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Robot to handle unexploded ordnance ready for tech transfer

By Chethan Kumar

Bengaluru: A state-of-the-art Unexploded Ordnance Handling Robot (UXOR) that can handle and defuse unexploded ordnance (UXOs) — bombs, motors and missiles — up to 1,000 kg remotely from 1km Line Of Sight (LOS) is ready for technology transfer to private firms. Designed and developed by the defence research and development organisation's (DRDO) Research and Development Establishment (Engineers), the agency is offering three licences for production of the UXOR, which has already completed user trials with the Indian Air Force (IAF).

Sateesh Reddy, chairman, DRDO told TOI: "Both the Indian army and the air force are interested in the project. We have issued an expression of interest (EoI) already."



According to DRDO, the UXOR is based on an IC (internal combustion) engine and has a tracked Skid Steer Loader platform (like JCBs), good cross country mobility with six hours of endurance.

"It can defuse UXO with low order detonation. The Robot is equipped with an abrasive water jet cutting machine for case entry/through cut of UXOs. It is equipped with two manipulator arms, one for handling heavy bombs up to 1,000 kg and the other with the cutting nozzle," DRDO said.

The agency added that the seven axis manipulator holds the nozzle through which the abrasive compound is used to cut through steel (up to 25mm thick) and render the UXO safe by removal of fuse for smaller ordnance or case cutting for large bombs.

The EoI has been issued by the Research & Development Establishment (Engineers), a premier lab under DRDO. "The EoI is expected from original manufacturers having sufficient experience, expertise and willingness to undertake production work. The firm should be technologically sound to manufacture and supply the system with requisite quality standards," as per the DRDO.

One scientist explained that the problems with UXOs — explosive ordnance launched, placed, fired or released in such a way that it fails to explode as intended — is that over time, the detonator and main charge deteriorate, making them more sensitive to disturbance, and, thus, more dangerous to handle.

The DRDO added that the UXOR has multiple Degrees of Freedom (DOF) manipulator arm with a cutting mechanism to defuse the unexploded ordnance.

<https://timesofindia.indiatimes.com/india/robot-to-handle-unexploded-ordnance-ready-for-tech-transfer/articleshow/81731723.cms>

Two years after ASAT, India says it's almost cleared space debris

The Defence Research and Development Organisation (DRDO) successfully launched the Ballistic Missile Defence (BMD) Interceptor missile, in an Anti-Satellite (A-SAT) missile test Mission Shakti engaging an Indian orbiting target satellite in Low Earth Orbit (LEO) in a Hit to Kill mode from the Dr. A.P.J. Abdul Kalam Island, in Odisha on March 27, 2019

Exactly two years after India surprised the world with the dramatic announcement by Prime Minister, Narendra Modi that it achieved the capability to destroy space satellites, defence scientists claim that the debris created is almost cleared & further technologies developed.

Mission Shakti on March 27, 2019 had propelled India into the exclusive club of US, Russia and China that had the capability to launch missiles to destroy satellites in low-Earth orbit. India has demonstrated its ability to defend its space assets, the PM had declared.

But, the successful test-launch of the anti-satellite (ASAT) missile and destruction of the target raised both criticism and space environmental concerns globally.

The scientists of the Defence Research and Development Organisation (DRDO) fired the ballistic missile defence interceptor, the Prithvi Delivery Vehicle Mark-II (PDV MK-II) and destroyed the Microsat-R satellite at a low altitude of 300 km in a flight that lasted just over half a minute.

The Microsat was small and launched in January, the same year by the Indian Space Research Organisation (ISRO) using its Polar Satellite Launch Vehicle (PSLV). The intercept occurred on the PDV MK-II's downward trajectory at a closing velocity of 9.8 km/sec. The entire exercise pointed to a clear strategy to limit the orbital life of the debris created by the 'hit-to-kill' intercept.

Space debris & strategic compulsion

As a follow up to the successful test the DRDO has been working on a special research group to develop military capabilities in space. It has upgraded and fabricated advanced sensors and communications technology for satellites too.

According to an ANI report, the Union Government has okayed a Defence Space Agency, which was set up in Bengaluru. Work is also in progress to provide enhanced signal intelligence, communication intelligence and electronic intelligence to boost the overall military capabilities in space.

Though India has consistently maintained that the test was to secure its space assets and a technology demonstrator, both experts and critics point to a strategy of countering China.

In an article in April 2019, Ashley J. Tellis, Senior Fellow at the Carnegie Endowment for International Peace, says, the Chinese ASAT test in 2007 occurred at an altitude of 865 km and produced a debris field of some 3,000 objects that will linger in space for decades. In comparison, the Indian demonstration appears to have produced some 400 fragments (of which about 270 are being tracked) that will decay in weeks or perhaps a few months.



The Defence Research and Development Organisation (DRDO) successfully launched the Ballistic Missile Defence (BMD) Interceptor missile, in an Anti-Satellite (A-SAT) missile test Mission Shakti engaging an Indian orbiting target satellite in Low Earth Orbit (LEO) in a Hit to Kill mode from the Dr. A.P.J. Abdul Kalam Island, in Odisha on March 27, 2019.

Although there appear to be a few pieces of debris that were propelled into altitudes as high as 1,000 km, most space analysts agreed that the Indian test, however undesirable, did not compare with the Chinese test in terms of the damage done to the space environment.

Space junk is growing fast and posing a serious problem. It can potentially harm satellites being launched or in their orbital path. The damage can be high commercially.

According to the European Space Agency's statistical model, there are over 130 million pieces of anthropogenic space debris smaller than a millimetre. The only way we can hope to do anything about the problem is by working together.

But how we use space is changing. Satellite swarms, smallsats and "constellations" are becoming more common. SpaceX's StarLink alone has put hundreds of satellite in low-Earth orbit. So, the ESA says, it's more important than ever that everyone cooperates to keep our little corner of space as clean as we can.

India's capability in ASAT is decade-old

India has had the capability to conduct anti-satellite missile tests for at least 10 years, say scientists of the DRDO. Dr V K Saraswat, member NITI Aayog and former Chief of DRDO stated at a media conference that the defence scientists were prepared for such a test, but the earlier Governments had not given its go ahead.

India had already demonstrated the capability by launching missile interception tests where an incoming missile was brought down in exo-atmospheric conditions.

Interestingly, the A-SAT technology can be termed as a by-product of the Ballistic Missile Defence Programme that was being driven from the Research Centre Imarat, Hyderabad.

Anti-satellite weapons are considered critical since they can hit the communications systems which depend on satellites. In turn, it can cripple economic activity by impacting monetary transactions through banks and ATMs too.

Implications & balancing China power

Critics of India's ASAT demonstration fear that it could embolden many other nations to follow suit. There are several countries which have capability to undertake such tests. If that happens, there will be no stopping in turning space into a highly inhospitable environment for many different kinds of commercial and civilian exploitation's, they argue.

Ironically, India is a strong commercial player in the low earth orbit, with its PSLV launch vehicles being the most dependent and cost effective launcher. It has tapped the market well too in the past two decades with good commercial gains.

In addition, the ISRO's satellite programmes over the decades have been driven with the purpose of aiding in accelerating the country's economic growth and communications.

