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दैनिक सामयिक अभिज्ञता सेवा
A Daily Current Awareness Service

Vol. 44 No. 118 19 June 2019



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DRDO study on increasing working capacity of jawans

Jaisalmer: The Defence Research & Development Organisation (DRDO) has started a study to increase the working capacity of BSF jawans living in adverse conditions in the country and to keep them disease-free. DRDO's Defence Institute of Physiology and Allied Science (DIPAS) section (Timarpur, Delhi) is studying around 50 jawans. In the last 10 days data has been collected and work will soon begin.

Sources said that DRDO scientists have been studying jawans for last 10 days in the morning and at the peak time when temperature crosses 50 degrees. Blood sugar, heartbeat, pulse rate etc of these jawans are being noted. Sources added that deployment of jawans in areas with excessive heat and their activities are being tested in a scientific manner under this module. A scientist of DRDO who reached Jaisalmer said that a special module has been introduced by DIPAS group of DRDO.

The module will try and find out how to reduce body temperature, mental stress, make the digestive system better and keep the BP and heart rate normal. Activities where jawans do not feel thirsty frequently or do not face the problem of heatstroke will also be conducted.

Source said that government will act on the recommendation of this study. BSF Rajasthan Frontier IG Anil Paliwal has confirmed that DRDO is doing a study on BSF jawans.

<https://timesofindia.indiatimes.com/city/jaipur/drdo-study-on-increasing-working-capacity-of-jawans/articleshow/69833387.cms>

DownToEarth

Tue, 18 June 2019

DRDO, JNU scientists develop more potent Anthrax vaccine

Claim new vaccine superior than existing ones as it can generate immune response to anthrax toxin as well as spores

By Aditi Jain

A group of Indian scientists have developed a new vaccine against anthrax. It is claimed to be superior over existing vaccines as it can generate immune response to anthrax toxin as well as its spores rather than the toxin alone.

Anthrax is a deadly human disease caused by bacterium *Bacillus anthracis* that also infects animals like horses, sheep, cattle and goats. Humans, pigs and dogs are comparatively less susceptible and only get infected if exposed to copious amount of spores. In 2001, these spores were used as agents of bio-terrorism when letters containing anthrax spores were sent to some people in America, leading to widespread panic.

Spores of the bacterium that causes anthrax are present in soil and can stay in latent form for years.



However, under favourable environmental conditions, they become active and start to infect. Often, animals pick up spores while grazing, following which spores germinate in their body and produce toxins.

The anti-anthrax vaccines available in market generate immune response against a Bacillus protein-protective antigen — a protein that helps in transport of bacillus toxins inside the cells. This means that immune response is triggered only when spores germinate in body and start producing bacterial proteins. Anyone vaccinated with such a vaccine would show no immune response to bacillus spores and only perform once spores germinate and release toxins.

Studies have, however, shown that when inactivated spores are injected in addition to vaccine, the protection towards bacillus is enhanced. Researchers from the Defence Research and Development Laboratory (DRDL), Mysore and Jawaharlal Nehru University (JNU) decided to develop a single vaccine which is effective against both the toxin and its spores so as to provide complete protection.

For this, they stitched together portions of two genes: protective antigen protein and protein present in outer layer of spore. The protein thus produced was fusion of the two proteins and was injected into mice.

After a few days, scientists found that injected mice had high concentration of antibodies against fused proteins in its blood, showing immune response against the injected protein. It was found that these antibodies were also able to individually bind both protective antigen and spore protein demonstrating that the vaccine can produce immune response against both spores and the toxin.

“The ability of fused protein to generate protective immune responses against both spores and toxin suggests it as an efficient vaccine candidate against *B. anthracis* infection,” Joseph Kingston, a scientist at DRDL, told *ISW*.

While antibiotics are also available, vaccines for anthrax are necessary as the infection can cause death within two-three days leaving no scope for diagnosis and treatment.

While discussing the future directions, Rakesh Bhatnagar, co-author of the study and a professor at JNU, said, “We intend to study protective efficacy of this vaccine against *Bacillus* spores and toxins in higher animal models.”

