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# समाचार पत्रों से चयित अंश Newspapers Clippings

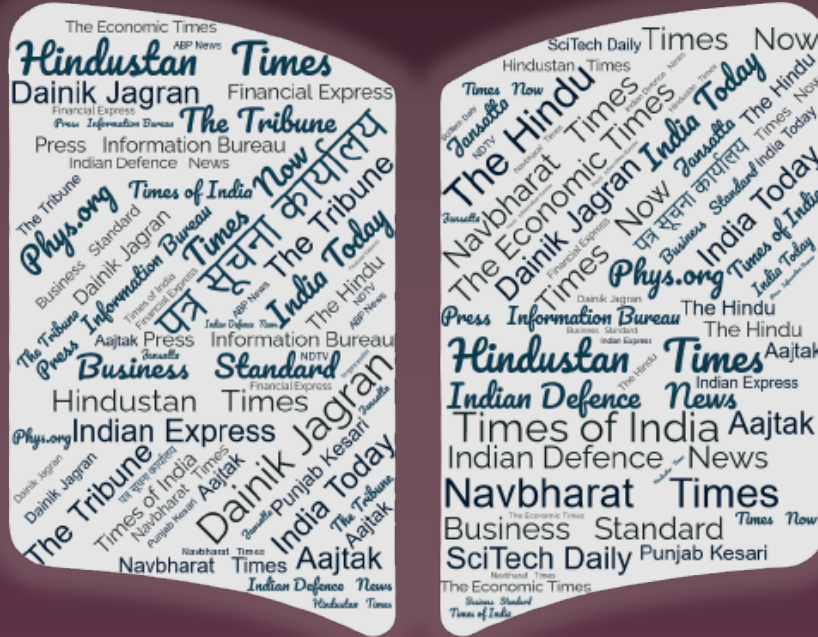
A Daily service to keep DRDO Fraternity abreast with DRDO  
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*Wed, 12 Oct 2022*

### **Make Use of Defence TDF Scheme, MSMEs Told**

A senior official in the Defence Research and Development Organisation (DRDO) has urged micro, small and medium enterprises in Telangana and Andhra Pradesh to avail themselves of the growth opportunities that the Technology Development Fund (TDF) scheme offers and help achieve the goals of Atmanirbhar Bharat. Scientist 'F' additional director DTDF Shiv Kumar, addressing a meeting organised by the Federation of Telangana Chambers of Commerce and Industry and FAPCCI, said this while highlighting the Telugu States' contribution to the indigenous efforts of DRDO. Describing the TDF scheme as a step towards Atmanirbhar Bharat in defence sector and how it offered opportunities to startups and MSMEs, he said since its launch, 58 projects worth Rs. 275 crore had been awarded under the scheme. It encourages participation of public/private firms and is focussed on promoting and providing financial aid to them to develop cutting-edge technologies for defence sector

In a release on the meeting, FTCCI said under TDF funding, up to Rs. 50 crore is available to the firms, especially MSMEs and startups. The entity must be owned and controlled by a resident Indian citizen with a minimum 51% ownership. FTCCI president Anil Agarwal said the scheme aims to provide a major fillip to the defence manufacturing sector. In addition to the funding for development of indigenous technology, it also provides various other benefits. Five entities from Telangana and Andhra Pradesh have been awarded projects under TDF scheme. "But the number is too small and we hope that this programme helps in reaching out to many more units to avail the scheme," he said. FAPCCI president Karunendra S. Jasti said the Andhra Pradesh government has identified defence manufacturing as a thrust sector for industrial development.

<https://www.thehindu.com/news/cities/Hyderabad/make-use-of-defence-tdf-scheme-msmes-told/article66002607.ece/amp/>

# DRDO on Twitter

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**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Wed, 12 Oct 2022 3:42 PM*

### **Indian Naval Ship Tarkash Reaches South Africa for IBSAMAR VII**

INS Tarkash reached Port Gqeberha (also known as Port Elizabeth), South Africa to participate in the seventh edition of IBSAMAR, a joint multinational maritime exercise among Indian, Brazilian and South African Navies from 10 - 12 Oct 22. The previous edition of IBSAMAR (IBSAMAR VI) was conducted off Simons Town, South Africa from 01 to 13 Oct 18. The Indian Navy is represented by the Teg class guided missile frigate, INS Tarkash, a Chetak helicopter and the personnel from the Marine Commando Force (MARCOS). The harbour phase of IBSAMAR VII includes professional exchanges such as damage control and fire-fighting drills, VBSS/cross boarding lectures and interaction among special forces. The Joint Maritime Exercise will strengthen maritime security, joint operational training, sharing of best practices and building interoperability to address common maritime threats.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1867069>



*Wed, 12 Oct 2022*

### **The Indian Army Goes Green, Opts for EVs in Ground Transport Fleet**

In a first, the Indian Army has put into plan a roadmap to induct Electric Vehicles (EVs) wherever possible. These electric vehicles including buses, sedans, and motorcycles, will be operational at locations which have been designated as peace stations. And this, according to sources in the security establishment will help reduce the army's carbon emissions and its dependency on fossil fuels.

## **Roadmap**

This adoption of EVs is in line with Prime Minister Narendra Modi's push for clean energy and to also help to reduce the dependency on fossil fuels, and to adapt to the changing environment. According to sources in the defence establishment it will help reduce the army's carbon emissions and its dependency on fossil fuels. Under the new plan considering the different terrains and necessity, the Army has plans to equip a few select units and formations which are located in Peace Stations with EVs "Around 48 percent MotorCycles, 25 percent Light Vehicles, and 38 percent Buses of the selected Units / formations are expected to be changed to EVs. And there will be adequate charging infrastructure," added sources. Before the roadmap was finalized various factors were taken into consideration which are unique to the Army's employability – like remote locations of employment and operational commitments.

## **Support Infrastructure**

The infrastructure required to help in this major step includes setting up of EV Charging points not only in the parking lots of offices but also in residential complexes which will help in on board charging. And there will be at least one fast charger and there will be around three slow chargers. Based on anticipated number of EVs per station there will be electric circuit cables and transformers with adequate load bearing capability.

## **Vehicles Procurement**

The Indian Army has plans to procure EVs through the Capital Route and to fulfill the deficiency of buses for select Peace Establishments, Electric Buses will be plied. In fact an Open Tender Enquiry (OTE) is expected to be floated soon for procurement of 60 Buses (Electric) along with 24 Fast Chargers. For working out the requirement, the Indian Army had taken into consideration the Operational role of the Establishments during operations. Also taken into account were the number of vehicles that were required to be shed for their Operational Role. According to sources, these EVs will help to establish the right momentum for setting up the ecosystem for further induction of such vehicles in the Armed Forces.

## **More about Army's use of EVs**

As part of its Civil Hired Transport (CHT) the Army is using EVs and charging stations are already set up in Delhi Cantonment (Cantt) which provides support to EVs which are hired or which will be inducted later. Earlier this year in April the Indian Army had a demonstration of available EVs to Defence Minister Rajnath Singh and these EVs were from various automobile giants including: Tata Motors, Revolt Motors, and Perfect Metal Industries (PMI). The company representatives not only showcased their EVs but also briefed the minister about the enhancement in technology and range of operation which was achieved in the past few years, explained sources.

## **Global Vehicles – EVs or Hybrid**

Militaries across the globe are looking at either EVs or hybrid models to be used in their transport fleets. In Fact some militaries are also looking at tanks which can be run on lithium or hydrogen fuel.

