser/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch) | https://www.defensenews.com/industry/techwatch/2024/01/19/in-first-uk-downs-aerial-drone-with-test-shot-from-dragonfire-laser/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch



The DragonFire laser directed-energy weapon achieved the U.K.'s first high-power firing of the weapon type against an aerial target. (Photo provided/ British Defence Ministry)

LONDON — An industry team has for the first time destroyed an aerial target using a high-power shot with its DragonFire laser, the British Defence Ministry announced Friday.

The trial with the direct-energy weapon is considered a significant milestone toward the deployment of the system, possibly within five years.

Efforts to quickly field such weapons are partly driven by conflicts in Ukraine and near the Red Sea, where expensive air defense missiles are used against cheap but effective drones. The cost of operating the laser is typically less than £10 (U.S. \$13) per shot, the ministry noted.

DragonFire is a £30 million technology demonstrator program revealed by the

ministry's Defence Science and Technology Laboratory in 2017.

The industry team — led by missile-maker MBDA, with partners Leonardo UK and QinetiQ — is the key element in a £100 million joint investment with the ministry to develop directed-energy weapons across several programs, including radio-frequency direct-energy weapons.

The MoD said the DragonFire test results are a major step forward in bringing the laser technology into service. The latest milestone follows a series of trials announced by the ministry late last year, including the first static high-power laser firing of a U.K.-made capability as well as the demonstration of the DragonFire system's ability to track moving air and sea targets with high accuracy.

Shimon Fhina, who directs the ministry's strategic programs, said the recent trials proved the technology can track and engage high-end targets at range. The government was looking to "accelerate the next phase of the program," he explained.

A spokesperson with the Defence Science and Technology Laboratory said the "timing of any deployment into U.K. service depends on a number of factors, but could be within the next 5 to 10 years."

The MoD had already announced its intent to progress directed-energy weapons into a so-called transition phase. This is meant to prepare the military for the eventual fielding of directed-energy weapons by communicating safety measures, implementing training, creating operational concepts and doctrine, and so on, the spokesperson explained.

Doug Barrie, an air warfare analyst at the London-based International Institute for Strategic Studies think tank, said the U.K.'s progress on laser technology is going well.

"There is a lot of work going on in countries like the U.S., Russia and China — most of it classified. But the U.K. has a long history in laser and radio-frequency work, and while we can only dream about the funding levels countries like the U.S. obtain, we [managed to squeeze] quite a lot out of our funding. It's transitioning the technology to the marketplace that is the problem," he said.

The British Army and the Royal Navy are each interested in using the technology for air defense. Naval News reported last year the MoD was looking at the retrofit of a 150-kilowatt-class laser directed-energy weapon for new Type 26 frigates beginning in the early 2030s.

The ministry declined to provide Defense news with technical details of the DragonFire, including its range and power levels. Media reports previously put the power level around 50 kilowatts.

"The range of DragonFire is classified, but it is a line-of-sight weapon and can engage with any visible target," the ministry said.

The latest trial took place at a test range in Hebrides, Scotland. The DragonFire shot down a drone, according to the Defence Science and Technology Laboratory, but no further details about the target were available, including range, altitude and speed.

"This type of cutting-edge weaponry has the potential to revolutionise the battlespace by reducing the reliance on expensive ammunition, while also lowering the risk of collateral

damage,” Defence Secretary Grant Shapps said in the ministry’s news release. “Investments with industry partners in advanced technologies like DragonFire are crucial in a highly contested world.”

France Buys 42 Rafale Jets for more than \$5.5 Billion

Rudy Ruitenberg | 12 January 2024

Source: Defense News | https://www.defensenews.com/air/2024/01/12/france-buys-42-rafale-jets-for-more-than-55-billion/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch



A French Rafale fighter takes off during an exercise at the French Navy's Lann-Bihoué base in Queven on Jan. 12, 2024. (Fred Tanneau/AFP via Getty Images)

PARIS — France has ordered 42 Rafale fighter jets from Dassault Aviation in a deal worth more than €5 billion (U.S. \$5.5 billion), the Armed Forces Ministry announced Friday.

