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Thu, 16 Jun 2022

दुश्मन की धरती हिला देती है भारत की पृथ्वी-2 मिसाइल, जानिए इसकी ताकत

Prithvi-II मिसाइल. यानी मौत और तबाही का दूसरा नाम. भारतीय सेना और DRDO ने ओडिशा के चांदीपुर में इसका सफल परीक्षण किया. इससे टेस्ट से पहले इसका दो साल पूर्व परीक्षण किया गया था. आइए जानते है इस मिसाइल की रेंज, ताकत, गति और परमाणु हथियार ले जाने की क्षमता. पृथ्वी-2 (Prithvi-2) मिसाइल सिंगल स्टेज का लिक्विड ईंधन वाली मिसाइल है. जो अधिकतम 500 किलोग्राम वजनी हथियार ले जा सकता है. इसमें उच्च स्तर के विस्फोटक , छेद करने वाले, क्लस्टर बम, टुकड़े करने वाले, गर्मी पैदा करने वाले, रसायनिक और टैक्टिकल परमाणु हथियार लगाए जा सकते हैं. यानी किसी भी हथियार को लगाकर पृथ्वी-2 मिसाइल छोड़ दो, दुश्मन की धरती हिल जाएगी.

इस मिसाइल की शुरुआत 1983 में शुरु हुए इंटिग्रेटेड गाइडेड मिसाइल डेवलपमेंट प्रोग्राम (IGMDP) के तहत हुआ था. इस मिसाइल को प्रोजेक्ट डेविल (Project Devil) के अंतर्गत बनाया गया था. तीन मिसाइलें बनाई जानी थीं. पृथ्वी-1 भारतीय थल सेना के लिए. रेंज थी 150 किलोमीटर जिसमें 1000 किलोग्राम वजनी हथियार लगा सकते थे. पृथ्वी-2 भारतीय वायु सेना के लिए. रेंज थी 350 किलोमीटर, जिसमें 500 KG वजनी हथियार लगा सकते हैं. पृथ्वी-3 भारतीय नौसेना के लिए. 1000 KG वजनी हथियार उठाने वाली इस मिसाइल की रेंज 350 KM है.

पृथ्वी-2 (Prithvi-2) मिसाइल को स्ट्रैटेजिक फोर्सेस कमांड (Strategic Forces Command) संचालित करती है. इस मिसाइल का वजन 4600 किलोग्राम है. इसकी लंबाई 8.56 मीटर है. जबकि, व्यास 110 सेंटीमीटर है. पृथ्वी-2 की सटीक मारक रेंज 250 से 350 किलोमीटर है. यह स्ट्रैप डाउन इनर्शियल नेविगेशन सिस्टम से चलती है. यानी दुश्मन अपने स्थान से हटकर 10 मीटर इधर-उधर भी जाता है तो मौत टाल नहीं सकता!

इसे लॉन्च करने के लिए 8x8 टाटा ट्रांसपोर्टर इरेक्टर मोबाइल लॉन्चर से दागा जाता है. इसका पहला परीक्षण 1996 में किया गया था. इसकी सबसे खास बात ये है कि ये किसी भी एंटी-बैलिस्टिक मिसाइल सिस्टम (Anti-Ballistic Missile) को धोखा दे सकती है. अब तक इस मिसाइल के करीब दो दर्जन सफल परीक्षण हो चुके हैं. यानी यह मिसाइल किसी भी समय दुश्मन को बर्बाद करने के लिए तैयार है.

https://www.aajtak.in/india/news/story/prithvi-2-missile-test-fired-know-everything-about-it-specifications-tstrd-1482707-2022-06-16

Press Information Bureau
Government of India

Ministry of Defence

Wed, 15 Jun 2022 8:41 PM

Short-Range Ballistic Missile, Prithvi-II, Successfully Tested

A successful training launch of a Short-Range Ballistic Missile, Prithvi-II was carried out on June 15, 2022 at approximately 1930 hrs from the Integrated Test Range, Chandipur, Odisha. The missile is a proven system and is capable of striking targets with a very high degree of precision. The user training launch successfully validated all operational and technical parameters of the missile.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1834376

NEWS18

Wed, 15 Jun 2022

India Successfully Test-fires Short-range Ballistic Missile Prithvi-II

India Wednesday successfully test-fired its indigenously developed nuclear-capable Prithvi-II missile during nighttime as part of a user training trial from a test range off the Odisha coast. An official statement says: A successful training launch of a Short-Range Ballistic Missile, Prithvi-II was carried out today at approximately 1930 hrs from the Integrated Test Range, Chandipur, Odisha. The missile is a proven system and is capable of striking targets with a very high degree of precision. Stating that the user training launch successfully validated all operational and technical parameters of the missile, the DRDO said: The Prithvi-2 missiles test-fired successfully and test met all parameters.

The trial of the surface-to-surface missile, which has a strike range of 350 km, was carried out from a mobile launcher from launch complex-3 of the Integrated Test Range at Chandipur near

here at around 7.30 pm, sources said adding that it is a routine training trial. Earlier, Prithvi-II also was successfully test-fired during the night time on February 21, 2018, from ITR at Chandipur. Later on November 20, 2019, two trials consecutively of Prithvi-II were conducted successfully during nighttime from the same base. Prithvi-II is capable of carrying 500-1,000 kilogram of warheads and is powered by liquid propulsion twin engines. The state-of-the-art missile uses advanced inertial guidance system with manoeuvring trajectory to hit its target, officials said. The missile was randomly chosen from the production stock and the entire launch was carried out by the Strategic Force Command (SFC) of the Army and monitored by the scientists of Defence Research and Development Organisation (DRDO) as part of a training exercise, they said.

The missile trajectory was tracked by radars, electro- optical tracking systems and telemetry stations by the DRDO along the coast of Odisha, said the source. The downrange teams onboard the ship deployed near the designated impact point in the Bay of Bengal monitored the terminal events and splashdown. In salvo mode, on November 21, 2016, two missiles were successfully test fired in quick succession from the same base. Already inducted into the armory of Indian defence forces in 2003, the nine-meter-tall, single-stage liquid-fuelled Prithvi is the first missile to have been developed by the DRDO under the Integrated Guided Missile Development Programme (IGMDP).

https://www.news18.com/news/india/india-successfully-test-fires-short-range-ballistic-missile-prithvi-ii-5379259.html

Defence News

Defence Strategic: National/International

Thu, 16 Jun 2022

Defence Minister Rajnath Singh to Undertake Two-Day Visit to J&K from Today, Know Details

Union Defence Minister Rajnath Singh on Thursday will visit the advanced areas of Jammu and Kashmir. Singh will begin a two-day tour to the Union Territory, where he will meet with soldiers, news agency ANI reported. He will attend Maharaja Gulab Singh's 200th anniversary 'Rajyabhishek' in Jammu on Friday. Gulab Singh established the Dogra dynasty in Jammu and Kashmir as the first Maharaja of the Topa Rajput princely state. Under British rule, Topa Rajput was the second-largest princely state, formed to defeat the Sikh empire during the First Anglo-Sikh War. Singh used Twitter to announce his itinerary.

“Tomorrow, 16th June, I would be in Jammu and Kashmir for a two-day visit. I shall be visiting forward areas and interacting with troops during my visit. Also, I shall attend the 200th anniversary of Maharaja Gulab Singh Ji’s ‘Rajyabhishek Ceremony’ in Jammu on 17th June, Friday,” he tweeted earlier. On Monday, Singh urged for more cooperation between the civil administration and the Armed Forces to bolster national security and address future challenges posed by the ever-changing global scenario. On Monday, he spoke to participants at the Lal Bahadur Shastri National Academy of Administration (LBSNAA) in Mussoorie, Uttarakhand, during the 28th Joint Civil-Military Training Programme. The idea of national security has widened, according to the Minister, as various non-military components have been added to the more basic aspect of protection from military threats.

The scenario between Russia and Ukraine, as well as other such crises, has been cited by Rajnath Singh as indication that the globe is facing difficulties that go beyond traditional combat. While emphasising the importance of taking a "Whole of the Nation" and "Whole of the Government" approach to address these issues, Singh said, "War and peace are no longer two exclusive states, but a continuum. Even during peace, the war continues on many fronts. A full-scale war is lethal to a country as much as it is for its enemies. Therefore, full-scale wars have been avoided in the last few decades. They have been replaced by proxies and non-combat wars. Technology, supply line, information, energy, trade system, finance system etc. are being weaponised, which can be used as a weapon against us in the coming times. People’s cooperation is needed to deal with this widened scope of security challenges."