<https://www.financialexpress.com/defence/the-indian-army-goes-green-opts-for-evs-in-ground-transport-fleet/2708267/lite/>

## **Bengaluru-based BEL to Showcase State-of-the-Art Products at DefExpo 2022**

Defence PSU Bharat Electronics Limited (BEL), Bengaluru Wednesday announced that it will showcase state-of-the-art products and systems spanning every domain of its business at the Defexpo 2022 to be held at Gandhinagar, Gujarat, from October 18-22. “The products and systems to be on display during Defexpo 2022 have been clustered as Air Defence & Surveillance, C4I Systems, Artificial Intelligence-based Products, Non-Defence & Diversification Products, Radar Systems, Communication Systems, Airborne Products & Systems, Homeland Security and Cyber Security, Futuristic Technologies, Missile Systems, EO & Laser-based Products, Outdoor Display Products and Indian pavilion. In addition, the BEL will also showcase its R&D capabilities by launching/demonstrating some of its new products/technologies,” the BEL said.

Under the Air Defence & Surveillance sector, the BEL will display Hexacopter, Tethered UAV, Robotic Surveillance and D4 Anti-drone Systems. The display in the area of C4I Systems will include C4I technologies, Combat Management Systems and Navigational Consoles. “The BEL will showcase its Radar Systems including Battle Field Short Range Active Electronically Scanned Array (BFSR-AESA) Radar, Air Defence Fire Control Radar, Mountain Fire Control Radar, Weapon Locating Radar, etc. The BEL’s display in the area of Communication Systems will include High Capacity Radio Relay, Manpack High-Frequency Software Defined Radio (SDR), Point to MultiPoint Radio, SDR Handheld Naval version, and a whole lot of other products,” the company added.

“Other futuristic technologies on display include Automatic Dependent Surveillance-Broadcast System, Position Indicator – G3I, Hand-Held Indian Regional Navigation Satellite System, Monolithic Microwave Integrated Circuit (15 types within one enclosure), etc,” it said.

<https://indianexpress.com/article/cities/bangalore/bel-defexpo-8204944/>

## **Boeing to Showcase F/A-18 Super Hornet Simulator, Helicopters at DefExpo**

In an effort to highlight its commitment to India’s ‘Atmanirbhar Bharat’ vision, the US based aerospace company Boeing Company is all set to showcase its wide range of advanced defense capabilities at DefExpo 2022 next week. Recently, the company has announced a potential

economic impact of US \$3.6 billion over 10 years to the Indian economy with the F/A-18 Super Hornet as India's carrier-based fighter. And also its continued investments in skilling, training, infrastructure, manufacturing, sustainment, engineering and technology transfer. And the economic impact, according to a company note issued ahead of the DefExpo , would be over and above American company's current offset obligations and other plans in the country.

### **Boeing theme this year: “By India, For India”**

It will highlight its strategic investments in India's aerospace and defence ecosystem to build workforce development, partnerships, services local infrastructure, and capabilities, while harnessing the strength of Indian talent. And the large and growing network which has more than 300 supplier partners.

### **What to look for?**

The company will highlight the existing defence programmes with the Indian Navy and the Indian Air Force (IAF) like AH-64E Apache, and CH-47F Chinook Helicopters, C-17 Transport Aircraft and P-8I. And will also outline training and performance-based logistics solutions and sustainment, for the Indian Armed Forces to support the lifecycle of their fleets and also increase mission readiness. The Indian Navy is still in the process of finalizing the fighter jets for its aircraft carrier. The choice is between F/A-18 Super Hornet Block III of Boeing and Rafale-M (Marine). Advanced capabilities of the F/A-18 Super Hornet Block III and F-15EX will also be showcased. And will highlight the industrialization benefits of the offer of the company to the Indian Navy.

On a simulator visitors will get a chance to be able to fly the Boeing F/A-18 Super Hornet Block III. And they will also get to learn more about the aircraft's capabilities. Presently, India is operating (12) P-8Is, three VVIP aircraft and two Head of State aircraft and also (11) C-17s, (22) AH-64 Apaches (with six more on order), (15) CH-47 Chinooks. Financial Express Online has reported that the company has been increasing its sourcing from India and has expanded its suppliers network.

### **Comments from the company**

Salil Gupte, president, Boeing India says that “the company is committed to supporting and enabling this progress with a vision to bring the best of Boeing to India and take the best of India to the world.”According to Alain Garcia,vice president, Boeing Defense, Space & Security in India, the company that supports defence modernization of the Indian armed forces, continues to partner with local industry.

<https://www.financialexpress.com/defence/boeing-to-showcase-fa-18-super-hornet-simulator-helicopters-at-defexpo/2708603/lite/>



## India's Rocket Artillery Force: Endeavour in Self Reliance

*By Debajit Sarkar*

At the macro level, every single conflict is about the attrition of the opponents' field forces, war-making capability, and/or will to fight. In order to attain a position of advantage created by way of attrition; one must be able to impact the enemy without incurring greater losses, frequently by using weapons with greater stand-off ranges to protect friendly forces. The Indian Army's conventional infantry forces will have to fight against enemy forces in a linear fashion. Therefore, they are subject to topography and the consequences that weather, geographical and man-made obstacles, and canalization have on the landscape. Due to their inherent closeness to hostile forces, infantry forces are also exposed to attrition by unrelenting indirect fire from cannons, rockets, mortars, and missiles that are designed to utilize stand-off ranges to their advantage. For these reasons, infantry forces care more about these indirect fire dangers than they do about war-making capability.

This is where rocket artillery comes in. Rocket artillery does not exactly assist the fighting directly. Rocket artillery is Army/Corps/Division resources that are deployed far from the frontlines for counter-battery duties. i.e., when an enemy artillery fires, the blue force artillery radar will track the trajectory of the artillery round and ascertain the approximate location of the enemy artillery. The friendly rocket artillery will then be delivered to the location and they will fire their rockets to overwhelm the area. In contemporary warfare troops and hardware never assembled in one place near the frontline. Artillery, armoured vehicles and infantry, air defence, are positioned at a distance from each other. The Indian Army has a long history of using rocket artillery. The Indian Army had the 62xBM-30 Smerch systems and the BM-21 Grad launchers. Both these MLRS systems are of Russian origin. While the Grad lacks the range in terms of anti armour guided weapons it does have the ability to deliver much more top attack munitions per load than Smerch, but launches them over shorter range. To replace the BM-21 Grad India's Defence Research and Development Organization (DRDO) toiled hard to develop the indigenous Pinaka Multi Barrel rocket launcher (MBRL) based on an 8x8 vehicle. Pinaka is a comprehensive system that integrates high energy propulsion, submunition warheads, servo-controlled launcher structure as well as fire control computer. Pinaka Incorporate State-of-the-art technologies for providing superior combat performance. Pinaka proved its combat capabilities during the Kargil conflict in June 1999.

Each Pinaka battery is composed of six launcher vehicles, six loader- cum replenishment vehicles and two command post vehicles. Every launcher vehicle carries two pods that accommodate a total of 12 rockets. Each Pinaka rocket can carry a 100 kg payload for a range of 40 km. A solitary Pinaka battery can neutralize a surface area of 700m x 500m. Upcoming rockets of the Pinaka system will have a much greater range. A salient aspect of the Pinaka

MBRL is that it continues to evolve and can therefore be upgraded to fire a variety of new rockets. Some of the new rockets that DRDO should consider developing are:

- A new 200km range rocket for the Pinaka that can hit in one salvo a cluster of targets at a major distance from each other, as they concurrently launch projectiles separate in flight, each corresponding to its input GPS-based target data. The upgraded Pinaka system should be able to automatically obtain and process information from drones or reconnaissance vehicles; it does not need to be keyed by the operator. With a 200km range this rocket can effectively carry out Suppression of Enemy Air Defenses(SEAD) operations because several ground-based radars are in that range.
- Taking a leaf out of the SA-6 SAM complex that employs a rocket booster as a combustion chamber for a ramjet, the DRDO can develop a ramjet powered rocket. A ramjet can be 3D printed quite quickly. This ramjet powered rocket could fly for a couple of minutes at low power settings that just remove drag and let it cruise along for huge distances, or it could run for a shorter phase with a higher thrust setting, permitting it to climb and move relatively fast at higher altitudes.
- Rocket tube launched drone. Having a rocket tube launched drone means the Indian Army will not have to depend on a separate recon unit to locate targets or support their operations. Much of the time the Indian Army's artillery force will work along with recon and intel forces which probably will have their own drones that will search for and find appropriate targets for the rocket artillery battery and then after a first rocket attack the drone can observe the results and calculate if another attack is needed or not.

