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Defence News

Defence Strategic: National/International

Harbour And Sea Training Phase Of International Crew Of IOS Sagar

Source: Press Information Bureau, Dt. 03 Apr 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2118199>

Indian Navy's maiden initiative of Indian Ocean Ship Sagar (IOS Sagar) concluded its harbour and sea training phase at Southern Naval Command, Kochi, and the ship with her crew, has left for Karwar.



44 International trainees of 09 friendly foreign countries underwent a specially curated training capsule ranging from basic seamanship activities to state-of-the-art simulator training. Truly signifying the motto of 'One Ocean One Mission', the international crew was trained together on various facets of Communication skills, Firefighting and Damage Control drills, Visit Board Search & Seize (VBSS) procedures and finer aspects of Bridgemanship. Simulator based practical trainings were imparted to equip the crew with dynamic challenges of maritime domain. The training interactions also facilitated a forum for exchange of best training practices and procedures. Over the past decades, Indian Navy's maritime training institutions have trained over 20,000

officers and sailors from over 50 FFC ranging from ab initio training to trade specific professional courses enhancing maritime expertise and capability.



In addition, the international crew was also exposed to sea training along with the Indian Navy crew of INS Sunayna by the Indian Naval Work Up team. The sea training was aimed at acclimatising the international crew with Indian Navy's systems and procedures enabling them to operate as a well-knit and cohesive unit during the forthcoming deployment.

IOS Sagar is a unique example of fostering deeper maritime understanding and promoting regional stability and cooperation. Indian Navy's collaboration with the regional Navies reaffirm commitment to safeguarding collective maritime interests and capacity building with partner nations across the Indian Ocean Region (IOR).

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Raksha Mantri Addresses The Senior Leadership Of Indian Army During Army Commanders' Conference

Source: Press Information Bureau, Dt. 03 Apr 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2118177>

The Army Commanders' Conference, an apex level biannual event, is being held in New Delhi from 01st Apr to 04th April 2025. During the event, Indian Army's apex leadership comprehensively deliberated upon all aspects of existing security scenarios, situation along the borders, in the hinterland and challenges for the present security apparatus. In addition, the conference also focused on issues pertaining to organisational restructuring, logistics, administration, human resource management, modernisation through indigenisation, induction of Niche technologies and assessment of impact of the various existing global situations. The main

highlight of the third day of the conference was the address by the Raksha Mantri, Shri Rajnath Singh, to the senior leadership of the Indian Army, which was preceded by a brief on the “Year of Reforms”.

The Raksha Mantri reaffirmed the faith of the billion-plus citizens in the Indian Army as one of the most trusted and inspiring organisations in the country. He highlighted the commendable role played by the Army in guarding our borders and fighting terrorism apart from providing assistance to the civil administration in every need of hour. The Raksha Mantri also remarked “The Army is present in every domain from Security, HADR, Medical Assistance, to maintaining the stable internal situation in the country. The role of Indian Army is incomparable in Nation building as also in the overall national development”. He reiterated his happiness to be present in the Army Commander’s conference and complimented the Army leadership for successfully taking ahead the ‘Defence and Security’ vision of the Nation to new heights. He also complimented the Indian Army’s approach on the infusion and absorption of cutting edge technology.

The Hon’ble Raksha Mantri stressed upon the present Geo Strategic uncertainties and the complex world situation which effects everyone globally. He stressed upon that the present world is an inter connected world and such incidents whether happening in our neighbourhood or far off countries will effect everyone. He stated that “Unconventional and asymmetric warfare, including hybrid war will be part of the future conventional wars. Cyber, information, communication, trade and finance have all become an inseparable part of future conflicts. This necessitates that Armed Forces will have to keep all these facets in consideration while planning and formulating strategies”. Raksha Mantri stated that keeping in mind the present dynamic geo-strategic changes and the ongoing global security scenarios with the uncertainties the armed forces should prepare a dynamic perspective planning addressing both the long term and short term challenges. In the present global context the importance of Military Intelligence incorporating the modern technology cannot be stressed upon more.

On the current situation along the Northern borders, the Hon’ble Raksha Mantri expressed full confidence in the troops and complemented the Armed Forces for standing firm and vigil and the same should continue. The Raksha Mantri complimented the efforts of BRO, which has led to the quantum improvement of road communication in the borders both Western and Northern, while working under difficult conditions.