The purchase comes as French lawmakers express concerns about the Franco-German project to develop a successor to the Rafale. The Future Combat Air System, as it’s known, isn’t expected to enter service before 2045 or 2050, according to the French Senate’s defense committee.

The French defense procurement agency notified Dassault Aviation as well as equipment suppliers Thales, Safran and MBDA of the

contract for the fifth production phase of the aircraft, the ministry said.

“This is excellent news for our sovereignty and security, and for our armed forces, which will benefit from additional Rafales with modernized operational capabilities,” Armed Forces Minister Sébastien Lecornu said in a statement.

The Rafale entered service with the French Navy in 2004 and the French Air Force in 2006, and has seen action in Afghanistan, Libya, Mali, Iraq and Syria. The latest contract brings the total number of Rafales ordered by France to 234, including a special order in 2021 for 12 fighters to replace aircraft transferred to Greece.

Export orders for the Rafale currently stand at 261 new aircraft; customers including Egypt, India, the United Arab Emirates and Indonesia. In addition, Greece and Croatia have each bought 12 secondhand Rafales from the French Air Force.

The new aircraft, meant for the Air and Space Force, will be one-seater versions and fitted to the F4 production standard, for which development started in 2018. The standard is focused on connectivity and includes MBDA’s Mica medium-range air-to-air missile as well as an upgrade of the Spectra self-defense system developed by Thales. Safran supplies the fighter’s M88 afterburning turbofan engine.

The jets are to receive upgrades to the F5 standard in the 2030s, according to the ministry. The Senate has called for Dassault Aviation to start work on the upgrade — which might include a loyal wingman UAV based on the European nEUOn combat drone program — as early as 2024 due to the uncertainty around the Future Combat Air System. The FCAS could cost two to three times as much as a Rafale, while exports would be subject to approval by the German partner, senators said in a November report.

Until FCAS becomes operational, France will need a top-notch fighter to ensure the airborne component of its nuclear deterrent, the defense committee said.

The Rafale is considered a 4.5-generation fighter, similar to the Eurofighter Typhoon and Saab's Gripen, and includes stealth technology, the ability to reach supersonic speed without the use of afterburners, engage in combat beyond visual range.

Dassault Aviation said existing Rafale orders, including the new contract, means the jet's production line will be active for the next 10 years.

The company received orders for 60 Rafales in 2023, including the 42 for France and 18 for Indonesia, compared with 92 export orders in 2022, according to financials released separately on Friday. Deliveries last year amounted to 13 aircraft, missing the goal of 15 — ultimately one less fighter than it delivered in 2022. The company's backlog for the Rafale increased to 211 at the end of December, including 141 for export; its backlog at the end of 2022 was 164.

The latest deal is the first major expenditure under France's 2024-2030 military budget law, and will support more than 7,000 jobs across more than 400 companies, the ministry said.

France to give Ukraine more Cruise Missiles, Plans Security Pact

Rudy Ruitenberg | 17 December 2024

Source: Defense News | https://www.defensenews.com/global/europe/2024/01/17/france-to-give-ukraine-more-cruise-missiles-plans-security-pact/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatchl



A member of the military walks past a MBDA Storm Shadow/Scalp missile at the Farnborough Airshow, south-west of London, on July 17, 2018. (Ben Stansall/ AFP via Getty Images)

PARIS — France will supply Ukraine with about 40 more Scalp-EG cruise missiles and hundreds of bombs in coming weeks, French President Emmanuel Macron said in a press conference Tuesday evening.

The French defense industry is also working within the framework of a “war economy” to boost production and supplies of equipment to Ukraine, in particular 155mm Caesar howitzers, the president said.