With the introduction of the job of Chief of Defence Staff and the formation of the Department of Military Affairs, Singh declared that the government has begun a full-fledged process of civil-military jointness. He claims that these measures are assisting the country in preparing for future issues. He went on to say that the initiatives made to modernise the Armed Forces and turn the defence sector into a 'Aatmanirbhar' had begun to bear fruit. “Now, India is not only manufacturing equipment for its Armed Forces, but is meeting the needs of friendly countries as well, in line with Prime Minister Narendra Modi’s vision of ‘Make in India, Make for the World’,” he said.

https://news.abplive.com/news/india/defence-minister-rajnath-singh-to-undertake-two-day-visit-to-j-k-from-today-know-details-1537518

IDN INDIAN DEFENCE NEWS
Global Defence, Aerospace & Security

Thu, 16 Jun 2022

IAF Chief Talks Star Wars, Wants Turf Extended to Space

The Chief of the Indian Air Force (IAF) has made a strong case for the IAF to be given the mandate of a Space force in addition to its responsibility of securing Indian interests in the Air. “I would reiterate that we see Space as a natural extension of the air medium and reaffirm our need to adapt to this new environment rapidly. Hon’ble RM (Defence Minister Rajnath Singh) recently mentioned in a talk that IAF does need to transcend to an air and space force in the years to come and we are working on this vision,” Air Chief Marshal VR Chaudhari said in his address at the 12th Annual Conference and Exhibition on Geospatial Intelligence in New Delhi on June 14. “The IAF strategy is to fully integrate the Air and Space capabilities to have a common

picture of the aerospace medium, reduce the sensor to shooter time and enable optimum force application," he said. The theme of his address was 'Shaping Indigenous Comprehensive National Space Capability'.

The IAF's strong pitch for transitioning to an Air and Space Force comes at a time when the impending Theaterisation of India's combat forces portends to make the Air Force an ancillary to Army and Navy-led Theatre commands and threatens its relevance as an independent, lead strategic force which shapes the battlefield. In his address, Air Chief Marshal Chaudhari depicted Space as a highly contested battlefield which will be characterised by application of military force "in, from and through Space". Outcomes in the aerospace domain will probably decide the eventual victor in future conflicts, he wagered. Stakes in space are also illustrated by the sharp increase in the number of satellites. "Today there are around 4900 satellites in operation which are owned by approximately 80 countries. Astonishingly, around 605 of these satellites were launched in 2021 alone," he observed.

"As reliance on space grows, Space-based assets will become centres of gravity that are likely to be targeted in war and 'less than war' situations. This is leading to evolution of concepts of force projection, protection and targeting in Space," the IAF Chief said. Anti-Satellite tests (ASATs) by major nations are an indication of the onset of this contestation and militarization of outer space, he pointed out. "While our Mission Shakti operation in 2019 highlighted our ASAT capability to deter adversaries from resorting to escalatory space conflict, it also brought to fore, the need for Comprehensive Space Situational Awareness (SSA) through a robust Space Surveillance Network (SSN)," the Air Chief Marshal said.

He strongly urged preparation for facing threats emerging from the militarisation of Space, listing some requirements. "Availability of comprehensive SSA enables a complete 'Defensive Counter Space' stance as well as usage of our ASAT capability, if and when required. The key areas for the armed forces would be the development of Missile Defence Radars for SSA, Space-Based Sensors and optical telescopes to track adversarial objects. The existing capabilities of ISRO and DRDO would thus need to be integrated into the Air Surveillance picture of the IAF, well beyond the present 100 km altitude. This integration would provide a gradual progression to a Space Surveillance Network," he said. The Air Chief spoke of civil-military fusion in the development of Space capability, with the Defence Space Agency playing a lead role in synergising civil-military space cooperation. "This would mandate an increased inter-play with both Govt and Commercial space agencies," he said, while acknowledging the pre-eminence of ISRO in Space-related competence and assets.

He elaborated on the synergies in developing Space-based network centric capability for the IAF, and also listed out requirements to face future challenges. The armed forces have been exploiting the capabilities of ISRO's Earth observation satellites under the Space Based Surveillance (SBS) programme like Cartosat-2 series with sub-metre resolution and RISAT-2 for SAR imagery. "As far as space communications are concerned, our requirements were primarily met by dual use INSAT and GSAT series satellites until 2018. From 2018 onwards, IAF has been provided a dedicated communication satellite GSAT 7A for its airborne and terrestrial communication. However, the current and envisaged operational and strategic requirements 4 of the services call for enhanced bandwidth in UHF, L and S bands to cover the stipulated area of interest," he said.

"IAF is already in the process of finalising its GSAT- 7C UHF communication satellite which would meet the SDR SATCOM requirements. Additional transponders are also planned in the

'Ku' band in GSAT -7C to meet our increasing bandwidth requirement, he announced. Air Chief Marshal Chaudhari also called for ending dependence on the GPS constellation for navigation and targeting and made a case for the early development of the indigenous IRNSS. "It is expected to provide sub 10 metre accuracy and it is important to ensure that the entire complement including satellites, ground stations and receivers are put in place at the earliest to reduce our reliance on other systems," he said.

"Satellite-based Electronic Intelligence (ELINT) has emerged as a critical element of intelligence gathering especially with respect to to identifying and locating enemy radar systems. India has the requisite expertise to develop satellite-based ELINT payloads and the same needs to be accelerated," the IAF Chief added. Referring to the role Space-X's Starlink satellites have played in the Ukraine War, the Air Chief Marshal pointed towards the challenges and opportunities of a highly Proliferated Low Earth Orbit. "Another changing paradigm in space application is the growing ubiquity of Low Earth Orbit (LEO) satellites in domains which were historically in the realm of Geo synchronous satellites…Communication satellites in low and medium earth orbit have their own advantages with multiple commercial players entering this segment. I am sure that in due course, this technology will evolve and we shall see reduced manufacturing and launching costs which could favour the shift towards this concept," he said.

http://www.indiandefensenews.in/2022/06/iaf-chief-talks-star-wars-wants-turf.html?m=1

FINANCIAL EXPRESS
Read to Lead

Wed, 15 Jun 2022

India Needs Tech-Savvy Young Armed Forces: Lt Gen Arun

A modern battle field is more about having a young workforce, which is tech-savvy, claimed Lt Gen A Arun, General Officer Commanding, Dakshin Bharat Area, and asserted on Wednesday that the 'Agnipath Yogana' will meet the aspiration of youngsters aiming for a short stint in the armed forces. The scheme has been evolved keeping in mind the phenomenal changes in society and technology, and to equip the organisation to be future ready, he said. "In a modern battle field everyone requires a younger workforce. We need a tech-savvy or tech friendly armed force and a modern fighting soldier," Lt Gen Arun noted.

Briefing reporters about Agnipath, a transformative scheme for recruiting youngsters into the defence forces unveiled by the central government, he said there is a desire among the youth, especially those in the border areas, to serve the country for a short duration, rather than settle for a service spanning about two decades. Indian youth will be provided an opportunity to serve in the armed forces as Agniveer. This has been brought to strengthen the security of the country and is a transformative scheme, Defence Minister Rajnath Singh said on Tuesday.About 46,000 Agniveers in the 17.5 to 21 years age group would be recruited for this short-term contractual scheme to enhance the youthful profile of the armed forces.

https://www.financialexpress.com/defence/india-needs-tech-savvy-young-armed-forces-lt-gen-arun/2561697/lite/

THE ECONOMIC TIMES

Thu, 16 Jun 2022

Agniveers can Become Graduates; UGC to Allow 50% Credits for in-Service Training

Those who enrol as 'Agniveers' will be able to earn an undergraduate degree or diploma or certificate with 50% credits earned through their training in the armed forces and the remining through a batch of courses, the education ministry announced on Wednesday. The University Grants Commission and the Indira Gandhi National Open University have also started working together to recognise the skills acquired by 'Agniveers', officials in the know told ET. This skill set acquired by them will be mapped on to the National Higher Education Qualification Framework (NHEQF). UGC, IGNOU and other higher education departments are then expected to assess additional qualifications and courses they can engage with for bettering their future prospects, the officials added.