Referring to the situation along the Western borders, he complimented the Indian Army’s response to cross border terrorism, however the proxy war by the adversary continues. The Hon’ble Raksha Mantri said “I compliment the excellent synergy between the CAPF/ Police forces and the Army in tackling the menace of terrorism in Jammu and Kashmir. The synergised operations in the Union Territory of Jammu and Kashmir are contributing to increased stability in the region and the same should remain”.

The Raksha Mantri complimented the forces for the high standard of operational preparedness and capabilities which he has always been experiencing first hand during his visits to forward areas. He also paid tributes to all the brave hearts for making the ultimate sacrifice in the defence of the motherland. He complimented the significant contributions made by the Army in military diplomacy to further our national security interests by creating sustainable cooperative

relationships with foreign Armies and also emphasised upon the important role of Defence Attaches in achieving the same. We must deliberate on the re-orientation of role of the Defence Attaches in line with the organisational aim.

The Hon'ble Raksha Mantri stressed upon the technological advancement taking place in every sphere of our life and applauded the Armed Forces for aptly incorporating them. He appreciated the Army's efforts to develop niche technologies in collaboration with civil industries, including premier educational institutions and thereby progressing towards the aim of 'Modernisation through Indigenisation' or 'Atamnirbharta'. He emphasised that a regular interface of Armed Forces with the emerging technologies is a must. Raksha Mantri commended on the initiative of discussions being done with Niti Ayog on achieving the aim of 'Viksit Bharat' during this Army Commander Conference. He also remarked that the government is committed in every manner towards the welfare of the Veterans and the Next of Kin of all categories of Battle Casualties and the nation remains indebted to the sacrifices made by vallant soldiers and their family.

He concluded by saying that issues related to "Defence diplomacy, indigenisation, information warfare, defence infrastructure and force modernisation should always be deliberated upon in such a forum. Doctrinal changes whenever required should be made to make the Armed Forces future ready. The recommendation and suggestions made by the senior leadership in such like forum as Commanders Conference should be deliberated upon and be taken to a logical conclusion with midcourse review and modification if required. The Nation is proud of its Army and the Government is committed to facilitate the Army in their forward movement, on the road to reforms and capability modernisation".

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Raksha Mantri exhorts AMC to continue adopting latest technologies to provide quality health services to soldiers

Source: Press Information Bureau, Dt. 03 Apr 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2118354>

"The medical sector is going through a phase of technological transformation across the globe, and the Army Medical Corps (AMC) must continue adopting latest advancements to provide quality health services to our soldiers," said Raksha Mantri Shri Rajnath Singh while addressing the 261st Raising Day celebrations of AMC at Army Hospital (Research & Referral), Delhi Cantt. on April 03, 2025.

While Raksha Mantri acknowledged AMC's efforts of adopting Artificial Intelligence (AI) and carrying out research in cutting-edge tech, he stressed on the need to stay abreast with evolving practices to achieve new breakthroughs in the field. He pitched for encouraging simulator-based training, wherein expertise in medical procedure is achieved through machine-based learning. He batted for additional research and training centres for the personnel to achieve this proficiency.

Shri Rajnath Singh highlighted the need to develop dual-use technologies, which can prove to be beneficial to both defence and civilian sectors. Civil-military convergence in the field of defence

technology is crucial for the overall development, he said, while commending AMC for working with academia such as ICMR, IITs & AIIMS and medical organisations of other countries. He also urged AMC to explore the possibility of training medical professionals of other developing and under-developed countries to increase India's stature in the field of military diplomacy.

Raksha Mantri appreciated the remarkable contribution of AMC in reforming the health sector - from infrastructure to services and policy making to implementation. He stated that AMC has strengthened the combat medical readiness of the Armed Forces by introducing Advanced Mobile Surgical Units and Rapid Response Medical teams. Indigenous Trauma Management System and AI-powered medical triage systems have improved emergency response time & patient care, he added.

Shri Rajnath Singh pointed out that the services of AMC are not limited to the serving soldiers, and they continuously strive for the well-being of the ex-servicemen and their families.