Macron turned to international issues more than two hours into a sprawling press conference in Paris, calling the Russian war of aggression in Ukraine the biggest risk to the security of Europe. He said France is finalizing a bilateral security agreement with Ukraine similar to the one concluded by the U.K. last week.

“We will basically continue to help Ukraine in its needs – for training, to hold on to the front, and to defend its skies,” Macron said. “With the deliveries I mentioned, with the agreements we’re finalizing.”

U.K. Prime Minister Rishi Sunak and Ukraine President Volodymyr Zelenskyy signed an agreement on security cooperation in Kyiv on Jan. 12, committing the U.K. to consulting with Ukraine in the event the country is attacked by Russia ever again, and to provide “swift and sustained” assistance for defense. The U.K. also announced military funding of 2.5 billion pounds (\$3.2 billion) for Ukraine in the 2024-2025 financial year.

Macron plans to visit Ukraine in February, by which time he said deliveries of munitions will have started, as France hands over equipment “almost in real time” with announcements.

France received its first Scalp from missile maker MBDA in 2003, and a senate report that year put the cost for a single missile at €860,000. The French started a midlife upgrade in 2016 to keep Scalp operationally effective until at least 2030.

French Armed Forces Minister Sébastien Lecorne is scheduled to host his Ukrainian counterpart Rustem Umerov in France on Thursday, with visits to the KNDS site in Bourges, where the company builds the truck-mounted Caesar howitzer, and MBDA’s production site of Scalp missiles in Selles-Saint-Denis.

France ranks behind Germany and the U.K. in value of military aid provided to Ukraine between January 2022 to October 2023, as well as behind smaller countries including Sweden,

Denmark and the Netherlands, according to data tracked by the Kiel Institute for the World Economy. At the same time, some of the equipment supplied by France expanded the long-range fire capabilities sought by Ukraine, including the Caesar cannons and Scalp missiles.

Macron said the world has become unstable, defined by the tension between China and the U.S., which risks upsetting Europe. He repeated calls for a more sovereign Europe that is an ally of the U.S. “but which doesn’t depend on it,” and which can be a hub of stability.

Russia cannot be allowed to win in Ukraine, because that would implicate the security of Europe and all of Russia’s neighbors, the president said.

“We will very clearly, us French and us Europeans, have new decisions to take in the weeks and months to come, precisely not to let Russia win.”

Macron said increased military investment now needs to be complemented by developing European defense, more common programs and investments, standardization of major European industrial programs and a closer military culture with partners.

Indian Aerospace Industry

France Ready for 100% Jet Engine Transfer to India for 5th-Gen AMCA, an Year after GE Deal for LCA Tejas

NC Bipindra | 27 January 2024

Source: Eruasian Times | <https://www.eurasiantimes.com/france-ready-for-100-jet-engine-transfer-to-indi/amp/>



Indian Prime Minister Modi with French President Macron in Jaipur during the latter's State visit to India on January 25, 2024. (Twitter)

Indian Ambassador to France, Jawed Ashraf, said Safran was willing to transfer technology. Ashraf was addressing the media on January 26 during the state visit of French President Emmanuel Macron to India to join the annual Republic Day parade in New Delhi.

India and France are already discussing the cooperation between Safran and India's Defense Research and Development Organization. In July 2023, during Indian Prime Minister Narendra Modi's official visit to Paris, the two nations announced that a roadmap for the joint development project for a combat jet engine would be prepared by the end of that year. Still, no formal announcement of the roadmap has been made.

Ashraf said the primary focus of the deliberations at present was to "align the engine specifications with India's future fighter jet requirements." He said India was looking for a comprehensive approach to tech transfer beyond just the transfer of manufacturing technology.

"The deal aims to delve into the actual design phase, metallurgical aspects, and other critical elements that contribute to developing advanced jet engines." Ashraf acknowledged the negotiations on the deal were complex, and navigating the complexities required finding common ground to meet India's overall military requirement targets.