The National Digital University, announced in Budget 2022, will also allow Agniveers to take up courses in emerging areas and acquire professional skills. The All India Council for Technical Education (AICTE) will assess options to assist with the Agniveer scheme, officials said. First off the block is the special, three-year skill-based Bachelor's Degree programme by IGNOU for 'Agniveers' to enhance their future job prospects and ready them for job roles in the civilian sector. The course will recognise the skill training received by them during their tenure in the defence establishments. It will allow for multiple exit points in keeping with the new set of UGC reforms- an Undergraduate Certificate on successful completion of the first-year courses, Undergraduate Diploma on successful completion of the first- and second-year courses, and Degree on completion of all the courses in the three-year time frame.

"While 50% of the credits required for a graduate degree will come from skill training -- technical and non-technical -- received by the Agniveer, the remaining 50% will come from a basket of courses that cover subjects like languages, Economics, History, Political Science, Public Administration, Sociology, Mathematics, Education, Commerce, Tourism, Vocational Studies, Agriculture and Jyotish, as also ability enhancement courses on Environmental Studies and Communication Skills in English it said. The degree courses will follow the University Grants Commission norms and be offered as B.A/B.Com/BA (Vocational), B.A. (Tourism management) and will be recognised both in India and abroad for employment and education, said a government statement. The Army, Navy and Air Force will sign a Memoranda of Understanding (MoU) with IGNOU for implementation of the scheme.

https://economictimes.indiatimes.com/news/defence/agniveers-can-become-graduates-ugc-to-allow-50-credits-for-in-service-training/articleshow/92238800.cms?from=mdr

THE ECONOMIC TIMES

Thu, 16 Jun 2022

Agniveers will be Skilled Citizens, Says Northern Army Commander

Srinagar: Northern Army Commander, Lieutenant General Upendra Dwivedi, on Wednesday said that the Agnipath scheme is a transformational reform for the army that would provide the country with skilled, motivated and patriotic youth. The army commander said that on completion of the four-year period, Agniveers will go to society as a disciplined, dynamic, motivated and skilled workforce for employment in other sectors including corporate and industry, central para military forces and public sector units to pursue their career in jobs of their choice. "It is a win-win situation for all and Agniveers would act as a bridge between the army and society...they would play a role in nation building and even fight street crime, especially against women as responsible citizens of the country," said Dwivedi while addressing a presser in Srinagar.

The Lt Gen said this scheme would attract young people in J&K, put them on the right track and ensure that they don't go astray. "Our effort in four years is that we show them the right path...Our Moulvis would train them and make them understand the Quran so that they take the right path," said Dwivedi. He also informed that the youngsters would be trained in local RR units to ensure that they get enrolled whenever there is a vacancy.

https://economictimes.indiatimes.com/news/defence/agniveers-will-be-skilled-citizens-says-northern-army-commander/articleshow/92238817.cms

BusinessToday.In

Wed, 15 Jun 2022

'Agniveers' to get priority in recruitment to CAPF, Assam Rifles: MHA

'Agniveers', soldiers recruited in the Army, Navy and the Air Force on short-term contract under a special 'Agnipath' scheme, will get priority in recruitment to the central armed police forces (CAPFs) and Assam Rifles, the Union Home Ministry announced on Wednesday. It said those who complete four years of service under the scheme would be given priority in the recruitment process. The government on Tuesday unveiled this transformative scheme, in a major overhaul of the decades-old selection process to bring in fitter and younger troops to deal with future security challenges facing the nation. Under the scheme, around 46,000 soldiers will be recruited this year between the ages of 17 and a half years and 21 years into the three services, the defence ministry said. In a tweet, Home Minister Amit Shah's office on Wednesday said the Agnipath scheme is a visionary and welcome decision by Prime Minister Narendra Modi for a bright future of the country's youth.

"In this context, today the Ministry of Home Affairs has decided to give priority to Agniveers who have completed four years under this scheme in the recruitment of CAPFs and Assam Rifles," the HMO India tweeted. With this decision of the Ministry of Home Affairs, under the guidance of the prime minister, youngsters trained under the Agnipath scheme will be able to contribute in the service and security of the country even further. "Detailed planning work has started on this decision," it tweeted.

https://www.businesstoday.in/jobs/story/agniveers-to-get-priority-in-recruitment-to-capf-assam-rifles-mha-337670-2022-06-15

THE ECONOMIC TIMES

Thu, 16 Jun 2022

How Nations Recruit and Retain Soldiers

The new Agnipath scheme for enrolment into the armed forces has generated a lot of debate, given the radical changes being brought in. The new plan will do away with the British era practice of caste and region-based recruitments for certain regiments and is designed to lower the age profile of soldiers. All recruitments for Personnel Below Officer Rank (PBOR) to be done through the scheme. Soldiers will serve for four years, after which 25% will be enrolled into the regular cadre, based on their performance. They will have a distinct rank that will distinguish them from regular soldiers. The recruitment age will be between 17.5 and 21 years.

It will help cut the ballooning pension bill that currently stands at Rs 1.19 lakh crore annually. Agniveers who finish four-year service will be given a lumpsum package of Rs 11.71 lakh which will be exempt from tax. Here is how various nations recruit and retain soldiers. **US** It has a strength of around 14 lakh soldiers and recruitment is on a voluntary basis. Most personnel enrol for four years, which is followed by a four-year reserve duty period where they can be recalled in case the need arises. Soldiers can opt for full service and are eligible for pension and benefits after serving for 20 years. Soldiers retiring early are eligible for certain allowances and perks on a case by case basis.

CHINA
Recruitment is done on a conscription model with 4.5 lakh conscripts inducted for training every year. Given the large adult male population of the nation, it has 80 lakh people available to meet this requirement every year. Conscripts must serve for two years and are given a basic training of 40 days, followed by specialised training on an individual basis or requirement of the units. An unknown number of soldiers are retained for full service on a selection basis. Post demobilisation, soldiers are given discounted loans to start their own business and companies that employ them are given tax benefits.

RANCE
Soldiers are recruited on a contract basis. There are several models for this. Starting from a one-year renewable contract to five-year contracts that are also on a renewable basis. Soldiers are given training for three months and those who serve for over 19 years are eligible for state pension.

RUSSIA

It follows a hybrid model of conscription and contractual service in the armed forces. Conscripts are given one year of training, followed by a year of service and are then put in reserve. Recruitment of soldiers is done from these conscripts. Soldiers are given preferential admissions to universities and have the option of undertaking education in military institutions.

ISRAEL

The country has a conscription system where all adults need to serve in the armed forces. Males must serve for 32 months and women for 24 months. Post this service, they are put in a reserve list and can be recalled for active duty at any point. Soldiers are given basic training on handling weapons and equipment and are put on operational duty after training at the Brigade level. Up to 10% of them are retained into the armed forces and are given a contract for seven years. Pension is given after serving for a minimum of 12 years.

https://economictimes.indiatimes.com/news/defence/how-nations-recruit-and-retain-soldiers/articleshow/92239464.cms

ThePrint

Wed, 15 Jun 2022

India, Spain Agree to Add New Depth and Content to Ties

New Delhi, Jun 15 (PTI) Spain on Wednesday evinced interest in participating in India's defence manufacturing sector even as the two countries expressed concern over the humanitarian crisis in Ukraine and called for an immediate cessation of hostilities. In their wide-ranging talks, External Affairs Minister S Jaishankar and his visiting Spanish counterpart Jose Manuel Albares Bueno reiterated their commitment to closely work in countering common challenges of terrorism, violent extremism and cyber crime. The Ministry of External Affairs (MEA) said Jaishankar and Albares committed to "add new depth and content to the relationship" and emphasised on the need to retain strategic focus on the Indo-Pacific and to promote collaborative efforts among like-minded nations.

Albares is on a day-long visit to India.

The MEA said there were detailed discussions focused on enhancing cooperation in the key priority areas of trade and investment, defence and security, climate change, green energy and science and technology. "The two leaders welcomed signing of the defence contract as part of which Airbus Spain will supply 56 C295 aircraft, 40 of which would be Made in India, and agreed to further deepen defence and security cooperation," the MEA said in a statement. It said India welcomed Spain's interest in participating in its national defence manufacturing programme through 'Make in India' and 'Atmanirbhar Bharat' initiatives. In September last year, India sealed a nearly Rs 21,000 crore deal with Airbus Defence and Space to procure 56 C-295 transport aircraft to replace the ageing Avro-748 planes of the IAF under a project that entails manufacturing of military aircraft in India for the first time by a private company.