Most political opponents and some observers have speculated that the ASAT test was determined by Modi's domestic political imperatives, especially given its timing in an election year. However, the ruling dispensation has been echoing the overall objective as the PM's mission of strengthening India's military capabilities in order to prepare for long-term competition with China.

India has good relations with all other space powers and has no reason to target any of their space assets. Only China fits the bill of being India's adversary while possessing the capability and the intention to threaten India's space programme. With a hostile neighbour in Pakistan and the good relations that country has with China, make matters worse.

India's ASAT test also undoubtedly validated several emerging Indian ballistic missile defence technologies, including the imaging infrared sensor in the PDV MK-II's kill vehicle and its 'seek and attack' control system.

On most counts, the Indian ASAT test arguably achieved its political objectives and technology demonstration successfully. But, the larger military and geo-political challenge from China remains formidable.

<https://www.siasat.com/two-years-after-asat-india-says-its-almost-cleared-space-debris-2116616/>

Mission Shakti: India's formidable growth in space military capabilities

Two years back on March 27, 2019, India successfully tested the entirely indigenous Anti-Satellite (ASAT) Missile, formally named 'Mission Shakti', which ensured India's entry into the elite space power group

New Delhi: Two years after it successfully shot down a satellite in space, India has been working to increase its military capabilities in Space as the DRDO has developed sensors and satellites along with ground stations to help the defence forces in warfare. Mission Shakti, the vantage point of viewing India's formidable space military capabilities, was special for 2 reasons. One, India became only the 4th country to acquire such a specialised & modern capability. And two, this entire effort was indigenous. "On this occasion, Secretary DDR&D and Chairman DRDO, Dr G Satheesh Reddy, greeted the contributors and encouraged the scientific community of DRDO to dedicate their efforts towards development of cutting edge technologies and #defence #systems for #AtmaNirbharBharat" DRDO said on Twitter.



Mission Shakti' is the name of an Anti-Satellite (A-SAT) missile test launch which was successfully conducted by DRDO on March 27, 2019

However, looking at the developments in terms of India's military capabilities in space, things have moved significantly ahead. "The Mission Shakti demonstrated the capability of India to take down any satellite. In the last two years, a lot of work has been done to increase the country's capabilities in space through the development of sensors and satellites by the Space group formed within the DRDO," sources at the defence research organisation said.

Mission Shakti

'Mission Shakti' is the name of an Anti-Satellite (A-SAT) missile test launch which was successfully conducted by DRDO from Dr APJ Abdul Kalam Island in Odisha on March 27, 2019. The DRDO developed A-SAT Missile successfully engaged an Indian orbiting target satellite in Low Earth Orbit (LEO) in a 'Hit to Kill' mode. The interceptor missile was a three-stage missile with two solid rocket boosters. Most importantly, tracking data from range sensors had confirmed that the mission met all its objectives. The entire effort was indigenous which demonstrated the Nation's capability to develop such complex and critical missions. A number of industries also participated in the mission. With this success, India became the fourth nation in the world to possess such a capability.

The test also helped the country develop deterrence capability against adversaries who may want to attack Indian satellites to cripple systems in times of war.

After that, the Defence Space Agency was set up in Bengaluru under an Air Vice Marshal-rank officer and will gradually take over the space-related capabilities of the three forces. The government has created agencies for tackling space and cyber warfare along with a Special Operations Division to tackle the need for special operations required to be carried out both inside and outside the country.

Space research agency under the DRDO

On the completion of two years to Mission Shakti, defence sources said along with the Defence Space Agency formed after the Cabinet Committee on Security approval, the government had also approved a space research agency under the DRDO to develop military capabilities in space.

"Work is in progress to provide enhanced Signal Intelligence (SIGINT), Communication Intelligence (COMINT) and Electronic Intelligence (ELINT) capabilities of the defence forces," the sources said.

"Especially, in view of the Chinese aggression activities in the last year, work is also in progress to provide higher resolution imagery to armed force to analyse the development in-ground and keep a closer eye there," the sources added.

<https://psuwatch.com/mission-shakti-indias-formidable-growth-in-space-military-capabilities>



Sat, 27 March 2021

Developing cutting edge space technologies on DRDO menu

By Ravi Shankar

The Defence Research and Development Organisation (DRDO) is working on developing advanced space technologies to augment India's capabilities to deal with threats from space. Leveraging emerging technologies in the space domain, DRDO is working silently ever since it had conducted an Anti-Satellite (A-SAT) missile test 'Mission Shakti' two years ago on 27 March 2019. The anti-satellite missile system is seen as a symbol of national technological advancement.

On the occasion of the 2nd anniversary of Mission Shakti, DRDO Chief G Satheesh Reddy called upon its scientists to work towards the development of cutting-edge technologies and defence systems for Atmanirbhar Bharat- self-reliance- to progress. He also exhorted the scientific community to come up with new ideas for advanced technologies.

A DRDO-developed Anti-Satellite missile had successfully shot down a live Indian orbiting target satellite in Low Earth Orbit (LEO) in a 'Hit to Kill' mode under 'Mission Shakti'. DRDO used its Ballistic Missile Defence interceptor, which is part of the ongoing ballistic missile defence programme, along with related technologies it has developed, to be able to field the capability to ensure achieving the objectives set out in the mission.

Anti-satellite weapons (ASATs) are created to destroy or incapacitate satellites. Many countries have this capability, but only four countries including India have demonstrated their ASAT capabilities. The US first tested ASAT technology in 1958, the USSR followed in 1964 and China in 2007. The DRDO, in February 2010, had announced that India was developing the necessary technology to produce a weapon to destroy enemy satellites in space.

In the last few months, DRDO has test-fired several missile systems and developed counter-space technologies like tracking enemy assets and surveillance. These capabilities assume significance given that China has been strengthening its military space capabilities. India needs to protect its space assets as it possesses over 50 orbiting satellites, perhaps the largest in the Indo-Pacific region. Anti-satellite weapon systems provide crucial deterrence capabilities against the enemy's capabilities. Disclosing about its further advancement in the space domain technologies,



Image Courtesy : Wikipedia

an official stated “DRDO is capable of carrying out such missions with even enhanced parameters if required, for defending national assets.”

A recent report of the US Congress revealed that China is developing electronic warfare capabilities such as satellite jammers and offensive cyber capabilities. To counter China, India has set up the Defence Space Agency (DSA) to bolster counter-space activities. Technology enabler DRDO, which has commissioned several space projects and the newly created DSA work in tandem to deal with challenges emanating from outer space.

<https://bharatshakti.in/developing-cutting-edge-space-technologies-on-drdo-menu/>



Sat, 27 March 2021

Two years after Mission Shakti, India increasing its military capabilities in Space

Two years after it successfully shot down a satellite in space, India has been working to increase its military capabilities in Space as the DRDO has developed sensors and satellites along with ground stations to help the defence forces in warfare

By Ajiy K Dubey

Two years after it successfully shot down a satellite in space, India has been working to increase its military capabilities in Space as the DRDO has developed sensors and satellites along with ground stations to help the defence forces in warfare.