Pinaka MBRL will be extremely effective in any border conflict against China or Pakistan in targeting armoured formations. The adversary's armoured vehicles can button up and drive through rocket artillery fire but as soon as they button up, their ability to see diminishes to a large extent. And as they drive through the artillery fire, there is a high chance they will have firepower and mobility damage or that the formation will alter its direction of attack. The results are interruption and suppression of armour. By far, perhaps the most important factor is production of these rockets. Over the years the production of Pinaka rockets has increased. With two active defence corridors in Uttar Pradesh and Tamil Nadu and an increase in the participation of the Indian private sector in the defence industry there is every reason to believe that the volume of production will increase going forward.

<https://www.financialexpress.com/defence/indias-rocket-artillery-force-endeavor-in-self-reliance/2708498/lite/>



*Thu, 13 Oct 2022*

## **Military History must be in our Curriculum**

*By Nishtha Kaushiki*

Although we are not fighting an openly declared war on the border, the tentacles of hybrid warfare are spreading fast. The young generation probably holds some of the most influential

leaders, space and nuclear scientists, microbiologists and administrators. A curriculum that makes the students aware of the struggles of independent India and the glorious military history will keep their expectations realistic from India's neighbours and not fall into the trap of divisive forces. In such a scenario, service to the country would be the main guiding principle. The history of South Asia tells us that India has never been an expansionist state despite having a predominant geographical and military position in South Asia. Wars have always been imposed, and, despite being victorious, the country was benevolent towards its aggressors. India returned the Prisoners of War and the land (such as Haji Pir Pass) that was won. Unfortunately, the graciousness of a strong victor has been taken as a 'soft approach' by many western strategic experts, Pakistan and China.

Both the adversaries together present before us a collusive and collaborative threat. The horizons of active security threats have broadened. They now include new and emerging technologies such as artificial intelligence and space, bio-warfare, trade wars, and hybrid warfare apart from the conventional ones such as nuclear threats. In such a changing geopolitical landscape, it becomes pertinent for India to include military history in a comprehensive and well-defined manner starting from the primary stage and going up to the secondary and higher secondary stages, apart from the university level.

In all schools, even at the level of primary classes, various dance drama skits are screened based on Shri Krishna Leela and Shri Ramayana themes, apart from excerpts from Discovery of India. The establishment of the Mauryan Empire, and the advent of invaders from the Mughals to the British, leading to India's freedom struggle, has been well explored. However, excluding military history from the curriculum ends up in a vacuum where the distractions of globalization set in and consequently divert the child's psychology. Short biographies of various gallantry award winners can be a part of both Hindi and English literature. Each 'shauryagatha' will motivate the students to serve the motherland by joining the forces or contributing through other means.

The middle section of social sciences textbooks, while including ancient India, can also include Kautilya's Arthashastra. 'Kuta-yuddha' (concealed fighting) and 'tusnim-yuddha' (silent fighting), which Kautilya spoke about, has contemporary relevance. We are responsible for making children, youth and others aware that Kautilya laid the foundations of modern-day realpolitik. Sun Tzu's Art of War, which has often been hailed as a 'masterpiece', was written 50 years after Kautilya's Arthashastra. India always had a 'grand strategy' in place but owing to the enslavement by the British, we lost the outlook of exploring the ancient Indian knowledge traditions of science, maths and even warfare.

The higher-level social sciences books of history may give a detailed description of the wars of independent India, apart from the respect that forces have given to various international agreements. For instance, the burial of Pakistani soldiers by the Indian government during the Kargil War, treating Prisoners of War (PoW) with due respect, discrimination between combatants and non-combatants and not using human shields are some principles that are in the International Humanitarian Law and the forces have always abided by it, even during the harshest of counter-terrorism operations. These principles were outlined first by the Dharam Shastras.

Being the most ancient civilization, Hinduism has immensely contributed to modern-day international law, an awareness of which should be brought into the public domain. Imparting such knowledge will benefit future generations, and we should not shy away from including such

topics in our curriculum. Such a strategy will develop a favourable international legal perspective towards their country apart from a sense of pride and positive self-esteem towards the forces.

For science, junior-level books should incorporate the achievements of ancient Indian knowledge systems such as making coins, the sciences of the building of the temples, water conservation, weaponry system, Sushruta Samhita and surgeries apart from various overlapping concepts such as embryology. The subject can be correlated in the middle section with ancient and medieval weaponry systems depicted in ancient India's temples. For instance, the use of bows used the technology of gears and pull-back mechanisms. The arrows used were thick ones with rounded tops with explosive materials, akin to today's missiles with chemical warheads. Also, young scientists have not explored advanced technology like acoustic levitation in the south and central Indian temples.

The use of natural harmonics in ancient India is similar to the modern use of resonance frequency and has to be explored. Some time back, a few CIA staff and U.S. Vice President Kamala Harris had faced mysterious symptoms in Singapore and Vietnam. Such a cause has been associated with 'Havana syndrome', with experts suggesting targeted frequencies. Ancient knowledge undoubtedly is the guiding force. Such a vast knowledge system with strategic significance stands unexplored and sidelined by the national curriculum and strategic experts.

With scientific overlapping between the past and the present, military history can be considered a single chapter in most subjects. At the secondary and higher secondary stages, the study of various institutes of national importance and their achievements, such as satellites, nuclear missiles, vaccines such as Covaxin by DRDO, ISRO, AIIMS and the Indian Academy of Sciences (IAS) etc. will contribute immensely in developing a positive feeling of self-esteem.

Innovation during the war can too be included in the syllabus. For instance, the Kargil War is related to military nationalism and the innovations of the Indian army, such as precision striking during the night, developing secured communication networks, etc. Such inclusions will motivate the science students to apply their knowledge towards creating new technologies and avoiding brain drain. It will boost technological indigenization, particularly in green energy and the development of military operational systems.

A gradual introduction to Vedic mathematics techniques will enhance the children's calculation skills. Previously, concepts such as Bijaganita have been appreciated by many western mathematicians such as G. B. Halsted and Andre Weil. Incorporation of Mathematical calculations for warfare highlighted in the Mahabharata, such as Krauncha Vyuha (Heron formation), Mandala Vyuha (Galaxy formation), Makara Vyuha (Crocodile formation) through activity-based learning will sharpen their problem-solving skills.

Overall, such moves will alter the psychology of the young generation. They would not be living in a world of fantasy where either the movie heroes or artificial characters rule the roost. When War heroes and indigenous achievements replace the non-existing heroes, the building up of national character improves substantially. For this purpose, regular civil-military interfaces at the school level for perception management should be encouraged. Finally, such an approach will help permeate the idea of democratic 'responsibilities' towards the nation rather than just 'rights' through which the people reflect their abstract notions of 'freedom' or 'Azadi'.

<https://www.dailypioneer.com/2022/columnists/military-history-must-be-in-our-curriculum.html>

# THE TIMES OF INDIA

*Thu, 13 Oct 2022*

## **Naval MIG-29K Crashes off Goa Coast, Pilot Ejects Safely**

In yet another crash in the armed forces, a naval MiG-29K fighter jet crashed off the Goa coast after a technical malfunction on Wednesday morning. The pilot, fortunately, managed to eject safely. The twin-engine MiG29K, being flown by a commander-rank officer, was returning to land at the INS Hansa base at Goa after a routine sortie in the morning when the jet "developed a technical malfunction". "The pilot ejected safely and was rescued in a swift helicopter search and rescue operation. He is in stable condition.