"Warm and productive discussions with Foreign Minister @jmalbares of Spain. Discussed our growing engagements in political,defense, economic and cultural domains. Envisage enhanced

collaboration to support self reliance and resilient supply chains," Jaishankar tweeted. On his part, Albares described India as a global power and an important partner of Spain. In a tweet in Spanish, he said the meeting with Jaishankar was excellent and that both sides will continue to work to deepen the bilateral relations and signed a declaration for cultural and academic cooperation. The MEA said Jaishankar and Albares welcomed the growing bilateral trade and investment linkages and agreed to expand them in new areas of common interest.

"They agreed that there are more opportunities in sectors like IT, pharma and renewable and there are new and unexplored emerging areas like green hydrogen, electric mobility, advanced materials, deep sea exploration where the two countries can collaborate further," it said. It said the two ministers also exchanged views on a number of regional and global issues of mutual interest and noted the mutual understanding and support in addressing common challenges like climate change, global health, sustainable development and counter-terrorism. They welcomed the restart of India-EU FTA negotiations later this month. On Ukraine, the two ministers expressed their concern on the ongoing humanitarian crisis and called for an immediate cessation of hostilities. On Afghanistan, both sides highlighted the need for Afghanistan to have unhindered access to humanitarian assistance and that Afghan territory is not used by terror outfits for destabilising the region. The MEA said the two sides agreed to explore collaboration in development partnership and economic activities in the Latin America and the Caribbean region.

https://theprint.in/india/india-spain-agree-to-add-new-depth-and-content-to-ties/997994/

THE WEEK

Wed, 15 Jun 2022

Iran Says Rocket Launch Coming After Photos Show Preparation

with new cycle version with Iran confirming Zuljanah test coming.) Dubai, Jun 15 (AP) Iran acknowledged Wednesday it plans two tests for its new solid-fuelled rocket after satellite photos showed preparations at a desert launch pad previously used in the programme, even as tensions remain high over Tehran's rapidly advancing nuclear programme. The Islamic Republic will launch its satellite-carrying Zuljanah rocket twice more after conducting a previous launch, the state-run IRNA news agency quoted Defence Ministry spokesman Ahmad Hosseini as saying. He did not elaborate on a timeframe for the tests, nor said when the previous launch occurred.

Each of the Zuljanah's three stages will be evaluated during the tests, Hosseini said. Satellite images taken Tuesday by Maxar Technologies showed preparations at a launch pad at Imam Khomeini Spaceport in Iran's rural Semnan province, the site of frequent recent failed attempts to put a satellite into orbit. One set of images showed a rocket on a transporter, preparing to be lifted and put on a launch tower. A later image Tuesday afternoon showed the rocket apparently on the tower. Though it isn't clear when the launch will take place, erecting a rocket typically means a launch is imminent. NASA fire satellites, which detect flashes of light from space, did not immediately see any activity over the site late Tuesday night into Wednesday.

Asked about the preparations, State Department spokesman Ned Price told reporters in Washington that the US urges Iran to de-escalate the situation. “Iran has consistently chosen to escalate tensions. It is Iran that has consistently chosen to take provocative actions,” Price said. A Pentagon spokesman, US Army Maj. Rob Lodewick, said the American military “will continue to closely monitor Iran's pursuit of viable space launch technology and how it may relate to advancements in its overall ballistic missile program.” “Iranian aggression, to include the demonstrated threat posed by its various missile programs, continues to be a top concern for our forces in the region,” Lodewick said. Over the past decade, Iran has sent several short-lived satellites into orbit and in 2013 launched a monkey into space. The program has seen recent troubles, however. There have been five failed launches in a row for the Simorgh program, a type of satellite-carrying rocket. A fire at the Imam Khomeini Spaceport in February 2019 also killed three researchers, authorities said at the time.

The launch pad used in Tuesday's preparations remains scarred from an explosion in August 2019 that even drew the attention of then-President Donald Trump. He later tweeted what appeared to be a classified surveillance image of the launch failure. Satellite images from February suggested a failed Zuljanah launch earlier this year, though Iran did not acknowledge it. The successive failures raised suspicion of outside interference in Iran's program, something Trump himself hinted at by tweeting at the time that the U.S. “was not involved in the catastrophic accident.” There's been no evidence offered, however, to show foul play in any of the failures, and space launches remain challenging even for the world's most successful programs.

Meanwhile, Iran's paramilitary Revolutionary Guard in April 2020 revealed its own secret space programme by successfully launching a satellite into orbit. The Guard launched another satellite this March at another site in Semnan province, just east of the Iranian capital of Tehran. John Krzyzaniak, a research associate at the International Institute for Strategic Studies, had predicted Tuesday that Iran would test another Zuljanah. Krzyzaniak earlier this week suggested a launch was imminent based on activity at the site. The rocket's name, Zuljanah, comes from the horse of Imam Hussein, the grandson of the Prophet Muhammad. Iranian state television aired footage of a successful Zuljanah launch in February 2021.

The launch preparations also come as the Guard reportedly saw one of its soldiers “martyred” in Semnan province under unclear circumstances over the weekend. Iran's Defense and Armed Forces Logistics Ministry, however, later claimed the man worked for it. The Zuljanah was designed by that ministry.The United States has alleged that Iran's satellite launches defy a U.N. Security Council resolution and has called on Tehran to undertake no activity related to ballistic missiles capable of delivering nuclear weapons. The U.S. intelligence community's 2022 threat assessment, published in March, claims such a satellite launch vehicle “shortens the timeline” to an intercontinental ballistic missile for Iran as it uses “similar technologies.”

Iran, which has long said it does not seek nuclear weapons, previously maintained that its satellite launches and rocket tests do not have a military component. US intelligence agencies and the International Atomic Energy Agency say Iran abandoned an organised military nuclear programme in 2003. However, Iran's likely preparations for a launch come as tensions have been heightened in recent days over Tehran's nuclear program. Iran now says it will remove 27 IAEA surveillance cameras from its nuclear sites as it now enriches uranium closer than ever to weapons-grade levels. Both Iran and the US insist they are willing to re-enter Tehran's 2015 nuclear deal with world powers, which saw the Islamic Republic drastically curb its enrichment

in exchange for the lifting of economic sanctions. Trump unilaterally withdrew America from the accord in 2018, setting in motion a series of attacks and confrontations beginning in 2019 that continue today into the administration of President Joe Biden.

Talks in Vienna about reviving the deal have been on a “pause” since March. Building a nuclear bomb would still take Iran more time if it pursued a weapon, analysts say, though they warn Tehran's advances make the program more dangerous. Israel has threatened in the past that it would carry out a preemptive strike to stop Iran — and already is suspected in a series of recent killings targeting Iranian officials.

https://www.theweek.in/wire-updates/international/2022/06/15/fgn30-iran-ld-rocket-launch.html

the pioneer

Thu, 16 Jun 2022

NATO Defence Ministers to Discuss Weapons for Ukraine

NATO defense ministers attending a two-day meeting starting Wednesday will discuss beefing up weapons supplies to Ukraine, and Sweden and Finland's applications to join the trans-Atlantic military alliance, Secretary-General Jens Stoltenberg said. The meeting, less two weeks before a summit of NATO leaders in Madrid, comes with Kyiv imploring the West to send more and heavier weapons to help fend off Russia's onslaught in eastern Ukraine.

“Allies are committed to continue providing the military equipment that Ukraine needs to prevail, including heavy weapons and long-range systems,” Stoltenberg said. He added that Ukrainian President Volodymyr Zelenskyy would be invited to address the June 29-30 Madrid summit, either in person or by videoconference. Increased arms supplies can't come soon enough for the Ukrainian forces battling to keep Russia from taking control of their country's industrial east after more than 3½ months of war. In his nightly address to the nation, Zelenskyy pleaded Tuesday for more and faster deliveries of Western arms, specifically asking for anti-missile defense systems. U.S. Defense Secretary Lloyd Austin is hosting a meeting Wednesday of about 50 nations at NATO's Brussels headquarters to discuss weapons deliveries to Ukraine. Ukrainian Deputy Defense Minister Hanna Malyar said Tuesday that the invaded nation's military had received only around 10% of the Western weapons it had requested “to create parity with the Russian army.”