"The Mission Shakti demonstrated the capability of India to take down any satellite. In the last two years, a lot of work has been done to increase the country's capabilities in space through the development of sensors and satellites by the Space group formed within the DRDO," government sources told ANI. Sources said along with the Defence Space Agency formed after the Cabinet Committee on Security approval, the government had also approved a space research agency under the DRDO to develop military capabilities in space.

"Work is in progress to provide enhanced Signal Intelligence (SIGINT), Communication Intelligence (COMINT) and Electronic Intelligence (ELINT) capabilities of the defence forces," the sources said. "Especially, in view of the Chinese aggression activities in the last year, work is also in progress to provide higher resolution imagery to armed force to analyse the development in-ground and keep a closer eye there," the sources said.

The country had carried out the Anti-Satellite Test in March 2019 to demonstrate its capability to shoot down satellites in space. With this missile test, India had joined an elite club of four nations with such capability. The test also helped the country develop deterrence capability against adversaries who may want to attack Indian satellites to cripple systems in times of war.

After that, the Defence Space Agency was set up in Bengaluru under an Air Vice Marshal-rank officer and will gradually take over the space-related capabilities of the three forces. The Modi government has created agencies for tackling space and cyber warfare along with a Special Operations Division to tackle the need for special operations required to be carried out both inside and outside the country. (ANI)

(This story has not been edited by Devdiscourse staff and is auto-generated from a syndicated feed.)

<https://www.devdiscourse.com/article/law-order/1511605-centre-can-ask-10-pc-more-share-in-profits-from-barmer-block-to-extend-psc-with-vedanta-hc>



Visual of Mission Shakti (Photo/ANI).
Image Credit: ANI

India increases military capabilities in space two years after Mission Shakti

The country had carried out the Anti-Satellite Test in March 2019 to demonstrate its capability to shoot down satellites in space

By Caroline Esther D'Souza

Highlights

- 1. The DRDO has developed sensors and satellites to increase military capabilities in space**
- 2. Government officials said work is in progress to provide enhanced Signal Intelligence**
- 3. The country had carried out the Anti-Satellite Test in March 2019**

New Delhi: India has been working to increase its military capabilities in space as the Defence Research and Development Organization (DRDO) has developed sensors and satellites along with ground stations to help the defence forces in warfare. These developments come two years after it successfully shot down a satellite in space.

"The Mission Shakti demonstrated the capability of India to take down any satellite. In the last two years, a lot of work has been done to increase the country's capabilities in space through the development of sensors and satellites by the Space group formed within the DRDO," government officials told ANI.

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The Modi government has created agencies for tackling space and cyber warfare along with a Special Operations Division to tackle the need for special operations required to be carried out both inside and outside the country.

<https://zeenews.india.com/india/india-increases-military-capabilities-in-space-two-years-after-mission-shakti-2350777.html>



Picture credit: ANI

अंतरिक्ष में भारत: मिशन शक्ति के दो साल, बढ़ा रहा है अपनी सैन्य क्षमताएं

गौरव पाण्डेय

नई दिल्ली: दो साल पहले भारत ने अंतरिक्ष में एक मिसाइल को मार गिराया था। तब से अब तक भारत अंतरिक्ष में अपनी सैन्य क्षमताओं को बढ़ाने पर लगातार काम करता रहा है। इसी का परिणाम है कि डीआरडीओ (रक्षा अनुसंधान एवं विकास संगठन) ने सेंसर और सैटेलाइट विकसित किए हैं जो युद्ध की स्थिति में जमीन पर मौजूद रक्षा बलों की मदद कर सकते हैं।

समाचार एजेंसी एएनआई के अनुसार सरकारी सूत्रों ने शुक्रवार को कहा, 'मिशन शक्ति ने भारत की क्षमता का प्रदर्शन किया था कि वह किसी भी सैटेलाइट को निशाना बना सकता है। पिछले दो साल में, डीआरडीओ के तहत बनाए गए 'स्पेस ग्रुप' ने कई सेंसर और सैटेलाइट विकसित कर अंतरिक्ष में देश की क्षमताएं बढ़ाने के लिए महत्वपूर्ण कार्य किया है।'



Mission Shakti - फोटो : ANI

सूत्रों ने कहा कि कैबिनेट समिति की ओर से सुरक्षा की अनुमति मिलने के बाद डिफेंस स्पेस एजेंसी (रक्षा अंतरिक्ष एजेंसी) का गठन करने के साथ सरकार ने डीआरडीओ के तहत भी एक अंतरिक्ष एजेंसी को अनुमति दी है। बता दें कि डीआरडीओ के तहत इस एजेंसी का गठन अंतरिक्ष में भारत की सैन्य क्षमताओं को विकसित करने के लिए किया गया है।

<https://www.amarujala.com/india-news/two-years-of-mission-shakti-india-increasing-military-capabilities-in-space>

'The Make in India focus opened up a plethora of opportunities for the industry'

By Elizabeth Roche

- *The focus on Atmanirbhar Bharat and Make in India has also made the world sit up and take notice of the potential of the Indian industry, says Neeraj Gupta, managing director of MKU Ltd*

Kanpur-based MKU Ltd is one of the few Indian companies that have made a mark domestically and internationally delivering bulletproof jackets and vests for Indian security forces and security personnel in countries such as Brazil and Spain. Edited excerpts from an interview with Managing Director of the company Neeraj Gupta.

Could you tell us something about how MKU began and your early experience in the Indian defence market?

The foundation of this company was laid way back in 1985. We made tents and then composite helmets for the Army and soon became one of its largest suppliers. 1999 was a defining year. The Indian forces faced an acute shortage of snow boots (during the Kargil war) essential for fighting in the high snow-capped regions and we at MKU decided to rise to the challenge. We diverted all our resources to make snow boots on priority to meet the emergency. It was during this war that I also realized our brave forces also did not have quality protection equipment. This firmed my resolve to provide world class equipment for our forces, and in 2000 we pioneered the manufacture of composite hard armour plates in India, to replace the heavy steel plates that were in use at the time. This was a turning point in our history and marked our foray into the manufacture of light-weight bulletproof jackets.



Neeraj Gupta, managing director, MKU Ltd.

From then on it has been an exciting but tough journey. It was not easy, especially since the defence sector in India was primarily in the domain of the government and most requirements were met through imports or DPSUs (defence public sector undertakings). The mission was clear—to provide our brave forces with world-class protective gear and to establish the manufacturing capability in India. In 2001, we partnered with DRDO/ TBRL (Defence Research and Development Organization/Terminal Ballistics Research Laboratory), and over the next seven years manufactured bulletproof jackets for our forces. It was a successful partnership and we acknowledge the support and guidance received from DRDO during the period.

From the beginning, we paid a lot of importance to building technological capability and infrastructure. We invested in R&D and international certifications and quality standards and slowly but steadily made progress in this niche market. Soon enough we were able to establish MKU in the defence market.

Can you tell us anything about new products and new technologies that you have come up with?