Raksha Mantri made special mention of Surgeon Vice Admiral Arti Sarin, the incumbent and first female Director General of Armed Forces Medical Services (AFMS), describing her as a shining example of the growing Nari Shakti in the military. "Under her leadership, not only are our doctors carrying out exceptional work, the participation of women has also increased," he said.

On the occasion, Shri Rajnath Singh presented the Raksha Mantri Trophy in recognition of the outstanding performance in delivery of healthcare to Armed Forces personnel. The trophy for the best hospital in AFMS for 2024 was awarded to INHS Asvini, Mumbai, while the second-best hospital trophy was given to Command Hospital, Western Command, Chandimandir, Haryana. These awards stand as testimony to the AMC's unwavering pursuit of excellence and patient care.

The event was attended by senior dignitaries, including Raksha Rajya Mantri Shri Sanjay Seth, Chief of Defence Staff General Anil Chauhan, Chief of the Naval Staff Admiral Dinesh K Tripathi, Chief of the Army Staff General Upendra Dwivedi, Chief of Air Staff Air Chief Marshal AP Singh, Defence Secretary Rajesh Kumar Singh, DGAFMS Surgeon Vice Admiral Arti Sarin and other civil and military officials.

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PM Modi, Thailand counterpart discuss ways to strengthen defence, security partnership

Source: ANI News, Dt. 04 Apr 2025,

URL: <https://www.aninews.in/news/world/asia/pm-modi-thailand-counterpart-discuss-ways-to-strengthen-defence-security-partnership20250404000950/>

Prime Minister Narendra Modi and his Thailand counterpart Paetongtarn Shinawatra held bilateral talks on Thursday and discussed ways to further strengthen political exchanges, defence and security partnership and strategic engagement between the two countries.

They also underlined the need to enhance connectivity, health, science and technology, start-up, innovation, digital, education, culture and tourism collaborations.

On arrival at the Government House, the Prime Minister was received by the Thailand Prime Minister.

This was their second meeting. Earlier, the two leaders had met on the sidelines of ASEAN related Summit in Vientiane in October 2024. The two leaders reviewed the entire range of bilateral cooperation between India and Thailand.



"They discussed ways to further strengthen political exchanges, defence and security partnership, strategic engagement, trade and investment and people-to-people ties. While doing so, they underlined the need to enhance connectivity, health, science & technology, start-up, innovation, digital, education, culture and tourism collaborations," a MEA release said.

"They also discussed ways to deepen cooperation for countering transnational organised crimes including human trafficking, narcotics trafficking, and cyber scams," it added.

The two Prime Ministers exchanged views on global issues and discussed ways of forging closer cooperation in sub-regional, regional and multilateral fora, including BIMSTEC, ASEAN and Mekong Ganga Cooperation.

The two leaders witnessed exchange of the Joint Declaration on the Establishment of India-Thailand Strategic Partnership. They also witnessed exchange of MoUs in the fields of : handlooms and handicraft; digital technologies; Micro Small and Medium Enterprises (MSMEs); and maritime heritage. Both leaders also welcomed the establishment of an India-Thailand

Consular Dialogue, which will further facilitate people-to-people contacts between the two countries.

As a gesture of goodwill, the Thai government released a special postage stamp depicting 18th century Ramayana mural paintings to mark Prime Minister's visit.

Underlining the close cultural and religious connections between the two countries, Prime Minister was presented a special edition of Buddhist holy scriptures TI-PITAKA in Pali by Prime Minister Shinawatra.

As a gesture to further deepen the close civilizational ties between India and Thailand, Prime Minister offered sending Lord Buddha's Relics excavated from Gujarat to Thailand, for people to pay their respect.

Last year, the Holy Relics of Lord Buddha and two of his disciples had travelled from India to Thailand, and over 4 million people had paid their respects.

India and Thailand are maritime neighbours with shared civilizational bonds underpinned by cultural, linguistic and religious ties, including those of Ramayana and Buddhism.

"India's relations with Thailand are an integral pillar of our 'Act East' Policy, Comprehensive Strategic Partnership with ASEAN, Vision MAHASAGAR and our vision of the Indo-Pacific," the release said."

Sustained interactions between the two countries have led to a robust and multifaceted relationship based on age-old ties and shared interests," it added.