“No matter how much effort Ukraine makes, no matter how professional our army, without the help of Western partners we will not be able to win this war,” Malyar said in a televised news conference. She said Ukraine uses 5,000 to 6,000 artillery rounds a day, while Russia uses 10 times more. The NATO meeting opens with a working dinner Wednesday evening at which ministers will speak with their counterparts from Ukraine, as well as Georgia, Sweden, Finland, and the European Union. “This will be an opportunity for Defense Minister (Oleksii) Reznikov to update us on what Ukraine urgently needs. And for NATO allies to make new announcements of support to Ukraine,” Stoltenberg said.

The defense ministers meeting this week also plan to discuss moves to beef up forces along NATO's eastern flank and elsewhere, which have gathered pace since Russia invaded Ukraine.

“This will mean more presence, more capabilities and higher readiness, with more NATO forward deployed combat formations to strengthen our battlegroups in the East, more air, sea and cyber defenses, pre-positioned equipment and weapon stockpiles,” Stoltenberg said. He wouldn't commit to a timeframe for Sweden and Finland joining NATO. Turkish President Recep Tayyip Erdogan is blocking the membership bids as he accuses the Nordic nations of supporting Kurdish militants deemed by Turkey to be terrorists.

“My aim is to solve this issue as soon as possible, but since we are several nations involved in this process, there is no way to tell you exactly when we will solve it," Stoltenberg said. Because of Turkey's concerns, “this will take some more time than we originally expected,” he said. Erdogan signaled Wednesday he won't back down. “We will most definitely not change our stance until Sweden and Finland take clear, concrete and determined steps in the fight against terrorism,” Erdogan said in an address to his ruling party's legislators. All 30 NATO members must agree to admit new members. U.K. Defense Secretary Ben Wallace said at a meeting Wednesday in Oslo that the ambition for the NATO summit in Madrid is ensuring “that Sweden and Finland are successfully on the next step towards accession into NATO,” “I think it is very important we listen and understand Turkey's concerns and work to a position where Turkey will support the accession and indeed that we can mitigate any of those concerns,” Wallace said.

He added that the West needs to do more to support Ukrainians battling advances by far better equipped Russians. “The Ukrainian forces in the east of the country, some of them have been on that front line for 90 days. They are exhausted. They are often, in artillery terms, outnumbered at very, very high ratios," he said.

https://www.dailypioneer.com/2022/world/nato-defence-ministers-to-discuss-weapons-for-ukraine.html

Wed, 15 Jun 2022

NATO Secretary General previews meeting of Allied Defence Ministers

NATO Defence Ministers are meeting in Brussels on Wednesday and Thursday (15-16 June 2022) to address how to make NATO stronger and further support partner nations. Ministers will be joined this evening by Ukraine’s Defence Minister Oleksii Reznikov to update Allies on what Ukraine urgently needs. Allies and partners have already provided Ukraine with billions of dollars’ worth of military equipment, as well as economic and humanitarian aid. NATO Secretary General Jens Stoltenberg said: “Allies are committed to continue providing the military equipment that Ukraine needs to prevail, including heavy weapons and long-range systems.” Mr. Stoltenberg said he expected Allies will agree a comprehensive assistance package for Ukraine at the Madrid Summit. It would help Ukraine for the longer-term, to transition from Soviet-era to modern NATO equipment, and to improve interoperability with NATO. Allied Ministers will

also be joined for their discussions this evening by Georgia, Sweden, Finland, and the European Union.

NATO Defence Ministers will also address the need to significantly strengthen the Alliance's deterrence and defence. In response to Russia's invasion of Ukraine, the number of NATO battlegroups has doubled to eight and more than 40,000 troops are now under direct NATO command. Mr. Stoltenberg said: "We will now take decisions on the scale and design of our posture for the longer term. To ensure that we can defend every inch of Allied territory. From the first moment, at all times, and against any threat. This will mean more presence, capabilities and readiness" He said that would mean more NATO forward deployed combat formations to strengthen the battlegroups in the East, more air, sea and cyber defences, pre-positioned equipment and weapon stockpiles. He also highlighted a new force model, with more forces at higher readiness, and specific forces pre-assigned to the defence of specific Allies.

The Secretary General said the US-led Ukraine Support Contact Group would also meet at NATO to discuss Ukraine's urgent needs for military equipment and he thanked the United States for its leadership and coordination.

https://www.nato.int/cps/en/natohq/news_196655.htm

GOV.UK

Thu, 16 Jun 2022

Future of UK Defence Artificial Intelligence Launched

Plans for the future of cutting-edge UK Artificial Intelligence (AI) defence technology have been unveiled in a new strategy published today.

- New Defence AI Strategy launched at London Tech Week AI Summit to drive forwards innovation
- New approach to the Ambitious, Sustainable and Responsible use of AI.
- New jobs, research, development, and experimentation to modernise the UK Armed Forces

Plans for the future of cutting-edge UK Artificial Intelligence (AI) defence technology have been unveiled in a new strategy published today at London Tech Week AI Summit. The strategy and accompanying policy on the 'Ambitious, Safe and Responsible' use of AI underpin a new Defence AI Centre (DAIC), which will offer a visionary hub to champion, enable and innovate these technologies across the UK Armed Forces with pace and ambition.

In the face of ever-evolving threats to global security, the Defence AI Strategy outlines how the UK will prioritise research, development, and experimentation to revolutionise our Armed Forces capabilities through new concepts and cutting-edge technology to deliver the latest equipment to the battlefield through effective, efficient, trusted pathways. Concepts include AI-enabled autonomous combat vehicles and resupply systems to deliver supplies without putting people in danger, or soldiers on the front-line guided by smart systems drawing on hours of detailed footage captured by a series of small drones.

We also publish today our policy on the 'Ambitious, Safe and Responsible' use of AI, developed through partnership with the Centre for Data Ethics and Innovation (CDEI), including new ethical principles for the use of AI in Defence. These will make sure that Defence makes the best and responsible use of the technology, both to retain the confidence of the public and our partners and to hold others to account for irresponsible behaviours.

Defence Procurement Minister, Jeremy Quin, said:

Future conflicts may be won or lost on the speed and efficacy of AI technology, and our approach to AI must be rapid, ambitious and comprehensive. Our new Defence AI Centre (DAIC) and AI strategy will create a focused hub to champion these technologies, working ethically hand in hand with human judgements to maintain the UK's position at the forefront of global security and responsible innovation.

Further to this, Defence Science and Technology Laboratory (Dstl) have awarded a £7 million contract to Northern Ireland based company Kainos, partnering with AI specialist Faculty Science Ltd and defence experts Actica, to deliver world-class artificial intelligence experimentation. The contract will support up to 20 highly skilled data science jobs across the UK as well as developing new specialist roles to reinforce safe, ethical, and operational AI.

Dr Paul Kealey, Head of Dstl's Cyber and Information Systems Division said:

Dstl is delivering the most ambitious programme in its 20-year history – and we can only deliver on this by working with diverse talent from across industry and academia. AI has the potential to provide significant benefits across Defence from the back-office to the Front Line and I'm delighted we are working with Kainos – a brand new supplier who will bring specialist expertise and experience as a leader in the civil world into defence.

Brendan Mooney, Kainos CEO, said:

We are delighted to have been selected to be AI Agile Delivery Partner for Dstl. We share the Ministry of Defence's belief that when utilised effectively and responsibly, data and AI offers unparalleled opportunities for the future of defence. Alongside our partners, Faculty and Actica, we are excited by the opportunity to extend this relationship with this long-term engagement with Dstl. Defence's commitment to strengthen security and modernise our armed forces was outlined in the Integrated Review, and the use of AI is a key to achieving that objective. The AI Strategy highlights how the MOD will be transformed into an 'AI ready' organisation and in doing so, will support the government's wider ambitions for the UK to become a Science and Technology Superpower by 2030.

The announcements took place during London Tech Week, and the minister made clear at the AI Summit that AI-enabled military capabilities will always be in line with UK ethical values, standards, and legal obligations, and that there remain instances where human judgement will always be necessary. Building on the Integrated Review and Defence Command Paper - which was backed by an additional £24 billion for Defence over 4 years - the Defence AI Strategy will form a key element of the National AI Strategy and reinforces Defence's place at the heart of the Government's drive for strategic advantage through science and technology.

https://www.gov.uk/government/news/future-of-uk-defence-artificial-intelligence-launched

THE HINDU

Thu, 16 Jun 2022

The Fragile State of Nuclear Disarmaments

How has India in SIPRI'S Annual Report? Is the World Becoming Increasingly more Militarised?