The Navy has ordered a Board of Inquiry to investigate the cause of the incident," an officer said. With this crash, the Navy now has 40 of the 45 supersonic MiG-29Ks inducted from Russia at a cost of \$2 billion from 2009-2010 onwards to operate from the deck of the 44,500- tonne aircraft carrier INS Vikramaditya, which cost another \$2.33 billion. The operational serviceability of the MiG-29K fighters, four of which have crashed in the last four years, has been a problem. The Navy is now actively hunting for an additional 26 carrier-based fighters after the commissioning of the country's first indigenous aircraft carrier, the 45,000- tonne INS Vikrant, on September 2.

INS Vikrant will become fully combat-ready after the MiG29Ks complete crucial flight trials from her sprawling deck by around mid-2023. She is equipped with high-tech weapons like the Israeli-origin 80-km range Barak-8 surface-to-air missile systems.

<https://timesofindia.indiatimes.com/city/goa/naval-mig-29k-crashes-off-go-a-coast-pilot-ejects-safely/articleshow/94821276.cms>

# The Tribune

*Thu, 13 Oct 2022*

## **Rafale, Chinook Hog Attention at Air Show in Udhampur**

The skies over Udhampur roared on Wednesday as fighter jets and combat helicopters of the IAF captivated the audience with their manoeuvres during an air show to mark the diamond jubilee celebrations at the headquarters of the Air Officer Commanding (AOC) Jammu, Kashmir and Ladakh. As part of the event, a fly-past began with skydiving by a team of Akashganga from AN32 followed by air manoeuvres and different formations by Jaguar, MiG29, Su-30 and Rafale aircraft, officials said. Combat helicopters like Apache, Mi-17 Slithering and Chinook also exhibited adrenaline-pumping manoeuvres in the first-of-its-kind air show at the Udhampur Air Force Station. Air Officer Commanding-in-Chief, Western Air Command, Air Marshal Sreekumar Prabhakaran, lauded the role of the headquarters, AOC, Jammu, Kashmir and Ladakh, for dominating the Himalayas over the past 60 years.

General Officer Commanding-in-Chief, Northern Command, Lt Gen Upendra Dwivedi, Air Officer Commanding, Jammu, Kashmir and Ladakh, Air Vice-Marshal Praveen Keshav Vohra

and other senior IAF, military and civil dignitaries also attended the show. “As part of the diamond jubilee celebrations of the headquarters, AOC, the motive is to dominate the Himalayas and that is what they have been doing it for the past 60 years.



*Figure 1 An IAF paratrooper performs during the diamond jubilee celebrations of the headquarters of Air Officer Commanding, Jammu, Kashmir & Ladakh, in Udhampur on Wednesday.*

The AOC, J&K, was established in 1962 and it moved to Udhampur in 1964,” Prabhakaran said. He said the headquarters, AOC, had worked as a link between the IAF’s Delhi-based Western Command and the Northern Command of the Army. “And thanks to the headquarters, AOC, the Northern Command of the Army and the Western Command based in Delhi, we work closely and it is this headquarters which has helped in coordinating all activities between the Army and the Air Force,” the Western Commander said.

Prabhakaran said the headquarters had built a good liaison with the Army and soldiers on the frontline were looked after well and all their needs, whether related to ration or ammunition, especially during the winters, were fulfilled. “The headquarters also maintains a close liaison with civilians, whether it was an earthquake which happened in J&K earlier, flood in Srinagar and the issue which we recently had at the Amarnath cave,” he said.

<https://www.tribuneindia.com/news/j-k/rafale-chinook-hog-attention-at-air-show-440759>

## THE ECONOMIC TIMES

Wed, 12 Oct 2022

### **US, India to Work Together to Support Shared Vision of Free and Open Indo-Pacific: Biden's National Security Strategy**

The United States and India will work together both in the bilateral and multilateral setups to support their shared vision of a free and open Indo-Pacific, the Biden administration's National Security Strategy said on Wednesday as it identified China as "one of the major threats" to American national security. "As India is the world's largest democracy and a major defence

partner, the US and India will work together, bilaterally and multilaterally, to support our shared vision of a free and open Indo-Pacific," said the Strategy, a declassified version of which was released. The Strategy, which identified China as "one of the major threats to American national security," reaffirmed US' iron-clad commitments to its Indo-Pacific treaty allies - Australia, Japan, South Korea, the Philippines and Thailand.

"We will continue to modernise these alliances. We reaffirm our unwavering commitment to the defence of Japan under our mutual security treaty, which covers the Senkaku Islands," it said. The US, India and several other world powers have been talking about the need to ensure a free, open and thriving Indo-Pacific in the backdrop of China's rising military manoeuvring in the region. China claims nearly all of the disputed South China Sea, though Taiwan, the Philippines, Brunei, Malaysia and Vietnam all claim parts of it. Beijing has built artificial islands and military installations in the South China Sea. "We have entered a consequential new period of American foreign policy that will demand more of the US in the Indo-Pacific than has been asked of us since the Second World War," according to the National Security Strategy document.

No region will be of more significance to the world and to everyday Americans than the Indo-Pacific, it said. "We are ambitious because we know that we and our allies and partners hold a common vision for its future." The White House said the National Security Strategy outlines how the United States will advance its vital interests and pursue a free, open, prosperous and secure world. "We will leverage all elements of our national power to outcompete our strategic competitors; tackle shared challenges; and shape the rules of the road," it said. On China, it said the US will effectively compete with Beijing, which is the only competitor with both the intent and, increasingly, the capability to reshape the international order, while constraining a "dangerous" Russia. "Strategic competition is global, but we will avoid the temptation to view the world solely through a competitive lens, and engage countries on their own terms," it said.

The White House said the US places a premium on growing the connective tissue on technology, trade and security between its democratic allies and partners in the Indo-Pacific and Europe because they recognise that they are mutually reinforcing and the fates of the two regions are intertwined. "As we deepen our partnerships around the world, we will look for more democracy, not less, to shape the future. We recognise that while autocracy is at its core brittle, democracy's inherent capacity to transparently course-correct enables resilience and progress," said the White House about the national security strategy. "As an Indo-Pacific power, the US has a vital interest in realising a region that is open, interconnected, prosperous, secure and resilient. We are ambitious because we know that we and our allies and partners hold a common vision for the region's future," it said.

<https://economictimes.indiatimes.com/news/defence/us-india-to-work-together-to-support-shared-vision-of-free-and-open-indo-pacific-bidens-national-security-strategy/articleshow/94819184.cms?from=mdr>

Wed, 12 Oct 2022

## Multilateral IBSA Naval Drills Conclude in South Africa

To build interoperability to address common maritime threats and to further strengthen maritime security, navies of India, Brazil and South Africa have concluded IBSAMAR VII Joint Maritime Exercise. Based on the information shared by the Indian Navy on Tuesday (Oct 12, 2022) to participate in a three days drill, INS Tarkash reached Port Grequhrea (also known as Port Elizabeth), South Africa. This multinational maritime exercise among the navies of the three countries which are also part of BRICS (Brazil, Russia, India, China and South Africa) started from Oct 10- 12, 2022. In this edition of the naval drill between the three countries, besides the Teg class guided missile frigate, INS Tarkash, personnel from the Marine Commando Force (MARCOS) and a Chetak helicopter were also there.

According to the Indian Navy during the harbour phase of IBSAMAR VII there were professional exchanges like fire-fighting and damage control drills, and also interaction among Special Forces and VBSS/cross boarding lectures. In August, Financial Express Online had reported that from South American nation Brazil, a frigate and a team of marines, and South Africa one of its Valour Class frigates and two Maritime Reaction Squadron (MRS) boarding teams were deployed for the exercise.