Safran, a key player in the aerospace industry, is willing to engage with the Indian military research agency across various phases of the Advanced Medium Combat Aircraft (AMCA) project, including design development, certification, and production.

When the negotiations conclude, and the deal between the French firm and the Indian side is concluded, this would mark the second such arrangement India has entered into recently to meet its unfulfilled need for a jet engine for its indigenous combat aircraft projects.

Safran for AMCA, GE for Tejas Mk2

In June 2022, during Modi's official visit to the United States, American jet engine maker General Electric announced in a media statement that GE Aerospace has signed a Memorandum of Understanding (MOU) with Hindustan Aeronautics Limited (HAL) to produce fighter jet engines for the Indian Air Force.

In addition to potentially generating new work in India, the GE agreement would help several US facilities that currently support work on the

F414 engine with additional volume; as a result, GE said then.

While the Safran deal in the future would meet India's jet engine requirement for its futuristic twin-engine AMCA project, the agreement with GE would see another futuristic combat aircraft's powering needs — in this case, the Tejas Light Combat Aircraft's Mk2 variant.

India has already decided that its Tejas LCA Mk2 aircraft would be fitted with the GE F414 jet engine, and so would its LCA Mk1A, of which the HAL would produce 180 aircraft in Bangalore. The GE F404 jet engines power the LCA Mk1 jets, 40 already inducted into the Indian Air Force and are operationally deployed in two squadrons.

The agreement with GE includes the potential joint production of F414 engines in India. Eight F414 engines have been delivered as part of an ongoing development program for LCA Mk2. "The latest agreement will advance GE Aerospace's earlier commitment to build 99 engines for the Indian Air Force as part of the LCA Mk2 program."

GE began working with the Aeronautical Development Agency and HAL to support the development of India's Light Combat Aircraft (LCA) with F404 engines in 1986. Subsequently, GE Aerospace's F404 and F414 have been part of the development and production programs of LCA Mk1 and LCA Mk2. GE has delivered 75 F404 engines; another 99 are on order for LCA Mk1A.

India's Tryst with Jet Engine Technology

Jet engine technology is one of the significant gaps in India's DRDO's capabilities, as its successive efforts have failed to produce an

adequately powered jet engine. The present effort, jointly with Safran, would be called the 'Sakthi' engine project when it fructifies.

In its previous effort, beginning in 1986, India had attempted to develop a jet engine from scratch using turbofan technology, calling the project 'Kaveri' under the Gas Turbine Research Establishment (GTRE) of the DRDO. A turbofan powerplant should enable adequate thrust for the aircraft to achieve atmospheric glide and super-manoeuvrability.

The Kaveri project, with US\$53 million in funding, was part of the Tejas combat jet project. Though the plan was for 17 prototypes of Kaveri engines, the first bid could only achieve the core module, called 'Kabini.' The third prototype was the first to get variable inlet guide vanes on the first three compressor stages and had its first run in 1995.

In 1996, the first entire run of the Kaveri engine took place, and all five ground-test prototypes were tested in 1998. The initial flight tests were planned for 1999, and the test on Tejas was to happen in 2000. However, the sanctions that came following the 1998 Pokhran nuclear tests resulted in the Kaveri project slowing down due to technology acquisition difficulties.

The Kaveri project continued in spurts till mid-2004 when a failure during a high-altitude test in Russia ended all hopes for the engine to get on board the Tejas aircraft. By then, the Kaveri engine had done 1,700 hours of tests.

The Kaveri engine was sent to Russia again in 2008 for its second high-altitude test, though in 2007, GTRE decided to bifurcate the project into two separate programs. The K9+ program was a proof of concept in complete design and

for experience in integration and flight trials, and the K10 program was the final production variant through foreign collaboration.

After various trials and tribulations, in 2016, India announced a collaboration with Safran to make Kaveri engines worthy of the Tejas fighter jet. However, the plan has now shifted to get Kaveri ready to power India's indigenous unmanned combat aerial vehicles in the future.