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Indian defence firm inks MoU with Israeli company to bring advanced drone camera tech to country

Source: The Economic Times, Dt. 03 Apr 2025,

URL: <https://economictimes.indiatimes.com/news/defence/indian-defence-firm-inks-mou-with-israeli-company-to-bring-advanced-drone-camera-tech-to-country/articleshow/119939518.cms>

An Indian defence firm has signed an MoU with an Israeli company to bring advanced drone camera technology to the country, officials said on Thursday. The pact has been inked between Paras Defence and Space Technologies and MicroCon Vision of Israel, part of Controp and the Rafael Group, an official statement said.

The collaboration will position Paras Defence as the exclusive supplier of advanced drone camera technology in India at "much lower cost", it said.

The Indian firm will bring indigenous content in these drone cameras and intelligence, surveillance and reconnaissance (ISR) payloads, improving the country's self-reliance while lowering costs, the statement said.

It will offer two models, whose usual import price is "around Rs 20 lakh and Rs 40 lakh per unit", the statement said.

Paras Defence "anticipates 50-60 per cent price reduction for each model", making advanced surveillance technology more accessible to Indian defence forces and for commercial applications.

"MicroCon will serve as Paras Defence's exclusive supplier for drone cameras, which include ISR payloads and electro-optical/infrared (EO/IR) seekers, while Paras Defence becomes MicroCon's exclusive partner for ISR operations in India.

"This aligns with MicroCon's strategy to expand its footprint in the country, which is witnessing accelerated growth in its drone market," the statement said.

"This collaboration represents a major leap forward in India's defence capabilities," the statement quoted Munjal Sharad Shah, managing director at Paras Defence, as saying.

"We are committed to supporting India's strategic goals and are proud to partner with MicroCon in this groundbreaking endeavour," Shah added.

The MoU is focused on expanding both the companies' presence in the Indian ISR payload market.

The integration of advanced technologies such as AI-powered analytics, high-resolution imaging, and thermal vision will enhance surveillance capabilities, improving operational efficiency in both defence and civilian sectors, it said.

"MicroCon is committed to delivering cutting-edge ISR payloads that drive the future of defence and surveillance systems," Chen Almog, CEO of MicroCon, was quoted as saying in the statement.

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Defence Ministry grants in principle approval for Adilabad airport in Telangana

Source: The Economic Times, Dt. 03 Apr 2025,

URL: <https://economictimes.indiatimes.com/news/defence/defence-ministry-grants-in-principle-approval-for-adilabad-airport-in-telangana/articleshow/119944459.cms>

The Ministry of Defence has granted in-principle approval for civil aircraft operations at Adilabad airfield, originally established during the Nizam era. In a letter to the Telangana government, the MoD stated that the Indian Air Force (IAF) plans to set up a training establishment at the location in the future.

"However, the IAF has considered the request and agreed in principle to the Telangana government's proposal for civil aircraft operations from Adilabad airfield," the letter read.

The IAF suggested that the airfield be developed as a joint-use facility, with the Airports Authority of India (AAI) acquiring adjacent land for a civil terminal, aircraft parking apron, and other infrastructure. The AAI may be required to submit a detailed proposal for an NOC from the IAF, the letter added.

This is the second airport approved by the Centre since the Congress government took office in the state in December 2023.

Telangana Minister Komatireddy Venkat Reddy thanked Prime Minister Narendra Modi and Union Civil Aviation Minister K Ram Mohan Naidu for granting permission.

He expressed satisfaction over securing approval for Adilabad Airport, following a similar nod for Mamnoon Airport in Warangal in February.

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Philippines Keen To Pull India Into Its “Squad” To Counter ‘Common Enemy’ China; Delhi Not Biting The Bullet!

Source: The EurAsian Times, Dt. 03 Apr 2025,

URL: <https://www.eurasiantimes.com/philippines-keen-to-pull-india-into-its-squad-to-counter-common-enemy-china-delhi-not-biting-the-bullet/>

The Philippines is working to expand the SQUAD, a strategic alliance currently composed of Australia, Japan, the Philippines, and the United States, by inviting India and South Korea to join. According to General Romeo S. Brawner, Chief of the Armed Forces of the Philippines, who spoke at the Raisina Dialogue in New Delhi in March, this initiative aims to counterbalance China’s increasing influence in the Indo-Pacific.