The research team also included Saugata Majumder, Shreya Das, Shivakiran S Makam from DRDL and Vikas Kumar Somani from JNU. The research results have been published in journal *Frontiers in Immunology*. (India Science Wire)

<https://www.downtoearth.org.in/news/health/drdo-jnu-scientists-develop-more-potent-anthrax-vaccine-65125>



Wed, 19 June 2019

India to get NASAMS-II from US, Israel, Russia

Two places in Rajasthan will be the epicentres for launching the National Advanced Surface to Air Missile System II (NASAMS-II) which will be used to create the ambitious multi-layered shield over Delhi and Mumbai

By Prakash Bhandari

Jaipur: Two places in Rajasthan will be the epicentres for launching the National Advanced Surface to Air Missile System II (NASAMS-II) which will be used to create the ambitious multi-layered shield over Delhi and Mumbai.

India is in the process of acquiring the NASAMS-II from the US along with the Israeli, Russian and home-made systems. Once the deal is signed off, the missile system would cost Rs 6000 crore.



Two places in the state will going to be important for the NASAMS-II. These locations are in two little known villages in Alwar and Pali districts will soon gain strategic importance as they have been selected by the Defence Ministry's Defence Research and Development Organisation (DRDO) for setting up radars to track enemy missiles.

The forest department has cleared the acquisition of 850 hectares of land in Khoa in Kishangarhbas tehsil of Alwar district and 350 hectares in Roopnagar, near Beawar in Pali district for installing ballistic missile defence grid that will protect the western and northern parts of the country.

This was done after the union ministry of environment and forest in 2014 cleared the DRDO proposal on the conditions laid down by the ministry. The ballistic missile defence grid will help guard New Delhi and Mumbai.

The state government has also allotted 80 hectares of land in Pilani for setting up the Bramhos missile assembly line.

These two sites in Khoa and Rupnagar have been strategically chosen by UDRDO and has a stealth feature. The ballistic missile defence system can be put in place at short notice.

To counter air-borne threats, DRDO will put a mixture of counter-attack missiles which will be able to shoot down enemy missiles both within the earth's atmosphere (endo-atmospheric) and outside it (exo-atmospheric).

<https://www.freepressjournal.in/india/india-to-get-nasams-ii-from-us-israel-russia>



Wed, 19 June 2019

Submarine rescue technology of Indian Navy: Where does India stands after five decades

A credible submarine rescue capability is integral to submarine operations because of the nature of the platform and its operating medium hundreds of metres below the surface of the sea

By Anil Jai Singh

51 long years after India commissioned its first submarine on 08 December 1967, the Indian Navy finally established its own submarine rescue capability with the commissioning of its first Deep Submergence Rescue Vessel (DSRV) on 12 December 2018 at Mumbai. The delay in acquiring this capability which should be integral to any submarine operating navy was also acknowledged by the former Chief of the Naval Staff Admiral Sunil Lanba at the commissioning ceremony. Speaking on the occasion he said “The induction of the DSRV...marks the culmination of years of... effort in acquiring this niche submarine capability”. The Indian Navy has procured two DSRVs from Messrs

James Fisher Defence, a UK firm which is the global leader in untethered DSRVs. The second DSRV is based in Visakhapatnam.

A credible submarine rescue capability is integral to submarine operations because of the nature of the platform and its operating medium hundreds of metres below the surface of the sea. Hence specialised equipment and procedures are required to rescue the personnel trapped in the submarine. The basing of one DSRV each on the east and west coasts of India is therefore a very positive move because it will enable an early response besides providing redundancy in ensuring a 24x7x365 capability even when one DSRV is undergoing its periodic routine maintenance cycle. These DSRVs are equipped with a side scan sonar for better detection of the distressed submarine which could be lying on the sea bed and could therefore merge with the sea bottom thus making detection difficult ; a Remotely Operated Vehicle (ROV) for providing immediate relief prior to the DSRV actually mating with the submarine and finally evacuating the personnel from the submarine to the surface.