It would not be prudent to mention this in great detail but suffice to say that we are not only investing in developing new and upgraded solutions but have also embarked on backward integration, especially keeping in mind the clarion call for 'Atmanirbhar Bharat'. Our focus has been on protection and surveillance segments and going forward would like to given an even more comprehensive bouquet of products to our users. Over the years we have developed several

innovative products and technologies and will continue to invest in developing new products and technologies needed by the forces. We are investing heavily in electro-optics and we feel this will be our growth driver going forward. We have aggressive plans and look forward to the future with a lot of hope and expectation.

What are the products that your company manufactures for the Indian defence forces? And what are the products that you manufacture for countries abroad? How did you manage to find markets for your products abroad? Any details on your recent international contracts?

MKU is one of the leading manufacturers of protection and surveillance equipment both for the domestic and international markets. We have today a very large and integrated manufacturing facility for body armour, helmets and other protection equipment. Our 'NETRO' range of electro-optical devices are based on both image intensification and thermal imaging technologies.

Finding overseas market in this niche segment has not been easy. Slowly but steadily we have built a brand that is today well known and accepted internationally. We focused on quality and R&D and also ensured we had all the necessary international quality and system certifications required. We established a wide network of channel partners which helped us counter the local problems of time, language, customs and procedures, and helped us establish ourselves in the international market. Besides protection equipment, we are very proud to have bagged many prestigious international orders for our 'NETRO' range of electro-optical products from countries including the Philippines, Brazil and Croatia.

Do you have tie-ups with foreign companies?

Yes we have tie ups with international companies. We have been successfully running a joint venture with a German cable manufacturing company since 2013. We have entered into an agreement with world leader Thales to co develop and manufacture advanced electro-optical devices in India for the global market. At the last Aero india held in Bengaluru recently, we tied up with a leading Russian OEM with existing in-service equipment with Indian Navy. This effort is the culmination of the process started by the Indian ministry of defence to develop capability within the country for manufacturing parts and components for Russian made platforms and equipment.

Prime Minister Modi launched the Make in India campaign and the Atmanirbhar Bharat programme. How does this help you?

I think this is the way to go. We have always believed in this. We are in a niche business area the market of which is both finite and cyclical. We have therefore been focusing on the global market and this has helped us tide over this challenge. The Make in India focus has made the user forces and also the companies realize the strategic importance of this decision. It has opened up a plethora of opportunities for the industry. Further, the industry friendly policies of the government—negative import list, increase in Indian content, projects up to Rs200 crore reserved for Indian companies, public procurement policy, IDDM (Indian designed, developed and manufactured) earmarked budget for domestic procurement, favourable export climate and policies have only made the Indian defence industry, especially in the private sector, feel elated. The focus on Atmanirbhar Bharat and Make in India has also made the world sit up and take notice of the potential of the Indian industry.

Many companies have complained of procedural delays in getting their products approved by the defence forces or that there are hurdles in the way of sharing technology from DRDO. Have you faced these challenges?

Defence products by their very nature take a long time to get certified. There are laid down processes and one cannot have any short cut. There are other procedural delays and bottlenecks such as testing, which are now being addressed through administrative and policy changes. To overcome covid-induced challenges, the user forces have also introduced digital processes that, going forward, will help speed up the processes. Limitations due to shortage of testing facilities are also being addressed by the government.

The process of TOT (transfer of technology) is much more transparent and industry friendly now. To encourage such sharing of technology, DRDO has reduced the TOT fee and is openly encouraging the industry to use its technology.

There was also a feeling that the Indian defence forces prefer to buy state of the art products from foreign vendors. Is this a challenge that you, too, encountered? What is the experience like to compete with foreign OEMs?

I do not think this is justified anymore. Wherever the capacities exist, the forces are willing and eager to support the domestic industry. In fact the promulgation of the 'Negative Import List' is indicative of this. Besides, we are also exporting our products to many countries and are quite used to competing with the foreign manufacturers and OEMs. The important point to note is that the Indian industry must have the necessary international certifications and meet international quality standards.

One of the things that is required to stay ahead of competition is innovation and R&D (research and development). How have you managed to do this? How much do you spend on R&D/innovation?

R&D is the backbone of this business. We have always remained focused on this and spend almost 6-8% on R&D for developing new technologies and products and solutions. We have built a large team of engineers and have a modern, well-equipped technology centre in Kanpur. It is this focus on R&D that has actually enabled us to successfully develop solutions for so many projects and meet the requirements of international forces.

<https://www.livemint.com/companies/people/the-make-in-india-focus-opened-up-a-plethora-of-opportunities-for-the-industry-11616907033037.html>



Press Information Bureau
Government of India

Ministry of Defence

Fri, 26 March 2021 4:34PM

Raksha Mantri Shri Rajnath Singh and his Korean counterpart meet to strengthen bilateral defence partnership

Raksha Mantri Shri Rajnath Singh and Minister of Defence of Republic of Korea (RoK) Mr Suh Wook successfully concluded their bilateral talks on defence cooperation in New Delhi on March 26, 2021. The defence and security engagements between India and RoK have grown exponentially over the last few years. Latest talks explored new domains of bilateral defence cooperation and avenues to strengthen the long-standing bilateral defence partnership.

Shri Rajnath Singh and Mr Suh Wook acknowledged that the bilateral defence cooperation has broadened significantly in scale and scope across Tri-Service as well as agencies dealing with defence technology and industry. Both the countries have also found common ground on several multilateral fora and engagements.



Both the Ministers exchanged views on the impact of COVID-19 pandemic on the defence and security engagements as well as best practices followed by the Armed Forces of both nations. Shri Rajnath Singh lauded stellar contribution of RoK in the pandemic mitigation efforts.

They reaffirmed their support to multilateral initiatives to promote lasting peace and stability in the region and beyond. As brought out by the Raksha Mantri during his interaction with his counterpart, the bilateral relations between both the countries are set to grow further and the meeting between them will give it the necessary impetus to take it to the next level.

The Ministers also expressed satisfaction over the commitment exhibited by diverse agencies of both countries to sustain structured annual dialogues at various levels of leadership through virtual

means when travel and physical engagements became increasingly challenging during the ongoing pandemic. This has kept up the momentum of bilateral defence engagements. The Armed Forces of both countries hope to approach 2021 with renewed confidence.

Chief of Defence Staff General Bipin Rawat, Chief of Naval Staff Admiral Karambir Singh, Chief of Air Staff Air Chief Marshal R K S Bhadauria, Chief of Army Staff General M M Naravane, Secretary (Defence Production) Shri Raj Kumar and Secretary Department of Defence R&D and Chairman Defence Research & Development Organisation (DRDO) Dr G Satheesh Reddy formed part of the Indian delegation during the talks.