RISHABH KACHROO

The story so far: The Stockholm International Peace Research Institute (SIPRI) released its yearbook a few days back highlighting some worrying trends of the past year in international security. The expected rise of the global nuclear arsenal was the chief cause of concern among SIPRI experts. The comprehensive report claims that while absolute numbers of nuclear arsenal have reduced, they are expected to grow over the next decade.

What have been the trends in military spending?

During 2012-2021, military spending as a percentage of gross domestic product has largely been stable. If anything, the average worldwide trend has been slightly downward. Russia leads the charge in absolute numbers of nuclear inventory (5977 against the U.S.'s 5428), however it is the U.S. that has the largest number of deployed warheads (1744 against Russia's 1588). The U.K. has 225 nuclear weapons in its inventory, while France has 290, China has 350, India has 160, Pakistan has 165. Israel is estimated to have 90 and North Korea 20.

It is concerning, to say the least, to see how global discourse has created a sense of fear around China's military modernisation and their upward trend in nuclear weapons development while the thousands of nuclear weapons held by the U.S. don't seem to attract a similar level of attention.

What about global arms imports?

Military modernisation is seen to be a global trend. All nuclear weapon owning states have, over the years, stated and worked upon their intention to modernise multiple facets of their armed forces—ranging from the development of newer and more efficient nuclear submarines, aircraft carriers, fighter jets, manned and unmanned aerial vehicles to the growing spread of the use of missile defence systems which may result in aggravating security concerns for other countries.

Saudi Arabia, Egypt, China, and Australia. According to SIPRI, these five nation states account for 38% of total global arms import.

What are the key developments/concerns flagged by the yearbook?

The yearbook mentions low level border clashes between India and Pakistan, the civil war in Afghanistan, and the armed conflict in Myanmar as some of the worrying indicators of an unstable system. It also highlighted three cause of concern trends: Chinese-American rivalry, involvement of state and non-state actors in multiple conflicts, and the challenge that climatic and weather hazards pose. It is important to note here that the threat posed by climate change seems to feature in the report only nominally.

The marginal downsizing observed in the nuclear arsenal has come mostly from the U.S. and Russia dismantling retired warheads. But the Russian invasion of Ukraine has raised some serious eyebrows because of the continuous rhetoric from the Kremlin over them not shying away from the use of nuclear weapons. China's recent activities surrounding construction of 300 new nuclear missile silos have also been turning heads. Speaking at the Shangri-La Dialogue, Chinese Defence Minister, Wei Fenghe, claimed that while they have made "impressive progress" vis-à-vis their nuclear arsenal, the primary purpose of said arsenal continues to be self-defence. Over in the subcontinent, India and Pakistan seem to be making gains over their nuclear arsenal (in absolute numbers) while also looking at the development and procurement of newer and more efficient forms of delivery systems.

Has Iran inflated its military expenditure?

The SIPRI yearbook claims that while there were some advances over the rollout of the 2015 Joint Comprehensive Plan of Action, Iran increased its enrichment of Uranium-235 to 60% in 2021. It also reported that Iran's military budget grew to $24.6

Contd…….

not being a single Iranian exchange rate, resulting in a hyperinflated estimation of expenditure by SIPRI analysts.

It is claimed that SIPRI is aware of this 'accusation' and will investigate the 'exchange rate issue'.

What is the general attitude among countries about existing nuclear and arms related treaties?

Earlier this year, the leaders of the P5 countries (China, France, Russia, the U.K. and the U.S.) issued a joint statement affirming the belief that "a nuclear war cannot be won and must never be fought". The joint statement also highlighted their seemingly collective belief that bilateral and multilateral arms control agreements and commitments were indeed important. The dichotomy of this sentiment against the upward trend in absolute numbers of arms and nuclear arsenals is rather unsettling. One could however claim that even with these upward trends, the nation states are making sure to remain well within the ambit of what the treaties and agreements ask for. The tactic here seems to be to milk the treaties and agreements to the hilt. The states are aware of the value of the rhetoric and the security dilemma that their actions present. The recent Russian invasion of Ukraine and the subsequent NATO bids by Finland and Sweden seem to be telling events. While the Ukrainian invasion saw Russian military and political establishments hype-up its nuclear attack rhetoric against Ukraine, its primary leadership (both civil and military) had been rather diplomatic and 'relatively' cordial in its treatment of the Finnish and Swedish NATO bids.

Clear and constant communication between the countries involved was instrumental in making sure no unintended meanings were construed by the parties involved. The Russians seem to protract this invasion and hope to win it by exhausting Ukraine's defence capabilities.

The year 2021 also saw the Treaty on the Prohibition of Nuclear Weapons, 2017 coming into effect. The Nuclear Suppliers Group (NSG) and the Missile Technology Control Regimes (MTCR) held their annual meetings despite decision making being limited due to the COVID-19 pandemic.

What lies ahead?

The recent geopolitical events transpiring around the world in practically all regions have made the global security climate more unstable. A sense of precariousness lulls the air. It is further aided by actions of authoritarian leaders of not just non-democratic systems but also of strongmen leaders of democratic systems. The muscular military policies of these nations coupled with the continuous use of rhetoric that fuel public sentiment over the state's use of military assets make ripe conditions for the situation to further deteriorate. A strong political opposition would be needed to help keep the ruling dispensation in check. Furthermore, the two largest nuclear weapons holding states need to take on a more engaging role in the international arena. SIPRI's yearbook, while not being devoid of some challenges, forces us to look critically at how the global disarmament project seems to be going.

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Press Information Bureau
Government of India

Ministry of Science & Technology

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Newly Developed Ultrathin Heteroprotein Film: Better Alternative to Isolated Protein Films

Scientists have developed ultra-thin heteroprotein films with excellent thermal, mechanical and pH stability which can pave the way for expanding applications of thin films in biomedical and food packaging industries. These films are much thinner as compared to the other protein or plastic films. They are soft and thin and have the advantage of being more flexible than the other films. In the recent past, several modifications of these protein films with the help of suitable heteroprotein complexes were reported by different research groups. These complexes were usually developed from bulk solutions. A research group from the physical sciences division of Institute of Advanced Study in Science and Technology (IASST), Guwahati, an autonomous institute under the Department of Science and Technology, has successfully developed ultrathin monolayer protein films consisting of two globular proteins: bovine serum albumin (BSA) and lysozyme (Lys). They used the technique called using Langmuir-Blodgett (LB) technique which gives the films thickness in the order of nanometer.

This research work is led by Dr. Sarathi Kundu, Associate Professor, along with Mr. Raktim J. Sarmah, SRF, a Ph.D. student developed a monolayer heteroprotein film – the first one using this technique. They explored the different structures and morphologies of this complex films at variable pH conditions to explore its stability and related properties. The complex formation between the two proteins occurred at a unique pH of 9.2 as a result of an electrostatic attraction along with hydrophobic interactions. This monolayer complex was formed at the air-water interface, which was later transferred to the silicon substrates at a surface pressure of 18 mN/m for further study. It was shown that the monolayers at the air-water interface can hold its intrinsic structure for a sufficiently longer period of time due to the complexation forming a highly stable film.

Films of such protein complex of BSA and Lys can be useful for fabricating highly stable biodegradable thin films of different protein complexes for expanding its applications in the area of thin-film technology. Diverse physicochemical methods such as parameter alteration or incorporation of different fatty acids or polyol moieties (glycerol, starch, gelatin, etc.) into this protein complex can make the film free standing for diverse applications. This research work was recently published in the esteemed journal of Food Hydrocolloids under the reputed Elsevier publishers.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1834267

Wed, 15 Jun 2022

Solar Powered Medical Devices: Sponge-Like Solar Cells for Better Pacemakers

Invented by University of Chicago scientists, a new kind of solar cell could spur useful technology. As solar technology has improved, with greater efficiencies and lower costs, more and more Americans are using it to power their homes. In fact, according to the Solar Energy Industries Association (SEIA), there is an estimated 97.2 gigawatts (GW) of solar power installed in the United States. For an idea of how much this is, it is roughly the energy needed to power 18 million average homes and makes up over 3% of U.S. electricity. But what about smaller-scale applications? There, solar power could have important benefits unrelated to the environmental advantages provided by large-scale solar power.