Thus far, the Indian Navy had a very rudimentary rescue capability. Within the country, there was an antiquated diving bell on a diving tender and externally, India had an arrangement with the US for their fly-away kit and DSRV to be airlifted to India from its base in San Diego. Neither of these inspired confidence in the submariners and fortunately the need for it never arose. Closer home, Singapore too has a DSRV, also built by the same manufacturer.

Submarine rescue is a very specialised operation. A submarine could be in distress anywhere and at any time. By the very nature of its operations, it has to remain silent and concealed below the surface of the sea at all times. Therefore, by the time the information of it being in distress reaches ashore, its exact position and time at which the emergency occurred may not be accurately known. In all probability, a submarine in distress would have experienced an accident or an equipment malfunction which has led to its sinking and it would therefore be on the sea bed, perhaps damaged, perhaps flooded and possibly pitch dark without any power. Some of the crew could be injured, some may even be dead and the rest would be extremely traumatised. Imagine trying to remain organised in such a situation with food and water for sustenance in short supply and oxygen to breathe rapidly depleting since no ventilation or circulation of fresh air is possible. Hence for locating the submarine and providing it adequate support and rescue facilities, time will be of the essence. It is therefore significant that within months of getting this capability, the navy has successfully carried out a mating of the DSRV with a dived submarine (simulating a submarine in distress) off Visakhapatnam and successfully transferred personnel from the submarine into the DSRV. This live exercise has firmly established the credentials of the Indian Navy's submarine rescue capability as a Submarine rescue provider in the Indian Ocean region, thus further enhancing our status as a net security provider in the region. The IN is one of few navies with this capability and, other than Australia is the only Indian Ocean navy that has it.

However, training of the crew is an ongoing process and such exercises will have to be conducted regularly with different submarines for the crew of both DSRVs to be adequately trained and with enough practice to effect a rescue successfully when the occasion demands. A submarine accident will happen just once and without warning. The ability to rescue the crew of a submarine that has sunk will be the ultimate test of this capability and therefore, the DSRV and its crew cannot be found wanting at that time, whatever be the odds. Some readers would recall the sinking of the Russian submarine Kursk in 2000 when the entire crew was lost. It later emerged that had the rescue effort been provided in time, a fair number, who were alive inside for a few days, could have been evacuated.

DSRVs can be launched either from specialised vessels on which they are mounted with their associated equipment including de-pressurisation chambers for the crew or from vessels of opportunity which can be temporarily modified to carry these. The IN intends to have specialised Diving Support vessels which are being built at the Hindustan Shipyard in Visakhapatnam.

The induction of these two DSRVs is indeed a welcome step. The endeavour will be to ensure that they remain at peak efficiency at all times and the hope will be that they are never called upon to be used.

(The author is a submarine veteran and the Vice President of the Indian Maritime Foundation. The views expressed are personal.)

<https://www.financialexpress.com/defence/submarine-rescue-technology-of-indian-navy-where-does-india-stands-after-five-decades/1611416/>



Wed, 19 June 2019

Secure outer space

There is a dire need to revisit treaties governing our space to protect our extra-terrestrial security interests and scale down militarization

By Raghav Pandey & Anoushka Mehta

On May 23 this year, the United States (US) successfully launched 60 of its Starlink internet satellites. Starlink is one of the most ambitious projects of Space X, the private rocket company of high-tech entrepreneur, Elon Musk. The aim of the firm is to launch as many as 2,000 satellites per year, with the ultimate objective of placing up to 12,000 of such satellites into the orbit. Space today has been a witness to numerous projects that are funded by both Governments and private, commercial entities. In the present era of boundless technological capabilities, the use of the outer space for military purposes has become a cause of concern.

“It is not enough to have an American presence in space, we must have American dominance in space,” US President Donald Trump said, adding that he didn’t want to see “China and other countries leading us.” With this aim, the Trump administration is in the process of creating a US Space Force, the sixth branch of the US military service, which will undertake missions and operations in the rapidly evolving space domain.