The Squad is an informal multilateral defense collaboration that was officially established in May 2024. It originated from discussions among the defense chiefs of its four members at the Shangri-La security dialogue in Singapore in 2023. Since then, the Squad has conducted joint maritime exercises within the Philippines’ exclusive economic zone (EEZ) in the South China Sea.

Brawner’s comments come amid escalating tensions between Manila and Beijing over the contested waters of the South China Sea. China continues to assert near-total control over this crucial maritime trade route, valued at approximately \$3 trillion in annual commerce, despite competing claims from the Philippines, Brunei, Indonesia, Malaysia, and Vietnam. A 2016 arbitration ruling dismissed China’s expansive claims, but Beijing refuses to recognize the decision.

During a discussion with Dr. Kyung-what Kang of the Asia Society on March 26, 2025, Indian External Affairs Minister S. Jaishankar was asked whether India would consider joining the Squad. While he provided detailed responses to other questions, his answer on this topic was brief: “On the Squad issue, we are happy with the Quad.”

Brawner emphasized that the Philippines is actively bolstering its deterrence capabilities through collaborations with Squad members, focusing on military coordination, intelligence-sharing, and joint operations. He indicated that the Philippines and Japan are particularly keen on expanding the alliance to include India and possibly South Korea. Following his remarks, Brawner met with India’s Chief of Defence Staff, General Anil Chauhan, where he intended to discuss India’s potential participation in the Squad. However, a senior Indian defense official confirmed the meeting took place but did not specify whether the Squad expansion was formally discussed. The

Indian defense ministry, along with the embassies of South Korea and China, declined to comment on this. Brawner candidly stated, “We find commonality with India because we have a common adversary. And I’m not afraid to say that China is our common enemy. So, it’s important that we collaborate, perhaps even exchange intelligence.” He also noted that the Philippines already maintains a defense partnership with India, including cooperation in the defense industry.

China, for its part, dismissed the Philippines’ actions as externally influenced. Chinese Foreign Minister Wang Yi remarked on March 7 that Manila’s moves in the South China Sea were part of a “screenplay written by external forces” aimed at undermining China. General Romeo S Brawner JR, Chief of Staff Armed Forces, Philippines, called on General Anil Chauhan, Chief of Defence Staff #CDS_India. Discussions held on ongoing military cooperation, maritime security & defense technology partnerships

Key Takeaways From The Current Situation

The Philippines is increasingly stepping away from ASEAN’s collective security understandings, recognizing that the regional bloc lacks the strategic weight to support its stance against China. In its various forums, ASEAN has prioritized maintaining engagement with China rather than confronting it, leaving Manila isolated in its disputes with Beijing. This has prompted the Philippines to seek security assurances beyond ASEAN, aligning more closely with external partners such as the United States, Japan, and Australia.

China’s repeated intrusions into the Philippines’ EEZ have not galvanized ASEAN into taking a stronger stance against Beijing. The prolonged negotiations over a Code of Conduct (COC) in the South China Sea have exposed internal divisions within ASEAN, with some members maintaining closer ties with China than with their ASEAN counterparts.

Even if a COC is eventually agreed upon, its enforceability remains doubtful. The Philippines has likely drawn lessons from India’s experience, where China violated established border agreements in 2019-2020 despite formal diplomatic arrangements. The United States, Japan, and Australia have deepened their defense engagement with the Philippines, transforming their bilateral security partnerships into a more coordinated framework under the Squad. As part of this alignment, Manila has reportedly agreed to allow Squad bases in the northern Philippines to serve as a strategic point in case of a conflict involving Taiwan. This move signifies a decisive shift away from ASEAN’s ambiguous stance on China, bringing the Philippines into closer alignment with its Indo-Pacific allies.

Brawner’s remarks at the Raisina Dialogue may have been a strategic “trial balloon”—an attempt to gauge India’s willingness to move beyond its bilateral defense ties with the Philippines and join a broader security coalition. While the Philippines views India as a reliable security partner, Jaishankar’s response suggests that India remains cautious about aligning with an explicitly anti-China military group.