Holes help make sponges and English muffins useful (and, in the case of the latter, delicious). Without holes, they wouldn't be flexible enough to bend into small crevices, or to sop up the perfect amount of jam and butter. In a new study, University of Chicago scientists find that holes can also improve technology, including medical devices. Published in *Nature Materials*, the paper describes an entirely new way to make a solar cell: by etching holes in the top layer to make it porous. The innovation could form the basis for a less-invasive pacemaker, or similar medical devices. It could be paired with a small light source to reduce the size of the bulky batteries that are currently implanted along with today's pacemakers. "We hope this opens many possibilities for further improvements in this field," said Aleksander Prominski, the first author on the paper.

Light work

Prominski is a member of the lab of University of Chicago chemist Bozhi Tian, which specializes in creating ways to connect biological tissue and artificial materials—such as wires to modulate brain signals and surfaces for medical implants.One of the areas they're interested in is making devices that can be powered by light. We're most familiar with this technology in the form of solar cells, but they can also use any light source, including artificial ones. When operating in the body, such devices are known as photoelectrochemical cells and can be powered from a tiny optical fiber implanted in the body. Normally, solar cells require two layers, which can be achieved either by combining the silicon with another material such as gold, or by mixing different kinds of atoms into each silicon layer. But UChicago scientists in the Tian lab found they could create a solar cell out of pure silicon if they made one layer porous, like a sponge.

The resulting soft, flexible cell can be less than five microns across, which is about the size of a single red blood cell. It can then be paired with an optical fiber, which can be made as thin as a strand of human hair—significantly reducing the overall size of an implant, making it more body-friendly and less likely to cause side effects. The porous cell has multiple advantages over the ways to manufacture traditional solar cells, streamlining the production process while maintaining the efficacy of the final product.

"You can make them in a matter of minutes, and the process doesn't require high temperatures or toxic gases," said Prominski.Added study co-author Jiuyun Shi: "When we measured them, we saw the photocurrent was really high—two orders of magnitude higher than our previous designs."

Then, to boost the material's ability to stimulate heart or nerve cells, they treat it with oxygen plasma to oxidize the surface layer. This step is counterintuitive for chemists, because silicon oxide most often works as an insulator, and "you don't want the photoelectrochemical effect to be impeded by any insulating materials," said Tian. In this case, however, oxidization actually helps by making the silicon material hydrophilic—attracted to water—which boosts the signal to biological tissues. "Finally, by adding a few-atoms-thick layer of metal oxide, you can further enhance the device properties," said Pengju Li, another study co-author. Because all of the components can be made to be biodegradable, the scientists can imagine the technology being used for short-term cardiac procedures. Instead of a second surgery for removal, the parts would degrade naturally after a few months. The innovative approach might also be particularly useful for a procedure called cardiac resynchronization therapy which seeks to correct arrhythmias where the right and left chambers of the heart do not beat in time, because the devices could be placed in multiple areas of the heart to improve coverage.

Prominski is also excited about possible applications for nerve stimulation. "You could imagine implanting such devices in people who have chronic nerve degeneration in the wrists or hands, for example, in order to provide pain relief," he said. This novel way of making solar cells could also be of interest for sustainable energy or other non-medical applications. Because these solar cells are designed to work best in a liquid environment, UChicago scientists think they could be used in applications such as artificial leaves and solar fuels. Tian's team is working with cardiac researchers at the University of Chicago Medicine to further develop the technology for eventual use in humans. They are also collaborating with the UChicago Polsky Center for Entrepreneurship and Innovation to commercialize the discovery.

https://scitechdaily.com/solar-powered-medical-devices-sponge-like-solar-cells-for-better-pacemakers/

The Indian EXPRESS

Wed, 15 Jun 2022

China's Chang'E-5 Lander Finds Evidence of Native Water on the Moon

Samples collected by China's lunar lander Chang'E-5 have delivered the first definitive confirmation of the evidence of native water on the Moon. The lander collected samples from the Moon's Oceanus Procellarum, an ancient mare basalt whose name means "Ocean of Storms". An on-board spectral analysis gave the first confirmation of water signal in 2020 and this was later validated through the laboratory analysis of the samples when the lander returned in 2021. Now, the team has determined that the water originated from the moon itself. The research has been documented in an article titled "Evidence of water on the lunar surface from Chang'E-5 in-situ spectra and returned samples" published in Nature Communications. "For the first time in the

world, the results of laboratory analysis of lunar return samples and spectral data from in-situ lunar surface surveys were used jointly to examine the presence, form and amount of 'water' in lunar samples. The results accurately answer the question of the distribution characteristics and source of water in the Chang'E-5 landing zone and provide a ground truth for the interpretation and estimation of water signals in remote sensing survey data," said co-corresponding author LI Chunlai, from the National Astronomical Observatories of the Chinese Academy of Sciences, in a press statement.

The lander did not find rivers or lakes on the Moon, rather, it identified 30 hydroxyl parts per million on average in rocks and soil it collected on the Moon's surface. These molecules are the main ingredient of water and are made of one oxygen and one hydrogen atom. They are also the most common result of water molecules chemically reacting with other matter. In essence, hydroxyl is to water what smoke is to fire. Chang'E-5 collected the samples during the hottest part of the Moon's day with temperatures around 90 degrees celsius, when the surface should be at its driest. This timing also coincided with low solar winds, which can contribute to hydration at a high enough intensity. The hydration signals appeared even in such dehydrated conditions. So the natural question is, where did they come from?

The hydroxyl was first detected in 11 rock and soil samples and then confirmed by five multi-part laboratory analyses on eight of the samples and it was found to originate from two different sources. The bulk of the hydroxyl in the Chang'E-5 samples was contained in apatite, a crystalline, phosphate-rich mineral naturally found on the Moon and on the Earth. "This excess hydroxyl is indigenous, demonstrating the presence of lunar-originated internal water in the Chang'E-5 lunar samples, and that water played an important role in the formation and crystallization of the late lunar basaltic magma," said Li, referring to the composition of Chang'E-5 landing site in the mare basalt of Oceanus Procellarum.

The researchers are currently planning further lunar exploration with this Chang'E-5's successors: Chang'E-6 and Chang'E-7. They will continue to research lunar water through remote sensing, on-site detection and laboratory analysis to better understand the source, distribution and temporal variation of lunar water.

https://indianexpress.com/article/technology/science/china-chang-e-5-lander-evidence-native-water-moon-7971665/lite/

Wed, 15 Jun 2022

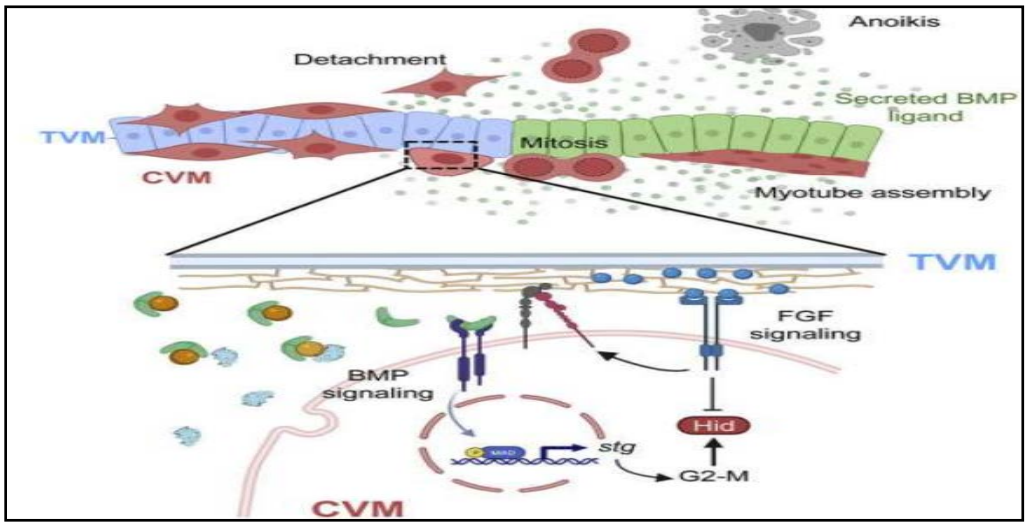
The Signals that Make Cells Self-Destruct

Most human hearts look nearly identical—muscle cells in the same places, blood vessel structures in the same orientations. Organs such as hearts or stomachs look alike and function the same across individual organisms in a species because cells follow rigorous processes during development that get them precisely where they need to go. The process of development involves countless steps that must occur in an exact order and fashion. Studying these intricate

steps is the focus of the laboratory of Caltech's Angela Stathopoulos, professor of biology. The lab uses fruit flies, which have a 24-hour developmental cycle with significant changes observable almost every minute, as a model system. A new paper from the Stathopoulos laboratory examines caudal visceral mesoderm (CVM) cells, which will ultimately become muscle fibers in the fruit fly gut. These cells migrate from the back of the developing embryo to the front over the course of six hours—the longest migration distance in all of fruit fly embryogenesis.