Earlier, Shri Rajnath Singh and Mr Suh Wook jointly inaugurated the India-Korea Friendship Park in a ceremony to mark the occasion at Delhi Cantonment. The park is a symbol of close relations between both the countries and acknowledges the contribution of the Indian Army's Medical Mission during the Korean War. The presence of distinguished guests from the Korean War Veterans Association during the inauguration ceremony was an acknowledgement of the event. Both the Ministers planted a sapling each to mark the momentous occasion. Mr Suh Wook felicitated Korean War Veterans Association of India General Secretary Shri Anil Malhotra on the occasion.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1707830>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Fri, 26 March 2021 4:34PM

रक्षा मंत्री श्री राजनाथ सिंह और उनके कोरियाई समकक्ष ने द्विपक्षीय रक्षा साझेदारी को मजबूत करने के लिए बैठक की

रक्षा मंत्री श्री राजनाथ सिंह और कोरिया गणराज्य (आरओके) के रक्षा मंत्री श्री सुह वूक ने दिनांक 26 मार्च, 2021 को नई दिल्ली में रक्षा सहयोग पर अपनी द्विपक्षीय वार्ता सफलतापूर्वक संपन्न की। पिछले कुछ वर्षों में भारत एवं कोरिया गणराज्य (आरओके) के बीच रक्षा और सुरक्षा संबंधों में तेजी से वृद्धि हुई है। ताजा वार्ता में द्विपक्षीय रक्षा सहयोग के नए क्षेत्रों और लंबे समय से चली आ रही द्विपक्षीय रक्षा साझेदारी को मजबूत करने के रास्ते तलाशे गए।

श्री राजनाथ सिंह एवं श्री सुह वूक ने स्वीकार किया कि द्विपक्षीय रक्षा सहयोग ने सेना के तीनों अंगों तथा रक्षा प्रौद्योगिकी एवं उद्योग से जुड़ी एजेंसियों का दायरा बहुत हद तक बढ़ा दिया है। दोनों देशों ने पाया कि अनेक बहुपक्षीय क्षेत्रों तथा संबंधों पर दोनों का आधार एकसमान है।

दोनों मंत्रियों ने रक्षा और सुरक्षा संबंधी व्यस्तताओं के साथ-साथ दोनों राष्ट्रों के सशस्त्र बलों द्वारा अपनाई गई सर्वश्रेष्ठ प्रथाओं पर कोविड 19 महामारी के प्रभाव पर विचारों का आदान-प्रदान किया। श्री राजनाथ सिंह ने महामारी शमन के प्रयासों में रोक के अभूतपूर्व योगदान की सराहना की।

उन्होंने क्षेत्र और इससे आगे बढ़कर स्थायी शांति और स्थिरता को बढ़ावा देने के लिए बहुपक्षीय पहलों के लिए अपने समर्थन की पुष्टि की। दोनों देशों के बीच द्विपक्षीय संबंधों का और अधिक विकास होना तय है और उनके बीच होने वाली बैठक से इसे अगले स्तर तक ले जाने के लिए आवश्यक प्रोत्साहन मिलेगा, यही रक्षा मंत्री की अपने समकक्ष के साथ बातचीत के दौरान सामने आया है।

दोनों देशों के मंत्रियों ने आभासी साधनों के माध्यम से नेतृत्व के विभिन्न स्तरों पर व्यवस्थित वार्षिक संवादों को बनाए रखने के लिए दोनों देशों की विविध एजेंसियों द्वारा प्रदर्शित प्रतिबद्धता पर भी संतोष व्यक्त किया, विशेषकर जब महामारी के दौरान यात्रा और व्यक्तिगत संपर्क चुनौतीपूर्ण हो गया है। इससे द्विपक्षीय रक्षा संबंधों की गति को बनाए रखा गया है। दोनों देशों के सशस्त्र बल नए सिरे से विश्वास के साथ 2021 से उम्मीद कर रहे हैं।



रक्षा प्रमुख जनरल बिपिन रावत, नौसेना प्रमुख एडमिरल करमबीर सिंह, वायुसेना प्रमुख एयर चीफ मार्शल आर के एस भदौरिया, सेनाध्यक्ष जनरल एम एम नरवणे, सचिव रक्षा उत्पादन श्री राज कुमार और रक्षा अनुसंधान एवं विकास विभाग के सचिव तथा रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) के अध्यक्ष डॉ जी सतीश रेड्डी बातचीत के दौरान भारतीय प्रतिनिधिमंडल का हिस्सा थे।

इससे पहले श्री राजनाथ सिंह और श्री सुह वूक ने दिल्ली छावनी में इस अवसर पर आयोजित एक समारोह में भारत-कोरिया मैत्री पार्क का संयुक्त रूप से उद्घाटन किया। यह पार्क दोनों देशों के बीच घनिष्ठ संबंधों का प्रतीक है और कोरियाई युद्ध के दौरान भारतीय सेना के चिकित्सा मिशन के योगदान की बानगी है। उद्घाटन समारोह के दौरान कोरियाई वॉर वेटेरन एसोसिएशन से विशिष्ट मेहमानों की उपस्थिति कोरियाई युद्ध में भारतीय सेना के चिकित्सा संबंधी योगदान का प्रमाण थी। दोनों देशों के मंत्रियों ने इस महत्वपूर्ण अवसर पर एक-एक पौधा लगाया। श्री सुह वूक ने इस अवसर पर कोरियाई वॉर वेटेरन एसोसिएशन ऑफ इंडिया के महासचिव श्री अनिल मल्होत्रा को सम्मानित किया।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1707946>

Visakhapatnam: Importance of missiles in Navy stressed

Highlights

Visakhapatnam : Chief of Staff, Headquarters Eastern Naval Command, Vice Admiral Biswajit Dasgupta highlighted the role and criticality of missiles in ..

Visakhapatnam: Chief of Staff, Headquarters Eastern Naval Command, Vice Admiral Biswajit Dasgupta highlighted the role and criticality of missiles in the navy's arsenal and the need to be self-reliant in the field of missile technology.



Participants at the seminar on 'Transforming Conventional Missiles for Tomorrow's War - Opportunities and Challenges' held in INS Kalinga

Speaking at a seminar on 'transforming conventional missiles for tomorrow's war-opportunities and challenges' organised at INS Kalinga, Vice-Admiral Biswajit Dasgupta unveiled a compendium of papers on the seminar topics.

Adhering to Covid-19 protocol, personnel from the navy, DRDO and defence industries took part in the event.

Commanding Officer, INS Kalinga Cmde Neeraj Uday delivered the opening address.

Eight papers on topics related to emerging missile technologies, uniformity and scalability and self-reliance in the field of missiles were presented by the personnel from the Indian Navy and DRDO, involved in the design, production, maintenance and deployment of missiles.

The seminar that concluded on Friday enabled stakeholders to engage in dialogue on issues associated with missile development and maintenance, while exploring the technological advancements in the world.

<https://www.thehansindia.com/news/cities/visakhapatnam/visakhapatnam-importance-of-missiles-in-navy-stressed-678954?infinitescroll=1>

India will match Chinese border infrastructure in 3 to 4 years: Rawat

India will catch up with China in developing border infrastructure in three to four years, chief of defence staff General Bipin Rawat said on Friday. He discounted major threats from the Chinese navy in the Indian Ocean region.

Speaking at the Times Network India Economic Conclave, the country's senior-most military officer said the "Quad" comprising India, US, Japan and Australia must not be seen from a military perspective or as a grouping against China.

"The nations have come together to ensure no single nation is able to dominate the region," he said. On Pakistan, against the backdrop of the fresh ceasefire, Rawat said it was "too premature" to say whether India's western neighbour will give up its policy of proxy war or cross-border terrorism.