### Importance of the drill

In view of China's growing presence across the global waters, naval cooperation and maritime security have been identified by the IBSA as important sectors to further deepen the cooperation. As has been reported by Financial Express Online earlier, the three countries have agreed to ensure security of sea lines of communication, sustainable exploitation of marine resources, including fishing as well as energy resources. In one of the earlier meetings of IBSA NSAs in New Delhi, India had proposed pooling in resources among the defence industries of the three countries which would help in joint development and production of the military and naval platforms. Brazil and South Africa had participated in Exercise MILAN 2022.

According to a top Indian Navy official such multinational drills exemplify the long term strategic relationship between three vibrant democracies, and strong economies. The first trilateral naval drill of IBSA was initiated in 2006 and has over the years has matured into more complex drill at sea which involves Special Forces, submarines, aircraft as well as warships.

### IBSA

This grouping or member countries exemplify the spirit of South-South cooperation. There is also an IBSA Fund which since its inception has allocated over more than US\$ 44 million. This has supported 39 South-South cooperation development projects in 35 partner countries out of which majority are Least Developed Countries. Next month, on the sidelines of the G20 summit in Bali, India, which is the incumbent IBSA Chair, will be hosting the 6th IBSA Summit.

<https://www.financialexpress.com/defence/multilateral-ibsa-naval-drills-conclude-in-south-africa/2708473/lite/>



## **North Korea says it has Tested and Deployed 'Tactical Nuke' Cruise Missiles**

Kim Jong Un supervised the launch of two long-range cruise missiles, state media said Thursday, adding that the weapons were equipped to carry tactical nukes and had already been deployed to North Korean army units. Pyongyang has conducted a blitz of ballistic missile tests recently which it described as tactical nuclear drills that simulated taking out airports and military facilities across South Korea. Analysts warned the isolated regime had completed preparations for another nuclear test. The cruise missiles -- which travel at much lower altitudes than ballistic missiles, making them harder to detect and intercept -- travelled 2,000 kilometres (1,240 miles) over the sea Wednesday before hitting their targets, the Korean Central News Agency said. Kim expressed "great satisfaction" with the tests for improving combat efficiency of the cruise missiles, which KCNA said have already been "deployed at the units of the Korean People's Army for the operation of tactical nukes."

Kim said the country's nuclear combat forces were at "full preparedness for actual war" and said that the tests were another warning to the country's enemies. North Korea must "continue to expand the operational sphere of the nuclear strategic armed forces to resolutely deter any crucial military crisis and war crisis," the report added. "Kim Jong Un stressed that we should focus all efforts on the endless and accelerating development of the national nuclear combat armed forces," it said. Pyongyang is not technically banned by the UN from testing cruise missiles, but all ballistic missile launches violate sanctions and are typically flagged by Seoul or Tokyo. Neither alerted the Wednesday test. Kim made acquiring tactical nukes -- smaller, lighter weapons designed for battlefield use -- a top priority at a key party congress in January 2021, and this year vowed to develop North Korea's nuclear forces at the fastest possible speed.

"The latest test means the North is operating tactical nuclear capability on cruise missiles, which are harder to detect for their low-altitude flight," Hong Min of the Korea Institute for National Unification told AFP. "It is a testament to Pyongyang's capability to mount nuclear warheads," he said, adding that cruise missiles can also have irregular flight paths making them harder to intercept. - Military drills - The country revised its nuclear laws last month to allow preemptive strikes, with Kim declaring North Korea an "irreversible" nuclear power -- effectively ending the possibility of negotiations over its arsenal. Since then, Seoul, Tokyo and Washington have ramped up combined military exercises, including deploying a nuclear-powered US aircraft carrier to the area twice, infuriating Pyongyang, which sees such drills as rehearsals for invasion. In response, North Korea "decided to organise military drills under the simulation of an actual war" that gamed out hitting South Korea's ports, airports and military command facilities, KCNA said Monday.

North Korean army units involved in "the operation of tactical nukes staged military drills from September 25 to October 9 in order to check and assess the war deterrent and nuclear counterattack capability", the agency said. Kim oversaw these tests as well, it said. This report also said that North Korea's October 4 missile launch, which flew over Japan and prompted rare

evacuation warnings, involved a "new-type ground-to-ground intermediate-range ballistic missile". The volley of KCNA statements about the country's recent tests -- which are unusual, as state media no longer routinely comments on launches -- indicates Pyongyang is concerned about the recent US-led joint drills, analysts say.

<https://economictimes.indiatimes.com/news/defence/north-korea-says-it-has-tested-and-deployed-tactical-nuke-cruise-missiles/articleshow/94822551.cms?from=mdr>

# THE ECONOMIC TIMES

Wed, 12 Oct 2022

## Explainer-What Makes a Nuclear Weapon 'Tactical'?

From the war in Ukraine to North Korea's recent missile testing spree, tactical nuclear weapons are being debated and developed in a way not seen since the Cold War. There is no universal definition of such weapons, and analysts note that the use of any type of nuclear device would break the "nuclear taboo" in place since the United States dropped atomic bombs on Japan in 1945, the only time they have been deployed in war. Here are the characteristics of tactical nuclear weapons and why they have drawn so much attention.

### What is a tactical nuclear weapon?

Tactical nuclear weapons are often characterized by their size, their range, or their use for limited military targets. They are often referred to as "non-strategic weapons", in contrast with strategic weapons, which the U.S. military defines as designed to target "the enemy's war-making capacity and will to make war," including manufacturing, infrastructure, transportation and communication systems, and other targets. Tactical weapons, by contrast, are designed to accomplish more limited and immediate military goals that win a battle.

The term is often used to describe weapons with a lower "yield", or the amount of power released during an explosion. They are typically many times larger than conventional bombs, cause radioactive fallout and other deadly effects beyond the explosion itself, and there is no agreed upon size that defines tactical weapons. Tactical weapons are often mounted on missiles, air-dropped bombs, or even artillery shells that have a relatively short range, far less than the huge intercontinental ballistic missiles (ICBMs) designed to travel thousands of kilometres and strike targets across oceans. However, many of these delivery systems can also deliver strategic nuclear weapons.

### Who has them?

Many of the world's nuclear powers have weapons that are considered low-yield or meant to be used on the battlefield. According to a March report by the U.S. Congressional Research Service (CRS), the United States has approximately 230 non-strategic nuclear weapons, including about 100 B61 bombs deployed with aircraft in Europe. In 2018 the Trump administration announced plans for a new low-yield warhead for submarine-launched ballistic missiles (SLBMs), and a new non-strategic nuclear-tipped cruise missile. Russia has 1,000 to 2,000 warheads for non-strategic nuclear weapons in its arsenal, the CRS report says. North

Korea said this week that its recent flurry of missile tests were designed to simulate showering the South with tactical nuclear weapons. Experts believe that if North Korea resumes nuclear testing, it could include development of smaller warheads meant for battlefield use.

### **Will they be used?**

President Vladimir Putin, who rules the world's biggest nuclear power, has repeatedly cautioned the West that any attack on Russia could provoke a nuclear response. U.S. President Joe Biden said on Wednesday he doubted that Putin would use a nuclear weapon, and analysts have said tactical weapons could have limited military use in the vast and dispersed battlefields in Ukraine. Earlier Biden noted that the use of even small nuclear weapons could spiral out of control. "I don't think there's any such thing as the ability to easily (use) a tactical nuclear weapon and not end up with Armageddon," he said last week. North Korea's pursuit of the weapons, meanwhile, could represent a dangerous change in the way North Korea deploys and plans to use nuclear weapons, analysts say. It has also prompted renewed debate in South Korea over redeploying American tactical nuclear weapons, which were withdrawn from the peninsula in the 1990s, or pursuing its own nuclear programme. North Korea says its nuclear weapons are for self-defence.