India’s Strategic Calculations

India’s reluctance to join the Squad stems from multiple factors. The global geopolitical landscape is in flux, particularly with uncertainties surrounding U.S. foreign policy in the Trump era. India, like many nations, is exploring multiple diplomatic avenues to ensure stability. This includes

strengthening ties with Japan and Australia while continuing defense cooperation with the Philippines. At the same time, India is also seeking to stabilize its own relations with China, particularly concerning their border dispute.

India's approach to the South China Sea dispute has been evolving, with New Delhi making stronger statements about freedom of navigation and adherence to international law. However, India prefers ASEAN to take the lead in managing regional security issues while it provides indirect support through diplomatic and economic means. Unlike the Philippines, which is actively confronting China, India remains cautious about provoking Beijing beyond what is necessary for its own security.

Future Of India's Engagement In The Indo-Pacific

For now, India is unlikely to formally join the Squad, given that its primary focus remains the Quad. The Quad, which comprises India, the United States, Japan, and Australia, has a broader agenda centered on providing regional public goods, such as infrastructure development, technology cooperation, and humanitarian assistance. In contrast, the Squad is more narrowly focused on military coordination, making it less attractive to India at this stage. Additionally, India does not want to be perceived as directly challenging China unless it is necessary for strategic interests. New Delhi's careful balancing act involves reinforcing its presence in the Indo-Pacific without crossing Beijing's "red lines."

While India remains committed to freedom of navigation and peaceful dispute resolution, it is unlikely to escalate its involvement in the South China Sea beyond diplomatic support for regional allies like the Philippines. The Squad represents a significant step in the Indo-Pacific's evolving security landscape, reinforcing collective deterrence against China's maritime assertiveness. While the Philippines actively seeks to expand this grouping, India remains cautious, preferring to engage within the existing Quad framework. As regional tensions persist, Manila is deepening its security commitments with its allies while India continues to navigate a complex diplomatic path that balances strategic partnerships with its long-term interests in managing relations with China.

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Science & Technology News

Novel method may transform understanding of adsorption & help control industry processes

Source: Press Information Bureau, Dt. 03 Apr 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2118305>

Researchers have recently shown that using optical tweezer electrophoresis can help us understand how particles stick to surfaces at tiny scales, at shorter time-scales, a phenomenon that is used in applications ranging from coating to water purification. The adsorption phenomenon is exploited in the industry for coating a product and refers to the adhesion of one material onto the surface of a

different material. This phenomenon is also used in water purification to remove pollutants and for colloidal stabilization during the synthesis of food emulsions. Usually, adsorption is detected via changes in mass or volume.

Researchers from the Raman Research Institute, an autonomous institute funded by the Department of Science and Technology (DST), Government of India, studied adsorption by using Laponite clay nanoplatelets (adsorbate) and Latex spheres (adsorbent) to understand how individual particles are adsorbed.

They used optical tweezer electrophoresis, a technique that tracks changes in electrical charge on the adsorbent. The technique of manipulating a micron-sized object using light is known as optical tweezer and was awarded the Nobel prize in Physics in 2018. The researchers exploited the optical force exerted by a focused laser beam to grab a micron-sized Latex particle suspended in a clay-water mixture.

The researchers then applied an electric field across a clay-water mixture and tracked the movement of the trapped Latex sphere at an extremely fast rate of 30,000 measurements/ second. The adsorption of clay particles transfers charges to the trapped microsphere.

The researchers tracked the change in the effective charges on the trapped sphere due to adsorption. The fast temporal resolution of these measurements allowed monitoring of adsorption events as they occurred, enhancing the understanding of dynamic interactions, and providing a better basis for the study of adsorption mechanisms. These measurements provided insights into the rate and extent of nanoplatelet adsorption. The results published in *Soft Matter*, the journal of the Royal Society of Chemistry indicated that higher Laponite concentrations accelerated the adsorption process due to increased nanoplatelet availability.

As a quantitative correlative test, the researchers used cryogenic-field emission scanning electron microscopy (cryo-FESEM) to observe the patterns of adsorption of the clay more clearly and to gain a better understanding of the mechanisms of clay adsorption. Cryo-FESEM images of Latex microspheres suspended in water revealed smooth surface textures, indicating no significant adsorption in pure water. However, when the microspheres were immersed in water- clay mixtures, the clay particles adhered onto the microsphere, displaying patches corresponding to clay nanoplatelets.