Rawat said he would "give more credit" to the concerted and coordinated action by the Army, police forces and intelligence agencies in reducing terrorist incidents in J&K. At the same time, "some wisdom" also seems to have dawned on Pakistan, which is keen to get off the Financial Action Task Force's "grey list", he added.

Stressing the need for the Army, IAF and Navy to integrate capabilities through joint commands and adapt to new technologies, Rawat said, "It's time for the Indian armed forces to transform, reform and perform." He also pushed for the private sector to play a greater role in military R&D and defence production, which will also provide competition to DRDO and defence PSUs.

<https://timesofindia.indiatimes.com/india/india-will-match-chinese-border-infrastructure-in-3-to-4-years-rawat/articleshow/81717178.cms>



Standoff with China highlighted India's technological asymmetry. Time to update

Despite the need for integral UAVs in the military, India is yet to see these being inducted in substantial numbers and employed in an integrated manner

By BS Dhanoa

The very recent conflict in Nagorno Karabakh has exposed the vulnerability of tracked weapons platforms and other unprotected ground targets to detection and engagement by unmanned aerial vehicles (UAVs) using an array of sensors and precision weapons on board. Such capability, earlier limited to only advanced militaries, is increasing rapidly. Today a plethora of means is on hand to military commanders to remotely deliver ordnance on target by air-, ground- and sea-borne weapons platforms. Rapid advances in detection and engagement capabilities, coupled with remotely controlled aerial loitering platforms that are difficult to detect, have made the task of striking targets in inaccessible locations relatively easier, while counters to such attacks have been slow to develop. Similar, yet slower, advances in the use of unmanned ground vehicles/platforms (UGVs) by troops have been in the offing for some time now. To paraphrase *Star Trek*, 'land is the final frontier' for the deployment and effective use of unmanned platforms. This is so as there are several unique challenges that UGVs face, the most obvious being the operating environment's complexity. Ground vehicles operate in a cluttered and unpredictable environment containing obstacles that are unknown at any detailed level before the mission.

Ongoing tensions with China have highlighted the technological asymmetry between the Indian Armed Forces and our northern adversary. It is glaring when it comes to the fielding of high-end drones (for intelligence and reconnaissance, or targeting), leveraging of space and cyber capabilities in a theatre of interest, and an extensive use of electronic warfare means to deny the electromagnetic spectrum to the other side while protecting friendly systems. If the military does not keep a laser-like focus on the likely changes that rapid advances in computers



Indian and Uzbek soldiers during the joint Army exercise, Dustlik-II, at the Foreign Training Node in Chaubatia near Ranikhet in Uttarakhand | Photo by special arrangement

(artificial intelligence or AI, machine learning and the ability to quickly process a vast quantum of data), robotics, wireless battlefield networks and sensor-driven weapons can — and will — bring to the coming fight, they will probably be severely handicapped on any future battlefield. While the challenges of maintaining and sustaining legacy forces consume the minds of most force planners, technology and the rapid introduction of “game-changing” weapons systems wait for none. Thus, it is necessary to have a dedicated future force team of thinkers, scientists and planners, civil as well as military, who are given executive authority to crystal gaze, broadly outline the likely contours of conflict in the coming decades, and identify possibilities of developing and integrating new technology weapons that will ensure that the military is not disadvantaged in any potential scenario. It will require a whole of government effort to be abreast of China in this field.

How does a mostly industrial-age army, with an uneven distribution of modern and high-tech weapons systems, manage to predict its future needs and ensure their development, induction and integration? It is not an easy task. In 2016, the Indian Army set up the Army Design Bureau (ADB) to plan for the upgrade of present systems and enunciate future technological needs. A formal interface with industry and academia has been established to get the best Indian minds and research

facilities involved in military technology development. Fundamental research by the Defence Research and Development Organisation (DRDO) and its affiliates is also closely interwoven into the process by the ADB. From this model, through a statement of future needs by different components of the army, the Indian Army hopes to project and develop future weapons systems, with unmanned platforms probably at the very top of the priority list.

A fair understanding of the complexity of developing and fielding UGVs is necessary to grasp the issues the Indian Army will face. The development of unmanned platforms is not new, yet it has taken the most brilliant minds in corporations like Tesla, Google and Microsoft to field prototypes of driverless cars, given the difficulty of safe autonomous navigation through the relatively benign yet continuously changing environment that cities present. Now imagine a military UGV operating in unknown complex terrain with different mission sets. Powerful algorithms will have to place the vehicle in a given threat posture in moments, sensing and overcoming any difficulty, while AI-driven engines will amalgamate the feeds of different surveillance sensors onboard, interpret the intelligence picture presented and activate its suite of weapons (an iteration of the OODA loop done many times over in a second). This may sound like science fiction, but it is the holy grail of convergence of disparate technologies — powerful AI engines, robotics, electro-optics, micro-sensors, 5G and satellite navigation — that have thus far only been tested in laboratories but are now being fielded in future force testbeds set up by most advanced militaries, including the US, Russia and China.

A glance at some of the ground platforms currently being field-tested may be instructive to understand their possible usage and determine an approach that India can adopt for eventual induction. Russia and the US are following proven methodologies for unmanned platforms — design, prototype, test, field. The US Army, under the Combat Capabilities Development Command, has the lead in this regard and the types of unmanned ground systems under development are legion; the most recent induction for use by the field army is the QinetiQ Inc. and Pratt Miller Defense Robotic Combat Vehicle-Light, a purpose-built hybrid electric unmanned ground combat vehicle. Russia has battle-tested the Uran-9 unmanned ground combat vehicle in Syria in 2018 and formally inducted it in its ground force in 2019. The Chinese have also been keeping pace with their development of unmanned ground systems and have introduced Norinco's Sharp Claw UGV, which was first unveiled at the Airshow China 2014 exhibition in Zhuhai, into the People's Liberation Army (PLA) in April 2020. ^[7] Each of these three UGVs can perform a variety of tasks — from intelligence, surveillance and reconnaissance (ISR) to fire support and even logistics delivery or casualty evacuation — within their operating parameters.

In India, the DRDO has developed and fielded remotely operated vehicles for several military tasks, from explosive ordnance detection and disposal to chemical, biological, radiological and nuclear reconnaissance, and these have been inducted in restricted numbers into the field army with specialist units. It is a small yet significant step to allow troops to gain experience with such platforms in their midst. However, any significant development of a remotely (or autonomously) operated weapons platform (micro, small, medium or heavy) has yet to see any progress outside the research environment, as is the case with the Muntra platform based on an ICV (BMP-II) or the wheeled (Honda CRV based) vehicle for use in urban terrain. UGV design and fielding of prototypes in India is almost entirely a defence research-led initiative, with some anticipation of eventual exports. The digital and support ecosystem existing in the army's field formations will be hard put to fully exploit any worthwhile capabilities of UGVs until an upgrade of the wireless network and digital battlespace needed to make UGV operations worthwhile is not fielded.