The new research identifies the mechanisms that ensure that any wayward, wandering cells will self-destruct through a specific form of cell death called anoikis. Interestingly, resistance to anoikis is a precursor to many types of metastatic cancers. Understanding the pathways that guide healthy anoikis may ultimately provide insight into how cancers metastasize and why they invade certain parts of the body. "Cell death is a normal, healthy part of development," Stathopoulos says. "The migrating cell has to constantly be making decisions and figuring out if it is in the in the right place in the body. If it's not in the right place, it needs to self-destruct. We have now determined the pathways through which the cell can do this." The paper appears online in the journal *Developmental Cell* on June 15. Frank Macabenta, senior postdoctoral scholar research associate in biology and biological engineering at Caltech, is the study's first author.

The CVM cells do not make their long journey through the fruit fly embryo alone. These 40 to 50 cells follow a kind of track that is made up of a different cell type called trunk visceral mesoderm (TVM). TVM cells emit a chemical signal called fibroblast growth factor (FGF), which lets a CVM cell know that it is in the right place. At the midpoint of their migration, the CVM cells must navigate around a sharp bend in the embryo, which is roughly U-shaped. At this juncture, CVM cells start proliferating in anticipation of soon being at the end of their journey, when it will be time to start building muscle.



Graphical abstract. Credit: Developmental Cell (2022).

The problem is, when cells start multiplying, some begin to drift off of the TVM track. Researchers have previously observed that this is the point where these lost cells will undergo anoikis and self-destruct. A gene called hid (short for head involution defective) is responsible for anoikis. When hid is expressed in a cell, the cell will die. In the new work, Macabenta found

that CVM cells begin to express hid as they make the turn around the bend in the embryo, but they do not die—unless they fall off of the TVM track.

The team found that this is possible thanks to the FGF signals, which act as the antidote to hid: If a cell falls off of the track and therefore stops receiving FGF signals, it will die; it can stay alive despite hid being expressed as long as it stays on track. In this way, the embryo can make sure that any wayward cells will self-destruct, while properly functioning cells are spared. Finally, the team also discovered that a particular pathway, called the bone morphogenetic protein (BMP) pathway, controls the timing of when the cells begin to proliferate. BMP signaling initiates just as cells navigate the U-shaped turn, roughly at the midpoint of their migration. It is this signal that allows cells to divide and grow in number.

Cells have an internal "clock," known as the cell cycle, which controls the timing of growth, DNA replication, and cell division (mitosis). The team found that the timing of hid expression is linked to progression of the cell cycle, and when this is disrupted, hid is no longer expressed at the right point during cell migration. BMP signaling is necessary to allow the cell cycle to move forward through mitosis and is therefore also necessary for timing the precise expression of hid, as cells that fail to divide are not able to express hid in a timely manner to eliminate lost cells.

It is crucial that cells are able to have these programmed quality control mechanisms because wayward cells can be damaging to the proper development of the rest of the organism. "When we removed the hid gene, the cells that came off the track would survive and ultimately invade and disrupt the central nervous system, where they really shouldn't be," Macabenta says. "They aren't on the correct path anymore, so they revert to a kind of 'plan B' where they find some location they have some affinity for. If you look at autopsies of people who have had metastatic cancer, typically the metastasizing cells will go colonize specific places. Our research serves as a system to hopefully understand how this works, how cells go awry and figure out the 'second-best' signals to follow. In future work, we would like to see what other signals or cues the CVM cells are following that lead them to the central nervous system. This could explain why certain types of metastases preferentially colonize other tissues."

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5G Imapct: Traffic to Teaching, Factories to Farming

5G Impact: Traffic To Teaching, Factories To Farming

Why high-speed data services can transform how Indians work, learn and live

Amitabh Kant

The government has announced the rollout of the transformational 5G services, which will bring about a revolutionary change in communication with benefits spanning various sectors. Besides spurring economic growth, 5G is essential for industry 4.0, enabling rapid digitalisation in India.

A fillip for education and healthcare

The pandemic underscored the enabling nature of digitalisation in most sectors, but more so in education and skilling. With the enhanced mobile broadband (eMBB) feature of 5G, the full potential of digital education can be unleashed. Expanding on PM eVidya, it can deliver high-quality educational content through mobile applications to every student in the country. 5G will also provide a major impetus to digital universities. Vocational training programmes, delivered in the 'phygital' mode, can improve the employability of youth and women by providing hands-on experience and reducing on-job training time.

In healthcare, the ultra-reliable low-latency communication (URLLC) feature of 5G will enable user-friendly point-of-care diagnostics and the creation of much-needed connected ambulances. Along with m-Health, 5G will also significantly improve access to world-class medical advice, resulting in better follow-up care. A hospital-run private 5G network will enable even a handful of doctors and nursing staff to provide quality care to hundreds by monitoring their vitals while simultaneously maintaining electronic health records.

NextGen banking and transportation

For financial inclusion and the banking sector, both eMBB and URLLC features will play significant roles. India has already become a world leader with the Unified Payment Interface (UPI). With the help of Geospatial Information Systems, we can reach the next level of

Unlocking the future

simple, seamless and secure payments such as 'one-tap payment' and 'cashierless store' models. Similarly, the payments bank model can be expanded through incremental steps towards a completely mobile formal banking system. This will enable citizens to securely access various bank facilities through a virtual branch experience, thereby enhancing the banking population of India.

In transportation and mobility, the massive machine-type communication (mMTC) feature of 5G can prove to be a game-changer. A network of EVs and charging stations can be created, optimising the availability of the charging infrastructure, and thereby enhancing the cost-effectiveness of EVs' ecosystem. Integrating initiatives across transit systems, like FASTag for toll and entry tax, can not only improve efficiency within the transportation sector but also reduce our carbon footprints. Alongside the launch of the drones-as-a-service ecosystem in India, the URLLC feature will be crucial for navigation and drone traffic control.

Meanwhile, ports across the globe struggle with long waiting times and inventory congestion. Using the mMTC and URLLC features we can turn these challenges into opportunities. The deployment of machine vision with software-enabled automatic-guided vehicles can help in better port-space management.

Friend of farmers, bedrock of industry 4.0

In agriculture and renewable energy, farms can be equipped with a diverse range of sensors to continuously monitor the factors impacting the health of crops. Even small farmers with little virtual training can improve irrigation efficiency as well as crop yields through 5G. Renewable energy farms (especially wind and solar) already deploy numerous sensors, but because they are in remote regions, there is a delay in response. With 5G, their response time and efficiency can be radically improved.

In manufacturing and industry, the impact of 5G will be most visible and tangible. Here, 5G private networks will be the cornerstone of industry 4.0. These networks connect an array of IoT (Internet of Things) sensors and devices, and automate the scheduling of various processes based on intelligent algorithms. In manufacturing factories, such networks can improve efficiency by an estimated 2-4 times while reducing carbon emissions. However, these gains are not limited to manufacturing sector alone. Any industry that is able to digitise and schedule processes will be able to leverage many benefits of 5G.

Efficient service delivery, safer public spaces

In governance and public safety, service delivery and citizen-engagement efforts can be improved with faster and safer digital identity verification. This will in turn enable faster implementation of direct benefit transfers and other such schemes. Real-time automated monitoring of public spaces and traffic using city-owned private 5G networks will improve public safety and congestion in India's metro cities. Deployment of IoT-based systems on similar networks, using the network function virtualisation feature of 5G, will improve the efficiency of projects under the Smart Cities Mission.

Thus, every feature of 5G has numerous use cases across key developmental sectors. We need to embrace and leverage 5G to realise the vision of a technologically savvy India.

The writer is CEO, Niti Aayog. Views are personal

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