Hyderabad Engineering Firm Azad to make Complex Components for Rolls-Royce's Defence Aircraft Engines

SNV Sudhir | 30 January 2024

Source: Deccan Herald | <https://www.deccanherald.com/business/hyderabad-engineering-firm-azad-to-make-complex-components-for-rolls-royces-defence-aircraft-engines-2869966>



Rolls-Royce and Azad Engineering agreement for sourcing. Credit: Special Arrangement

Hyderabad: Rolls-Royce inked an agreement with Hyderabad based precision engineering manufacturer Azad Engineering for making complex components for defence aircraft engines. Through this partnership, Azad Engineering will join the global supply chain for complex category components for Rolls-Royce's technologically advanced aero engines.

Rolls-Royce is a powerful player in the

defence aerospace engine market. Currently, more than 750 Rolls-Royce engines of 10 engine types are powering Indian Military aircrafts. With customers in over 150 countries, Rolls-Royce operates in more than 50 countries worldwide.

“As we work towards strengthening the defence ecosystem, we are happy to expand our supply chain in India in partnership with Azad Engineering. The sourcing of complex components from India for aero engine programmes further advances the goal of capability creation in the country,” said Rolls-Royce, Business Development and Future Programmes, Executive Vice President, Alex Zino.

Azad Engineering manufactures medium and highly complex precision components, assemblies/ sub-assemblies that are mission-critical for application of civil and military platforms.

“The agreement with Azad Engineering is another significant step for Rolls-Royce towards harnessing the potential of Indian companies to contribute to the defence manufacturing ecosystem. This reiterates our commitment to building our presence in India through local partnerships, furthering the vision of an ‘Atmanirbhar Bharat,’ said Rolls-Royce, Defence, India and South-East Asia, Senior Vice President, Abhishek Singh.

“Bringing these critical components to India not only showcases the capabilities of Azad Engineering, but also represents a pivotal moment for India's aerospace and defence industry, demonstrating the country's growing prowess in advanced manufacturing,” said Azad Engineering, Founder and CEO, Rakesh Chopdar.

DRDO Conducts Successful Flight-Test of New Generation AKASH Missile off Odisha Coast

12 January 2024

Source: PIB Delhi | <https://pib.gov.in/PressReleasePage.aspx?PRID=1995445#:~:text=Defence%20Research%20and%20Development%20Organisation,hrs%20on%20January%2012%2C%202024>



Defence Research and Development Organisation (DRDO) conducted a successful flight-test of the New Generation AKASH (AKASH-NG) missile from the Integrated Test Range (ITR), Chandipur off the coast of Odisha at 1030 hrs on January 12, 2024. The flight-test was conducted against a high-speed unmanned aerial target at very low altitude. During the flight-test, the target was successfully intercepted by the weapon system and destroyed. It has validated the functioning of the complete weapon system consisting of the missile with indigenously developed Radio Frequency Seeker, Launcher, Multi-Function Radar and Command, Control & Communication system.

The system performance was also validated through the data captured by a number of Radars, Telemetry and Electro Optical Tracking System deployed by ITR, Chandipur. The flight-test was witnessed by senior officials from DRDO, Indian

Air Force (IAF), Bharat Dynamics Limited (BDL) and Bharat Electronics Limited (BEL). The AKASH-NG system is a state-of-the-art missile system capable of intercepting high speed, agile aerial threats. The successful flight test has paved the way for User trials.

Raksha Mantri Shri Rajnath Singh has complimented the DRDO, IAF, PSUs and the Industry for the flight-test. The successful development of the system will further enhance the air defence capabilities of the country, he said.

Secretary Department of Defence R&D and Chairman DRDO Dr Samir V Kamat also congratulated the teams associated with the successful flight test of AKASH-NG.

Commentary

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“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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