<https://economictimes.indiatimes.com/news/defence/explainer-what-makes-a-nuclear-weapon-tactical/articleshow/94807493.cms>

## **DefenseNews**

*Thu, 13 Oct 2022*

### **Malaysia Picks Turkish Defense Firm in Drone Deal**

Malaysia has selected Turkish Aerospace Industries to provide three unmanned aircraft, according to the Southeast Asian nation's defense minister. "[F]or the procurement of three (3) MALE-UAS units, the Government has decided to contract with Turkish Aerospace Industries (TAI)," Hishammuddin Hussein said in a statement Sunday. The purchase will be funded under the country's five-year spending plan, rather than its defense budget, the minister added. TAI had pitched its Anka, a medium-altitude, long-endurance unmanned aircraft system. According to a TAI news release from 2019 ahead of the defense and aerospace LIMA expo, the company was set to hold high-level talks on exporting the Anka. On Aug. 18, 2022, Malaysian King Al-Sultan Abdullah visited TAI's facilities in Ankara, Turkey. Then on Oct. 7, TAI announced a memorandum of understanding for collaboration with MIMOS, Malaysia's research and development center.

TAI has not issued a statement on the agreement, and company officials declined to comment for this story. The Anka family of drones can perform reconnaissance, target acquisition and identification, and intelligence gathering missions. It features electro-optical/infrared and synthetic-aperture radar technologies. The manufacturer says the aircraft have autonomous flight capabilities and can take off and land on their own. The UAV family has a wingspan of 17.5 meters and a length of 8.6 meters, and has a service ceiling of 30,000 feet. They can remain airborne at the operational altitude of 18,000-23,000 feet for more than 30 hours.

It's possible Malaysia will choose the Anka-S version, which is in use with the militaries of Turkey and Tunisia. That variant boasts a data link range of 250 kilometers (31 miles) and an endurance of 30 hours. It can be armed with a variety of precision-guided bombs and missiles developed in Turkey, including the MAM series of laser-guided bombs that have seen combat in Libya, Syria, Nagorno-Karabakh and Ukraine. TAI also manufactures the Aksungur drone, which has a higher payload and endurance, and is in service with the Turkish military.

Malaysia's armed forces and Coast Guard are focused on piracy along its coasts as well as militancy and terrorism in the Sulu Sea, which lies between eastern Malaysia and the southern Philippines. Malaysia is made up of two separate landmasses with coastlines along the strategic Strait of Malacca and the South China Sea. It is also one of six claimants of ownership over the disputed Spratly group of islands.

<https://www.defensenews.com/unmanned/2022/10/12/malaysia-picks-turkeys-anka-system-in-drone-deal/>

## THE ECONOMIC TIMES

*Wed, 12 Oct 2022*

### **NATO to Hold Nuclear Exercise Despite Russian Warnings**

NATO will push ahead with long-planned nuclear exercises next week despite rising tensions over the war in Ukraine and President Vladimir Putin's insistence that he is not bluffing about using all available means to defend Russian territory, NATO Secretary-General Jens Stoltenberg said Tuesday. The exercise, dubbed "Steadfast Noon," is held annually and usually runs for about one week. It involves fighter jets capable of carrying nuclear warheads but does not involve any live bombs. Conventional jets, and surveillance and refuelling aircraft also routinely take part. Fourteen of the 30 NATO member countries will be involved in the exercise, which was planned before Russia invaded Ukraine in February.

The main part of the maneuvers would be held more than 1,000 kilometers from Russia, a NATO official said. "It would send a very wrong signal if we suddenly now cancelled a routine, long-time planned exercise because of the war in Ukraine. That would be absolutely the wrong signal to send," Stoltenberg told reporters on the eve of a meeting of NATO defense ministers in Brussels. "NATO's firm, predictable behaviour, our military strength, is the best way to prevent escalation," he said. "If we now created the grounds for any misunderstandings, miscalculations in Moscow about our willingness to protect and defend all allies, we would increase the risk of escalation." With the Russian army retreating under the blows of Ukrainian forces armed with Western weapons, Putin raised the stakes by annexing four Ukrainian regions and declaring a partial mobilisation of up to 300,000 reservists to buttress the crumbling front line.

As his war plans have gone awry, Putin has repeatedly signalled that he could resort to nuclear weapons to protect the Russian gains. The threat is also aimed at deterring NATO nations from sending more sophisticated weapons to Ukraine. NATO as an organisation does not possess any weapons. The nuclear weapons nominally linked to NATO remain under the firm control of

three member countries - the U.S., U.K. and France. The alliance's secretive Nuclear Planning Group will meet on Thursday among defense ministers.

Stoltenberg described Putin's spiraling nuclear rhetoric as "dangerous and reckless," and underlined that the allies "have also conveyed clearly to Russia that it will have severe consequences if they use nuclear weapons in any way." "We are closely monitoring Russia's nuclear forces," Stoltenberg said. "We have not seen any changes in Russia's posture, but we remain vigilant."

<https://economictimes.indiatimes.com/news/defence/nato-to-hold-nuclear-exercise-despite-russian-warnings/articleshow/94793531.cms?from=mdr>

## Science & Technology News



*Wed, 12 Oct 2022*

### **Study Assesses the Efficacy of Hands-Free Text Selection Systems for VR Headsets**

Virtual reality (VR) and augmented reality (AR) head-mounted displays allow users to experience digital content in more immersive and engaging ways. To keep the users as immersed in the content as possible, computer scientists have been trying to develop navigation and text selection interfaces that do not require the use of their hands. Instead of pressing buttons on a manual controller, these interfaces would allow users to select texts or perform commands simply by moving their heads or blinking their eyes. Despite the promise of these approaches, today most head-mounted displays still heavily rely on handheld controllers or hand and finger gestures. Researchers at Xi'an Jiaotong-Liverpool University and Birmingham City University have recently carried out a study aimed at investigating different hands-free text selection approaches for VR and AR headsets. Their findings, published in a paper pre-published on arXiv, highlight the benefits of some of these approaches, particularly those that enable interactions through eye blinks. "My group has been engaged in improving text entry for VR/AR over the past six years," Hai-Ning Liang, one of the researchers who carried out the study, told TechXplore. "Text entry is an important element in the ecosystem of text entry and editing."

The recent study by Liang and his colleagues builds on some of their previous research focusing on hands-free text entry techniques for VR. In their previous studies, the team found that hands-free techniques could simplify user interactions with VR systems, making entering text more intuitive. "The main goal of our work is to explore what types of features are suitable for hands-free text selection in VR," Liang explained. "In this new study, we investigated the potential of hands-free text selection approaches in a controlled lab experiment with 24 participants using a within-subjects experiment design (i.e., where the participants experienced all test conditions)." In their experiments, Liang and his colleagues asked participants to test different text selection

methods while performing a specific task. This task mimicked what the users might encounter in real-world settings while using VR and was divided into three conditions that varied based on the text selection methods while in a VR reading environment that the team had specifically created for the experiment. After they completed these tests, the participants were asked to provide feedback about their experiences.

"Text selection, like many other interactions in VR, requires a pointing mechanism for the identification of the objects to be selected prior to interacting with them, and then another mechanism to indicate the selection," Liang said. "In this study, we selected head-based pointing as our pointing mechanism, which means the cursor will follow the user's head movements." Liang and his colleagues decided to specifically assess the potential of three different text selection methods, referred to as "Dwell," "Eye blinks" and "Voice." Dwell requires users to hover the pointer on the area where the text they want to select is located for a specific time (e.g., 1 second). When using the Eye blinks for selection, users were asked to intentionally blink their eyes to select a specific text. Their system recognizes these intentional eye blinks because they are typically longer than natural ones (approximately 400ms instead of 100–200ms).

Finally, the Voice approach required users to produce a sound over 60db. In their experiments, the researchers asked their participants to make a humming sound when they wished to select a text fragment. "These selection mechanisms, including their parameters, were chosen based on findings from the literature and a series of pilot tests we did," Liang explained. "The findings gathered in our experiment once again confirmed that hands-free approaches could be suitable for text selection in VR. In addition, we showed that eye blinks are a very efficient and useful selection mechanism for hands-free interaction."