The size distribution histograms of these patches showed ranges close to 50 and 25 nm, corresponding to small clay aggregates and individual nanoplatelets. The researchers controlled the adsorption process by tuning the interparticle interactions between clay nanoplatelets and Latex sphere using additives, such as common salt and a peptizing agent. They were able to separate the roles of two attractive forces, dispersion and electrostatic, in the adsorption process and noted that optical tweezer based single colloid electrophoresis and cryogenic field emission scanning electron microscopy are reliable, complementary measurements to study adsorption processes.

“The use of optical tweezer-based single-colloid electrophoresis enables real-time tracking of nanoplatelet adsorption on a single particle and enables us to gain insights that were previously inaccessible through other techniques. While electron microscopy provides detailed visualization of the adsorbed particles, it cannot capture the adsorption kinetics. We used electron microscopy to

validate our findings,” the first author Vaibhav Raj Singh Parmar, a PhD student at the Raman Research Institute, explained.

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Ax-4 mission will see around 60 experiments, including 7 led by ISRO

Source: The Times of India, Dt. 03 Apr 2025,

URL: <https://timesofindia.indiatimes.com/india/ax-4-mission-will-see-around-60-experiments-including-7-led-by-isro/articleshow/119950117.cms>

The Axiom-4 mission (Ax-4), which will be piloted by India’s Group Captain Shubhanshu Shukla to the International Space Station (ISS) some time in May or early June will have a research complement of around 60 scientific studies, including seven from India. Revealing these details, Axiom Space — Ax-4 is Axiom’s fourth private astronaut mission — said the studies and research activities represent 31 countries, including the US, India, Poland, Hungary, Saudi Arabia, Brazil, Nigeria, UAE, and nations across Europe.

“This will be the most research and science-related activities conducted on an Axiom Space mission aboard ISS to date, underscoring the mission’s global significance and collaborative nature to advance microgravity research in low-Earth orbit (LEO),” the US-based firm said. Unique to this mission is a strong focus on scientific portfolios led by countries represented on the Ax-4 mission, including the US, India, Poland in partnership with the European Space Agency (ESA), and Hungary.

Isro-led research, in collaboration with Nasa and ESA, focuses on advancing microgravity research aboard the ISS to enhance our understanding of biological processes in microgravity and develop strategies for long-duration space missions. “The scientific experiments are set to drive significant advancements in space science and technology while also inspiring the next generation of Indian scientists and engineers. Ax-4 strengthens India’s presence in space and promotes the country’s dedication to contributing to global scientific progress,” the firm said.

The first three Isro-led research studies will focus on ‘investigating the physical and cognitive impact of computer screens in microgravity’, ‘studying growth, metabolism, and genetics of three microalgae strains in microgravity versus ground’ and ‘comparing growth, cellular responses, and biochemistry of two cyanobacteria strains in microgravity’. The other four are: ‘Identifying pathways of skeletal muscle dysfunction in microgravity and exploring therapies’, ‘investigating the impacts of spaceflight on germination and growth of crop seeds’, ‘examining spaceflight impacts on six crop seed varieties’, and ‘identifying molecular mechanisms of resilience in extreme environments’.

Axiom is leading a diverse array of research initiatives to advance scientific understanding of microgravity’s effects and better understand astronaut health and performance during space missions. These projects cover a wide range of topics, including medical support for diabetic astronauts, the effects of microgravity on the brain and body, and the collection of vital health data.

“The research also delves into the impact of space travel on joints, blood flow, stem cells, cancer growth, and radiation exposure. By addressing these critical areas, Axiom Space aims to enhance the overall well-being and readiness of astronauts for future missions and translate findings into benefits for Earth-based research,” the firm said.

The Axiom-led research studies will focus on: ‘Researching how to support astronauts with insulin-dependent diabetes during short-duration missions in microgravity’, ‘examining microgravity’s impact on the brain and cognitive risks’, ‘collecting physiological and psychological data from astronauts to understand how humans adapt to space’, and ‘studying the effects of short spaceflights on joints and blood flow’.

It will also look at: ‘Assessing astronaut readiness using a wearable device, iPhone software, and AWS Snowcone analytics’, ‘developing infrastructure for wearable device data processing during the Ax-4 mission’, ‘investigating cancer growth in space, focusing on triple-negative breast cancer,’ and ‘understanding the effects on blood stem cells during spaceflight’.