With a global quest for military supremacy and dominance, other space-faring countries have not remained mute spectators. Take the example of India, which recently launched an anti-satellite (ASAT) weapon on March 27. Indian military scientists successfully destroyed a low-Earth orbit satellite in space by using a missile which covered a distance of 300 km to engage the target. In a televised address, Prime Minister Narendra Modi said, “India has entered its name as an elite ‘space power’. An anti-satellite weapon, ASAT, successfully targeted a live satellite on a low-Earth orbit.”

ASAT weapons can be used in warfare as they have the capability to incapacitate or destroy enemy satellites for strategic military purposes. With the recent accomplishment, India became the fourth country to possess such a weapon alongside the US, Russia and China.

Given the increased militarisation of space and the immense threat it poses to nations across the world, it is essential to take a look at the laws which govern the military use of space. The use of space is governed by five space-related international treaties of the United Nations. One of them, the Outer Space Treaty, came into effect in 1967 and was signed by most nations on the globe. It has been signed and made official, or has been ratified, by 105 countries across the world. With regard to the use of space, the treaty prohibits military manoeuvres, weapon testing, establishment of military bases, installations and fortification on celestial bodies. Moreover, objects carrying nuclear weapons or any other kind of weapons of mass destruction is forbidden in the orbit.

However, the use of military personnel — any equipment or facility on the celestial bodies — is not forbidden unless used for peaceful purposes. So far, the treaty has worked well but lacks clarity on several issues, which has left plenty of wiggle room.

Questions have been raised as to what constitutes “mass destruction”; whether the outer space can be used for exploration of resources to be used in military machinery; if weapons of mass destruction can be placed in space without fully achieving orbit; and what about weapons that would not cause mass destruction? The treaty remains ambiguous in some crucial aspects about the use of the space.

Another issue that has attracted much debate in the arena of public international law is “peaceful purposes.” According to the treaty, the outer space is a “common heritage of mankind” and is to be used exclusively for “peaceful purposes.” However, the term, “peaceful purposes” lacks clarity of definition. There has been a plethora of debates to decide whether the term is supposed to adopt the ideology of being “non-aggressive” or “non-military.” Majority view it as “non-military” but the same has not been substantiated upon any of the space treaties.

Another treaty, commonly known as the ‘Moon Treaty’, falls within the overarching ‘Outer Space Treaty’. The ‘Moon Treaty’ specifically is applicable to the Moon and other celestial bodies in the solar system excluding planet Earth.

It explains that these bodies should be used exclusively for peaceful purposes; that their environments should not be disrupted; and that the UN should be informed of the location and purpose of any station established on those bodies. It also plugs a loophole in the Outer Space Treaty by banning ownership of any extra-terrestrial property by any organisation or private person, unless that body is international or Governmental.

However, the most controversial part of the ‘Moon Treaty’ pertains to the natural resources on the Moon. It provides that the Moon and its natural resources are the common heritage of mankind and harvesting of these riches is prohibited except by way of an international regime established to govern the exploitation of such capital. The exact nature of this regime is not detailed, nor the term “resources” is defined.

It becomes a cause of concern for the international community when the ‘Moon Treaty’ is neither signed, acceded to, nor ratified by any of the space-faring nations. Also, the ambiguity of the provisions of the treaties can leave the nations to interpret the provisions in a way that complements their self-interest in the issue.

Take the example of the US’ National Space Policy. On the one hand, it emphasises the country’s commitment to the exploration and use of outer space by all nations for peaceful purposes but at the same time, it declares US’ defence and intelligence-related activities in pursuit of national interests to be consistent with “peaceful purposes”.

Ever since the treaties were formulated in the 1960s, there was a limited view of the potential of utilisation of the outer space. But with rapid advancements in the use of technology and intelligence in the space, there is a dire need that the laws governing the use of space be revisited so as to address some important space issues of the 21st century like that of mining, space tourism, Artificial Intelligence and intellectual property of space resources among other things. Meanwhile, the international community can only live in the hope that the world does not see warfare and attack missions in space.