Some of the major technical challenges that scientists face in meeting military requirements for unmanned platforms, especially ground-based ones, are:

- Range of operating independently from a base is very limited, depending on terrain and the signal's fidelity in an operating space
- Successful and tactical negotiation of numerous obstacles, on the way and in a hostile area, are problematic for UGVs

- Loss of positional awareness of unmanned platforms due to jamming or spoofing of satnav signals, which are essential for onboard or remotely guided navigation
- Payloads that can be carried are limited to the vehicle configuration and its power plant type and size (from internal combustion engines to electrical motors and batteries)
- Power generation noise onboard for heavy UGVs and a requirement of frequently recharging the batteries of small and medium-sized unmanned vehicles remains an issue
- Identification of friend or foe is an ongoing hurdle for autonomous vehicles
- Frequent stoppages and breakdowns in onboard electro-optic sensor suites and weapons render such platforms inoperable at crucial junctures

The induction of UGVs, especially autonomous ones, is unlikely without the Indian Army going through a painful developmental phase. Despite the need for integral UAVs (of all sizes and types) in the military, India is yet to see these being inducted in substantial numbers and employed in an integrated manner across the spectrum of threats. The mainstay for the army has been the Searcher and Heron series of UAVs purchased from Israel, purely for ISR, while indigenous development remains on the backburner. The much-touted Rustom series, a DRDO project for ISR and combat (though which weapons are to be integrated is unclear), have had their own birthing pangs for some time now. On the other hand, China, and its weapons' largesse recipient Pakistan, have inducted and operated the CH series of reconnaissance and armed UAVs with growing confidence, with the PLA even integrating them into its war-fighting philosophy of the future.

The way ahead is not an easy one, but it needs to be mapped and enunciated now. India cannot be threatened by new ways of waging war, of which it is informed endlessly but is incapable of countering with a cogent technological and doctrinal response. There are enough indicators available that unmanned systems are going to play a crucial part on the future battlefield. The threat of drone swarms overwhelming a legacy system such as an integrated missile air defence network or even an aircraft carrier at sea can no longer be ignored. India's armed forces need to do their own thinking and red teaming for such scenarios. They must give a coherent yet broad-based needs statement to the defence research establishment now, rather than have to force fit independent weapons and systems developed by the DRDO into their doctrine (which has mostly been the case so far).

In sum, the army must: look at the threats and needs of the future battlefield now, especially for unmanned systems; field an inter-agency and intra-government task force headed by a designated transformation czar; get their teams to deliberately prepare and follow up on a national and military needs paper for future systems; and integrate all the different strands of development (government and private) into a purposeful research and development project that has achievable milestones. India has the capacity, intellect, and research facilities within and outside of government to develop and field such systems faster than ever before. It should not field stand-alone systems in a piecemeal fashion if the desire is to address the forces' needs for unmanned systems in a holistic manner. If the nation's defence ecosystem needs a stimulus to hasten development, it should be intellectually driven from within and not be forced upon it because of an external threat.

(Major General BS Dhanoa (Retired) @bsdhanoo was commissioned into the Armoured Corps in Dec 1983. He last served in the Army's premier institution, the Army War College, where his primary role was the mentoring and education of future military leaders of the Armed Forces. Views are personal.)

<https://theprint.in/opinion/standoff-with-china-highlighted-indias-technological-asymmetry-time-to-update/629483/>

Pakistan successfully test fires nuclear-capable ballistic missile Shaheen 1-A

In a statement Friday, the media wing of the Pakistani army, the ISPR, said that the test was aimed at re-validating various design and technical parameters of the weapon system

By Sajjad Hussain

Islamabad: Pakistan on Friday successfully test-fired a nuclear-capable surface-to-surface ballistic missile with a range of 900 kilometres, the Army said.

The test of Shaheen-1A surface to surface ballistic missile, was aimed at re-validating various design and technical parameters of the weapon system including advanced navigation system, the media wing of the Pakistani army – the Inter-Services Public Relations (ISPR), said in a statement.

The Army's media wing said that the missile has a range of 900 kilometers. Shaheen 1-A with its sophisticated and advanced guidance system is a highly accurate missile system.

The launch was witnessed by senior officials from Strategic Plans Division, strategic forces, scientists and engineers of strategic organisations.

Director General Strategic Plans Division, Lieutenant General Nadeem Zaki Manj, congratulated scientists and engineers on the conduct of this successful test.

He appreciated the technical prowess, dedication and commitment of scientists and engineers, who contributed whole-heartedly in making the missile launch successful.

President Arif Alvi, Prime Minister of Pakistan Imran Khan, Chairman Joint Chiefs of Staff Committee and Services Chiefs have congratulated the scientists and engineers on successful conduct of the missile test, according to the army.

In February, Pakistan successfully test-fired a nuclear-capable surface-to-surface ballistic missile which can strike targets up to 290 kilometres, the Army said.

The launch of Ghaznavi missile was culmination of Annual Field Training Exercise of Army Strategic Forces Command, the ISPR had said.

<https://theprint.in/defence/pakistan-successfully-test-fires-nuclear-capable-ballistic-missile-shaheen-1-a/629379/>



Pakistan's Shaheen 1-A is launched for its test flight, on 26 March 2021 | Youtube screengrab



Sat, 27 March 2021

इसरो के चेयरमैन सिवन ने कहा- अप्रैल में लांच होगा देश का अनूठा जीआइएसएटी-1 सेटेलाइट

अगर भारत का जियो इमेजिंग सेटेलाइट मार्च 2020 में लांच हो गया होता तो पूर्वी लद्दाख में चीनी सैनिकों की घुसपैठ का अविलंब पता चल जाता और भारतीय सेना जवाबी कार्रवाई कर उन्हें उसी समय पीछे धकेल सकती थी।

By Bhupendra Singh

चेन्नई: भारत का पहला जियो इमेजिंग सेटेलाइट (जीआइएसएटी-1) अप्रैल के पहले या दूसरे सप्ताह में अंतरिक्ष की कक्षा में स्थापित हो जाएगा। यह जानकारी भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) के चेयरमैन के सिवन ने दी है। यह अंतरिक्ष में भारत की आंख होगा।

इसरो के चेयरमैन ने कहा- तकनीक खामियों के चलते जीआइएसएटी-1 के लांच में विलंब हो सकता

सिवन ने बताया कि जीआइएसएटी-1 का लांच 28 मार्च को होना है, लेकिन सेटेलाइट और रॉकेट में आई मामूली तकनीक खामियों के चलते इसमें थोड़ा विलंब हो सकता है। सेटेलाइट लांचिंग प्रक्रिया की निगरानी रॉकेट दागे जाने के एक मिनट पहले तक लगातार होती है।

सिवन ने कहा- जीआइएसएटी-1 धरती को बारीकी से देखने वाला देश का पहला सेटेलाइट

सिवन ने बताया कि जीआइएसएटी-1 धरती के हर भाग को बारीकी से देखने वाला देश का पहला सेटेलाइट होगा। यह धरती से 35 हजार किलोमीटर से ज्यादा ऊंचाई पर जियोस्टेशनरी ऑर्बिट में स्थापित किया जाएगा। यह अंतरिक्ष में भारत की आंख बनकर कार्य करेगा।