The recent work by Liang and his colleagues highlights the huge potential of hands-free text selection techniques for making VR systems more intuitive and convenient to use. In the future, their findings could inspire more research teams to develop and evaluate blink-based techniques for text selection and other types of interactions. "Our plan for future research in this area will be to focus on making text selection even more efficient and usable and integrating it into the ecosystem for text editing and document creation in VR/AR," Liang added. "We will also be designing text selection methods that can be used by a variety of impaired users and exploring other approaches, including eye gaze for cursor movement instead of head movements."

<https://techxplore.com/news/2022-10-efficacy-hands-free-text-vr-headsets.html>



गुरुवार, 13 अक्टूबर 2022

## अंतरिक्ष अनुसंधान और मंगलयान

अभिषेक कुमार सिंह

खासकर यह सवाल कि क्या मंगल पर जीवन संभव है और क्या इंसान वहां जाकर अपनी रिहाइश के लिए बस्तियां बसा सकता है। अगर पृथ्वी से मंगल की औसत साढ़े बाईस करोड़

किलो मीटर दूरी तय करने में हमारे यान पांच-छह महीने के बजाय एक महीने का वक्त लेने लगे, तो संभव है कि इंसान पृथ्वी के बाद मंगल को अपना दूसरा ठिकाना बनाने के बारे में सोच सकता है। इसे संयोग कहा जा सकता है कि 2014 में अमेरिकी अंतरिक्ष एजेंसी नासा का यान मार्स एटमास्फीयर एंड वोलाटाइज्ड इवोल्यूशन (मावेन) और भारतीय अंतरिक्ष एजेंसी इसरो का मार्स आर्बिटर मिशन (मंगलयान-1) लगभग साथ-साथ मंगल तक पहुंचे थे। पर उस वक्त की गई इनकी तुलना बताती है कि कई चीजें इतिहास नहीं थीं। मसलन, 4026 करोड़ रुपए के खर्च से मंगल तक पहुंचे मावेन के मुकाबले करीब दस गुना कम लागत (450 करोड़ रुपए) वाले हमारे मंगलयान यानी मार्स आर्बिटर का पहले ही प्रयास में सफल होना कोई संयोग नहीं था।

इसके पीछे राजनीतिक इच्छाशक्ति और ठोस वैज्ञानिक इरादों के अलावा व्यापार की सोची-समझी रणनीति काम कर रही थी, जो भारत जैसे एक विकासशील देश को बेहद किफायत में अंतरिक्ष मिशन चला कर अंतरिक्ष में कमाई के मौके दिला रही है। अब हमारा मंगलयान खामोशी के साथ विदा हो गया है। बहुतों को लग सकता है कि अब भारत के अंतरिक्ष मिशन का क्या होगा और आखिर मंगलयान ऐसा क्या देकर गया, जिसे याद रखा जाएगा और जिसकी बुनियाद पर हमारे अगले अंतरिक्ष मिशनों का भविष्य तय होगा। गौरतलब है कि मंगलयान की चर्चा का प्रमुख आधार इस पर हुआ खर्च था। 5 नवंबर 2013 को इसरो के श्रीहरिकोटा स्पेस सेंटर से पोलर सेटेलाइट वीकल (पीएसएलवी) सी-25 की मदद से प्रक्षेपित मंगलयान 24 सितंबर, 2014 को मंगल ग्रह की कक्षा में पहुंचा था। फिलहाल सूचना यह है कि महज छह महीने के लिए मंगल ग्रह की कक्षा में परिक्रमा करने के लिए भेजा गया मंगलयान निर्धारित की गई मियाद से सोलह गुना ज्यादा लंबी उम्र गुजारने के बाद आखिरकार खामोश हो गया।

इसरो के यूआर राव सेटेलाइट सेंटर के निदेशक की ओर से 27 सितंबर, 2022 को जारी एक अनौपचारिक सूचना के मुताबिक अब मंगलयान से हमारा संपर्क टूट चुका है। इसकी वजह है मंगल पर लगातार लगे सूर्यग्रहण, जिनमें से एक इस साल साढ़े सात घंटे तक चला था। इन सूर्यग्रहणों के कारण मंगलयान में लगी सौर बैटरियां नाकाम हो गईं। उल्लेखनीय है कि मंगलयान की बैटरियां सूरज से रोशनी न मिलने की सूरत में एक घंटे चालीस मिनट तक ही चार्ज रह पाती थीं। हालांकि साढ़े सात घंटे लंबे ग्रहण के बावजूद बैटरियों ने मंगलयान को संचालित करने की कोशिश की, लेकिन वापस पहले वाली हालत में आना संभव नहीं हुआ। फिर भी यह उपलब्धि कोई कम बड़ी नहीं है कि इन बैटरियों से मंगलयान आठ साल तक काम करता रहा, जबकि उसका निर्माण छह महीने के संचालन के लिए किया गया था।

मंगलयान-1 के बाद भारत के मंगल मिशनों का अब कोई भविष्य है या नहीं- इसे लेकर कई चर्चाएं हैं। जैसे कहा जा रहा है कि अब इसरो की प्राथमिकता इंसानों को अंतरिक्ष में ले जाने वाली परियोजना- गगनयान और चंद्रयान-3 है। इसके अलावा सूर्य के नजदीकी अध्ययन के लिए

आदित्य- एल 1 भी इसरो की प्राथमिकता सूची में है। भारत और उसके अंतरिक्ष अनुसंधान संस्थान- इसरो के लिए किसी भी परियोजना का महत्त्व उसके आर्थिक पहलू, देश तथा जनता को उससे मिलने वाले लाभों पर आधारित होता है। संभवतः इसीलिए अब भारत का ध्यान मंगलयान-2 से ज्यादा दूसरी परियोजनाओं पर है। मगर उल्लेखनीय है कि मंगलयान-1 से भारत को अंतरिक्ष की होड़ में आगे बने रहने, मंगल ग्रह के करीबी अन्वेषण के साथ इस क्षेत्र के कारोबारी दोहन का वह मौका मिला, जो शायद इसके बिना मिलना संभव न होता।

मंगलयान अभियान का उद्देश्य मंगल के वातावरण के अध्ययन के साथ वहां की जलवायु में बदलाव की पड़ताल करना था। इसके लिए मंगलयान में कई ऐसे आधुनिक उपकरण लगाए गए, जो मंगल के वातावरण में मौजूद मीथेन गैस से लेकर ऊपरी वायुमंडल में हाइड्रोजन कणों की उपस्थिति दर्ज कर सकते थे। मंगलयान में लगाए गए करीब पंद्रह किलोग्राम वजनी उपकरण और सेंसरों ने सतह पर मौजूद खनिजों का पता लगाने, मंगल के वातावरण में मीथेन गैस की मात्रा का आकलन करने के लिए तस्वीरों के जरिए मंगल की विभिन्न जगहों की बनावट का सटीक ब्योरा प्रस्तुत किया। अपने उच्च क्षमता वाले कैमरे की मदद से उसने वलयाकार परिक्रमा पथ में भ्रमण करते हुए जो तस्वीरें लीं, उनकी सहायता से इसरो के वैज्ञानिकों ने मंगल का 'फुल डिस्क मैप' तैयार किया।