The creation of an international regime, much like the World Trade Organisation, is the need of the hour. An international platform needs to be set up wherein deliberations on peaceful use of space can be taken up through negotiations. Since only four countries officially have the ASAT technology, negotiations must start among them.

It is highly possible that an Non-proliferation Treaty (NPT)-type of regime may be established, wherein ASAT’s powers are recognised and further militarisation of the space may be scaled down.

India needs to exercise its diplomatic heft to materialise the same because then the country's strategic and security interests will also be secured while discouraging further space militarisation.

(Raghav Pandey is an Assistant Professor and Anoushka Mehta is a student at Maharashtra National Law University, Mumbai)

<https://www.dailypioneer.com/2019/columnists/secure-outer-space.html>



Wed, 19 June 2019

Govt restores 'ration in kind' for armed forces in peace areas

New Delhi: The Government has restored supply of rations to Defence officers posted in peace areas following a recommendation by the Defence Ministry.

The scheme in practice since mid 1980s was scrapped in 2017 following a recommendation by the Seventh Pay Commission and in lieu officers were paid Rs 117 per day.

Doing away with providing rations had led to discontentment amongst the armed forces and taking note of it the Government gave the nod for the Defence Ministry proposal for restoration of 'ration in kind,' officials said on Tuesday.

Rations include butter, eggs, cheese, pulses and vegetables besides other such items.

Incidentally, this is one of the first decisions taken after Defence Minister Rajnath assumed charge.

The provision of 'ration in kind' was earlier applicable to junior officers and later allowed for all officer ranks.

The officers were given a choice to opt for allowance instead of rations in kind by very officers opted for it, sources said. They also said the Defence forces had appealed for restoration of the scheme soon after it was scrapped in 2017.

However, officers deployed in operational areas continued to get ration in kind besides those posted in peace stations in counter-insurgency areas.

<https://www.dailypioneer.com/2019/india/govt-restores----ration-in-kind----for-armed-forces--in-peace-areas.html>



Wed, 19 June 2019

Chandrayaan-2: Lunar orbiter spacecraft arrives in Sriharikota

Launch of Chandrayaan-2 on July 15

Bengaluru: The mother orbiter spacecraft of Mission Chandrayaan-2 has reached the launch port of Sriharikota from Bengaluru and will soon be joined by its lander and rover companions, the ISRO said on Tuesday.

Their epic journey of 3.84 lakh km to Moon, to land on it and explore its surface will begin on July 15.

The orbiter was despatched from the U.R. Rao Satellite Centre here late last week and reached the launch port of the Satish Dhawan Space Centre on June 15. ISRO Chairman K. Sivan flagged off the road shipment carrying the lander and the rover at the URSC in the presence of URSC Director P. Kunhikrishnan and Chandrayaan-2 project director M. Vanitha.

<https://www.thehindu.com/sci-tech/science/chandrayaan-2-lunar-orbiter-spacecraft-arrives-in-sriharikota/article28066942.ece>



Wed, 19 June 2019

NASA funds programme to produce videos to teach Hindi through Indian scientific innovations

The NASA-funded programme STARTALK made a USD 90,000 grant to Ved Chaudhary, director of the project.

Washington: A programme funded by NASA in the U.S. has produced a series of videos about popular archaeological sites and institutions in India. The videos come with lesson plans in Hindi, to aid in teaching the language internationally using themes of science and technology .

The videos focus on scientific innovations at various sites like Amer Fort palace and Hawa Mahal in Jaipur, the rust-resistant Iron Pillar in Delhi, UNESCO Heritage site Qutub Minar, the Chand Bawri stepwell and the Jaipur Foot, a prosthetic given to impoverished amputees in 80 countries for free.

The NASA-funded programme STARTALK made a USD 90,000 grant to Ved Chaudhary, director of the project.

The programme is supplemented by funding from Chaudhary's New Jersey-based foundation Educators' Society for Heritage of India.