The European Space Agency (ESA) and Poland research features comprehensive scientific research and technology demonstrations. Focused on various experiments the Polish space industry proposed and developed under ESA’s guidance, these experiments aim to advance the understanding of space-related challenges and contribute to future space exploration efforts.

“Their research includes, studying astronauts’ mental and behavioural health on the International Space Station; monitoring bone loss upon re-entry after space missions; examining bone markers to predict recovery behaviour; evaluating neurofeedback for stress reduction and performance; investigating gut microbiome changes during short-term space stays,” Axiom said.

It added that the ESA/Poland research also includes: ‘examining immune cell adaptation to microgravity; monitoring astronauts’ soft tissue health during missions’, ‘exploring muscle electrical stimulation to protect muscle mass in microgravity’, ‘using brain imaging technology to develop a human-computer interface in microgravity’, ‘testing methods to extend pharmaceutical shelf-life in space; testing an acoustic monitor on the ISS’, ‘advancing onboard data processing for space and Earth applications’, ‘measuring space radiation levels with a monitor in the Columbus module’, ‘assessing six wearable biomonitor devices for function and stability in space’, ‘investigating red microalgae for long-duration space missions’, and ‘investigating a tardigrade gene in yeast for microgravity protection’.

The Hungarian To Orbit (Hunor) programme research on Ax-4 encompasses a range of scientific experiments designed to enhance knowledge of space and its impacts on humans and materials. These studies aim to provide valuable insights for space exploration and potential Earth-based applications. Among the Hunor research activities are: ‘Examining how space conditions affect human bacterial, viral, and fungal microbiomes’, ‘investigating microgravity’s effect on cognitive function and motor skills’, ‘demonstrating the application of nanofibrous eye inserts in microgravity’, and ‘examining low-melting point metal behaviour for next-generation ion-jet propulsion systems’.

They also include: ‘Monitoring crew radiation exposure and environmental conditions with a personal dosimetry device’, ‘mimicking planet-scale atmospheric dynamics with a novel way of

spinning a water sphere in microgravity’, ‘investigating how fruit flies fight radiation-induced DNA damage with enhanced biochemical processes’, ‘studying plant germination, microgreen production, and leaf development’, ‘examining microfluidic drug testing chips in space’.

Axiom added that they will also have the following: “Studying associative learning and visual processing in space; examining changes in cardiovascular and balancing systems; understanding cerebral blood flow adaptation to spaceflight; validating clothing heat transfer simulation in different gravity environments for improved astronaut thermal comfort; testing precise position tracking with standard inertial sensors in space; exploring spaceflight effects on 3D printed materials; studying upper atmospheric thunderstorms, and, demonstrating gravitational curiosities during a joint physics class with students from across Hungary.”

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New brain to voice technology makes it possible for paralysed people to talk in real-time

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Researchers from the University of California, Berkeley and San Francisco have developed a new brain-computer interface that restores “naturalistic speech for people with severe paralysis.” In a study published by Nature Neuroscience, the innovation addresses a huge challenge in speech neuroprostheses and is a huge step forward since it allows people who lost the ability to speak to engage in real-time communication. Researchers say they used artificial intelligence to develop a streaming method that translates brain signals into audible speech almost instantly. The method is similar to how voice assistants like Alexa and Siri quickly decode speech, resulting in “near-synchronous voice streaming” that sounds natural.

According to the study’s co-load author Cheol Jun Cho, neuroprostheses works by sampling neural data from the motor cortex, a part of the brain that controls speech and then uses AI to decode these brain signals into speech. Researchers say they tried this on a 47-year old woman named Ann, who has been unable to speak for the last 18 years. In the clinical trial, Ann was implanted with electrodes on her brain surface, which recorded neural activity when she tried to speak sentences on a screen.

The system then decoded these signals into an audible speech, which was powered by an AI model that replicated her pre-injury voice. While brain computer interfaces have been common for quite some time, one of the major breakthroughs in the study was the near real-time translation of thoughts into audio. Previously developed BCI models often suffered from a long latency, which, on average, resulted in an 8-second delay for a single sentence. The newly developed technology can help improve the lives of people who are affected by conditions such as ALS or stroke-induced paralysis.

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