मंगल पर आए धूल के तूफान का अध्ययन करने, यंत्र मेनका की मदद से ग्रह की सतह से 270 किलोमीटर ऊपर आक्सीजन और कार्बन डाई-आक्साइड की मात्रा का आकलन करने के साथ-साथ मंगल के 'एक्सोस्फेयर' में 'हाट आर्गन' की खोज करने जैसे कई अन्य महत्त्वपूर्ण काम मंगलयान ने किए। मंगल ग्रह के 'सोलर डायनेमिक्स' का जो अध्ययन इसरो मंगलयान की बदौलत कर पाया, उसके आधार पर इस संगठन को 'सेटेलाइट इमेजरी' जैसी अंतरिक्ष सेवाओं के लिए कई देशों से कारोबारी अनुबंध हासिल हुए हैं। बहरहाल, मंगलयान अब विदा हो चुका है, लेकिन कई सवाल हैं, जिनके उत्तर अभी खोजे जाने हैं। खासकर यह सवाल कि क्या मंगल पर जीवन संभव है और क्या इंसान वहां जाकर अपनी रिहाइश के लिए बस्तियां बसा सकता है। अगर पृथ्वी से मंगल की औसत साढ़े बाईस करोड़ किलोमीटर दूरी तय करने में हमारे यान पांच-छह महीने के बजाय एक महीने का वक्त लेने लगे, तो संभव है कि इंसान पृथ्वी के बाद मंगल को अपना दूसरा ठिकाना बनाने के बारे में सोच सकता है।

असल में, जीवन के सिलसिले में मंगल एक संभावना क्यों है- इसकी बड़ी वजह मंगल ग्रह का अब तक अनुमानों के विपरीत सूखा और बंजर ग्रह नहीं होना है। अमेरिकी स्पेस एजेंसी- नासा के अंतरिक्ष यान 'मार्स रीकॉनिसेंस ऑर्बिटर' से लिए गए चित्रों और प्रेक्षणों के आधार पर मंगल पर प्रचुर मात्रा में पानी की मौजूदगी का दावा किया जा चुका है। उन चित्रों के विश्लेषण में मंगल की एक सतह पर ऊपर से नीचे की ओर बहती हुई ऐसी धाराओं के प्रमाण मिले हैं जो



करीब पांच मीटर चौड़ी और सौ मीटर तक लंबी हैं। ये जलधाराएं कम तापमान या फिर सर्दियों में गायब हो जाती हैं और तापमान बढ़ने पर यानी गर्मियों में एक बार फिर प्रकट हो जाती हैं। तस्वीरों के अध्ययन से यह भी साफ होता है कि मंगल ग्रह पर नमक, पानी के जमाव और पानी के वाष्पीकृत होने के संकेत हैं। ये तीनों चीजें किसी सतह का तापमान बदल सकती हैं। इसका अर्थ यह हुआ कि ऐसे स्थान पर पानी लंबे समय तक मौजूद रह सकता है।

खास बात यह है कि मंगल ग्रह पर पानी का जमाव तापमान शून्य डिग्री सेल्सियस ही है, लेकिन वहां काफी कम दबाव है। इस वजह से से पानी दस डिग्री तापमान पर ही वाष्पित हो जाता है, जबकि पृथ्वी पर पानी को भाप बनने के लिए सौ डिग्री सेल्सियस तापमान की जरूरत होती है। हो सकता है कि मंगल का पानी इसी तरह वाष्पित होकर अंतरिक्ष में चला गया हो। यानी यह भी हो सकता है कि जिस पृथ्वी पर आज हम जीवन देख रहे हैं, उसमें भी मंगल ग्रह पर मौजूद रहे पानी की भूमिका हो सकती है। साफ है कि मंगल ग्रह को लेकर कई और सवाल अनुत्तरित हैं। ऐसे में अगर भारत और इसरो निकट भविष्य में मंगल पर भेजे जाने वाले नए मिशन (यान व रोवर) की ओर बढ़ते हैं तो निश्चय ही वे वैज्ञानिक अनुसंधानों और मंगल को अंतरिक्ष के नए पड़ाव के रूप में स्थापित करने में हमारी मदद कर सकते हैं।

<https://www.jansatta.com/politics/space-research-and-mangalyaan/2421863/>

**mint**

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## **Asteroid Path Altered in NASA's First Test of Dart Spacecraft**

The spacecraft NASA deliberately crashed into an asteroid last month succeeded in nudging the rocky moonlet from its natural path into a faster orbit, marking the first time humanity has altered the motion of a celestial body, the U.S. space agency announced on Tuesday. The \$330 million proof-of-concept mission, which was seven years in development, also represented the world's first test of a planetary defense system designed to prevent a potential doomsday meteorite collision with Earth. Findings of telescope observations unveiled at a NASA news briefing in Washington confirmed the suicide test flight of the DART spacecraft on Sept. 26 achieved its primary objective: changing the direction of an asteroid through sheer kinetic force.

Astronomical measurements over the past two weeks showed the target asteroid was bumped slightly closer to the larger parent asteroid it orbits and that its orbital period was shortened by 32 minutes, NASA scientists said. "This is a watershed moment for planetary defense and a watershed moment for humanity," NASA chief Bill Nelson told reporters in announcing the results. "It felt like a movie plot, but this was not Hollywood." Last month's impact, 6.8 million miles (10.9 million km) from Earth, was monitored in real time from the mission operations center at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Maryland,

where the spacecraft was designed and built for NASA. DART's celestial target was an egg-shaped asteroid named Dimorphos, roughly the size of a football stadium, that was orbiting a parent asteroid about five times bigger called Didymos once every 11 hours, 55 minutes.

The test flight concluded with the DART impactor vehicle, no bigger than a refrigerator, slamming directly into Dimorphos at about 14,000 miles per hour (22,531 kph). Comparison of pre- and post-impact measurements of the Dimorphos-Didymos pair as one eclipses the other shows the orbital period was shortened to 11 hours, 23 minutes, with the smaller object bumped tens of meters closer to its parent. Tom Statler, DART program scientist for NASA, said the collision also left Dimorphos "wobbling a bit," but additional observations would be necessary to confirm that. The outcome "demonstrated we are capable of deflecting a potentially hazardous asteroid of this size," if it were discovered well enough in advance, said Lori Glaze, director of NASA's planetary science division. "The key is early detection."

Neither of the two asteroids involved, nor DART itself, short for Double Asteroid Redirection Test, posed any actual threat to Earth, NASA scientists said. But Nancy Chabot, DART's coordination lead at APL, said Dimorphos "is a size of asteroid that is a priority for planetary defense." A Dimorphos-sized asteroid, while not capable of posing a planet-wide threat, could level a major city with a direct hit. Scientists had predicted the DART impact would shorten Dimorphos' orbital path by at least 10 minutes but would have considered a change as small as 73 seconds a success. So the actual change of more than a half hour, with a margin of uncertainty plus or minus two minutes, exceeded expectations. The relatively loose composition of rubble that Dimorphos appears to consist of may be a factor in how much the asteroid was budged by DART's blow.

The impact blasted tons of rocky material from the asteroid's surface into space, visible in telescope images as a large debris plume, producing a recoil effect that added to the force exerted on Dimorphos from the collision itself, NASA said. Launched by a SpaceX rocket in November 2021, DART made most of its voyage under the guidance of flight directors on the ground, with control handed over to the craft's autonomous on-board navigation system in the final hours of the journey. Dimorphos and Didymos are both tiny compared with the cataclysmic Chicxulub asteroid that struck Earth some 66 million years ago, wiping out about three-quarters of the world's plant and animal species including the dinosaurs.

Smaller asteroids are far more common and present a greater theoretical concern in the near term, making the Didymos pair suitable test subjects for their size, according to NASA scientists and planetary defense experts. Also, the two asteroids' relative proximity to Earth and dual configuration made them ideal for the DART mission. The Dimorphos moonlet is one of the smallest astronomical objects to receive a permanent name and is one of 27,500 known near-Earth asteroids of all sizes tracked by NASA. Although none are known to pose a foreseeable hazard to humankind, NASA estimates that many more asteroids remain undetected in the near-Earth vicinity.

<https://lifestyle.livemint.com/smart-living/innovation/asteroid-path-altered-in-nasa-s-first-test-of-dart-spacecraft-111665561504731.html>.

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