The programme is administered by the National Foreign Language Centre at the University of Maryland.

"This was a unique experience. I never knew I was going to have so much fun doing my research," said Alok Kumar, principal investigator.

Kumar said that context is crucial to learning new languages. Each video, designed for learners from middle school through college, employs a STEM (science, technology, engineering and math) perspective "to provide interesting and incredibly rich context to create learning experiences that can push learners to the advanced level of Hindi," he added.

Kumar, professor of physics at State University of New York, has published several books on ancient Hindu science, mathematics and medicine.

The University of Maryland said that science-based innovations are abundant in the sites Kumar chose.

A Hindu architect designed the honeycomb-patterned Hawa Mahal or 'Palace of Wind,' way back in 1799 when air conditioning units didn't exist. The architect used the 'Venturi effect,' Kumar said, adding that since air enters narrow passages of the building, it increases the wind speed and produces natural cooling.

The nearly 24-foot-tall Iron Pillar of Delhi, built in 402 CE, is a testament to the skill of blacksmiths who processed the phosphorus-rich iron to create a protective layer that has withstood centuries of monsoon and summer, the university said.

<https://www.thehindu.com/news/international/nasa-funds-programme-to-produce-videos-to-teach-hindi-through-indian-scientific-innovations/article28042878.ece>

Moon's crust hides the early history of our Sun, NASA scientists say

*Our natural satellite took shape when a Mars-sized object
smashed into Earth about 4.5 billion years ago.*

A team of astrophysicists, including one of Indian origin, has found that the Moon, where NASA will be sending astronauts by 2024, contains clues to the ancient mysteries of the Sun, which are crucial to understanding the development of life.

Our natural satellite took shape when a Mars-sized object smashed into Earth about 4.5 billion years ago. The force of this crash sent materials spewing into orbit, where they coalesced into the Moon.

"The Earth and Moon would have formed with similar materials, so the question is, why was the Moon depleted in these elements?" asked Rosemary Killen, a planetary scientist at NASA's Goddard Space Flight Centre in Greenbelt, Maryland.

The scientists suspected that one big question informed the other - that the history of the Sun is buried in the Moon's crust.

"We didn't know what the Sun looked like in its first billion years, and it's super important because it likely changed how Venus' atmosphere evolved and how quickly it lost water. It also probably changed how quickly Mars lost its atmosphere, and it changed the atmospheric chemistry of Earth," explained Prabal Saxena, an astrophysicist at NASA's Goddard.

Saxena stumbled into investigating the early Sun's rotation mystery while contemplating a seemingly unrelated one: When the Moon and Earth are made of largely the same stuff, is there significantly less sodium and potassium in lunar regolith, or Moon soil, than in Earth soil?

This question, too, revealed through analyses of Apollo-era Moon samples and lunar meteorites found on Earth, has puzzled scientists for decades.

Saxena incorporated the mathematical relationship between a star's rotation rate and its flare activity. "As you learn about other stars and planets, especially stars like our Sun, you start to get a bigger picture of how the Sun evolved over time," Saxena said.

The team's computer simulations, described in *The Astrophysical Journal Letters*, show that the early Sun rotated slower than 50 per cent of baby stars.

According to their estimates, within its first billion years, the Sun took at least nine to 10 days to complete one rotation.

"Space weather was probably one of the major influences for how all the planets of the solar system evolved," Saxena said, adding "so any study of habitability of planets needs to consider it".

To learn about the early Sun, one needs to look no further than the Moon, one of the most well-preserved artefacts from the young solar system.

"The reason the Moon ends up being a really useful calibrator and window into the past is that it has no annoying atmosphere and no plate tectonics resurfacing the crust," Saxena noted.

If astronauts can get samples of lunar soil from the Moon's southernmost region, it could offer more physical evidence of the baby Sun's rotation rate, said the scientists.

<https://gadgets.ndtv.com/science/news/moons-crust-hides-the-early-history-of-our-sun-nasa-scientists-say-2055278>