कोविड महामारी और लॉकडाउन के चलते सेटेलाइट की लांचिंग टलती चली गई

पहले इसकी लांचिंग पांच मार्च, 2020 को होनी थी। लेकिन लांचिंग से कुछ ही घंटे पहले तकनीक कारणों से इसे रोक दिया गया था। इसके बाद कोविड महामारी और उसके कारण देश में हुए लॉकडाउन के चलते इस सेटेलाइट की लांचिंग टलती चली गई। इसके बाद चार मार्च को इसकी लांचिंग का नया कार्यक्रम जारी हुआ। 2,268 किलोग्राम भार वाला जीआइएसएटी-1 सेटेलाइट धरती की रियल टाइम इमेज उपलब्ध कराएगा। इससे विलंब किए बगैर इमेज के विश्लेषण और उसका निष्कर्ष निकाला जा सकेगा।

दैवीय आपदा के समय सेटेलाइट से होगा बहुत लाभ

दैवीय आपदा के समय इससे बहुत लाभ होगा। इतना ही नहीं धरती की जल्द तस्वीर मिलने से बचाव या प्रतिक्रियात्मक कदम उठाने में आसानी हो जाएगी। ये तस्वीरें कई रिजॉल्यूशन में होंगी।

यदि सेटेलाइट मार्च 2020 में लांच हो जाता तो चीनी सैनिकों की घुसपैठ का अविलंब पता चल जाता

माना जाता है कि अगर यह सेटेलाइट मार्च 2020 में लांच हो गया होता तो पूर्वी लद्दाख में चीनी सैनिकों की घुसपैठ का अविलंब पता चल जाता और भारतीय सेना जवाबी कार्रवाई कर उन्हें उसी समय पीछे धकेल सकती थी। इस सेटेलाइट से कृषि, वन, जमीन के भीतर छिपे खनिजों, आपदा, बादलों की

उपस्थिति, बर्फ की मौजूदगी, समुद्री स्थिति आदि के बारे में महत्वपूर्ण जानकारियां मिल सकेंगी। यह सेटेलाइट अन्य कई खूबियों के साथ अंतरिक्ष में भेजा जाएगा।

आइआइएसटी के साथ सहयोग करेगा इसरो

इसरो अब अमेरिकी अंतरिक्ष संगठन नासा की तरह निजी क्षेत्र और अन्य सरकारी संस्थाओं के साथ सहयोग कर अपनी परियोजनाओं को आगे बढ़ाएगा। भविष्य के लिए होने वाले शोध कार्यों में इसरो इंडियन इंस्टीट्यूट ऑफ स्पेस साइंस एंड टेक्नोलॉजी (आइआइएसटी) का सहयोग लेगा।

<https://www.jagran.com/news/national-isro-chairman-sivan-said-unique-gisat-1-satellite-of-india-will-be-launched-in-april-21502949.html>

THE TIMES OF INDIA

Sat, 27 March 2021

ISRO revises launch schedule of GISAT-1 after 'minor issue' with satellite

Bengaluru: The Indian Space Research Organisation has revised the launch schedule of geo imaging satellite GISAT-1 on board GSLV-F10 rocket following a "minor issue" with the spacecraft. The Bengaluru-headquartered space agency was earlier looking to launch the satellite on March 28, subject to weather conditions.

"There is a minor issue with the satellite", ISRO sources told .

"As of now, we are planning to launch it on April 18".

GISAT-1 was originally planned to be launched from Sriharikota spaceport, about 100 kms north of Chennai, on March five last year but was postponed a day before the blast-off due to technical reasons.

Isro sources had earlier said the delay in the launch was due to Covid-19-induced lockdown which affected normal work.

According to Isro, GISAT-1 will facilitate near real-time observation of the Indian sub-continent, under cloud-free condition, at frequent intervals.

Weighing about 2,268kg, GISAT-1 is the first state-of-the-art agile earth observation satellite which will be placed in a Geosynchronous Transfer Orbit by GSLV-F10.

"Subsequently, the satellite will reach the final geostationary orbit using its on board propulsion system", Isro had said a few days before the planned launch in March last year.

<https://timesofindia.indiatimes.com/india/isro-revises-launch-schedule-of-gisat-1-after-minor-issue-with-satellite/articleshow/81709833.cms>



ISRO developing green propulsion, to launch all rockets with green fuel soon: Sivan

Will set up ground station in Australia to keep eye on Gaganyaan astronauts in space'

By Surendra Singh

New Delhi: Indian Space Research Organisation (ISRO) is developing a “green propulsion” technology for rocket launches in order to do away with hazardous and toxic propellants and planning to launch rockets with the environment-friendly fuel in near future.

Talking at the Times Network India Economic Conclave during the ‘Race to Space’ programme on Friday, Isro chairman and department of space secretary K Sivan said, “The green propulsion technology is essential for us. In fact, in our Gaganyaan mission where we will be flying humans to space, we need a green propulsion to control our orbiter module keeping in mind the safety of astronauts. That activity is currently on as it’s an essential requirement.”

On future launches, Sivan said, “We want to make everything environment-friendly and green. Our solid and liquid green propellants are advanced. But we want to bring the green propulsion in our entire launch system as this is the need of the hour. We want to avoid all toxic and hazardous waste. Therefore, the development of the green propulsion system is going on a fast-track mode.”

On Isro signing an MoU in space cooperation with Australia, the Isro chairman said, “We are continuously having MoUs with different space agencies, especially with



Australia, for mutual space cooperation. Isro wants to set up a temporary ground station at the Cocos Islands in Australia to support its Gaganyaan mission. We need to have a 100% communication (24 x 7) with the astronauts once they are placed in space. Ground stations in India won’t be enough to ensure all-time communication with astronauts when the module will move around the Earth as there will be certain non-visible zones. So, we need global support. Such a station in Australia will certainly help us.”

On other areas of space cooperation with Australia, he said, “We would also like to have a NaVIC (indigenous navigation system) station in Australia. And we will work with them in space medicines and life sciences too.”

About the Gaganyaan mission, Sivan the Covid-triggered restrictions last year had affected the pace of the programme. “But now every member of the Isro family is busy with meeting the launch deadline set by PM Modi. Astronauts training in Russia will be over by the month-end. Of the two unmanned missions before the final manned mission, we are targeting to launch the first one by year-end.”

He said Isro had carried out extensive analysis of what went wrong during the landing operation of the Chandrayaan-2 mission in 2019. “Lots of improvements have been done in Chandrayaan-3 mission and we are fully confident of launching it successfully. The project is on a fast track and will be launched in the first half of 2022.”

The first test-flight of SSLV (Small Satellite Launch Vehicle or min-PSLV) is “also due this year”. This project will certainly boost Isro’s revenue in the global market as there is a huge demand for such a small customer-based vehicle, Sivan said.

The ISRO Chairman also said the Modi government’s move to unlock the space sector is providing immense opportunity to private players to make the most of the new policy change as it has provided them easy access to the agency’s space assets. He also said the Centre’s decision of

democratisation of geospatial data “will also bring a sea-change in the system as it will give developers easy access to data without much security restrictions. An MoU has been concluded with MapmyIndia in this regard. Likewise, more companies will do well as they will get free access to the geospatial data”.

<https://timesofindia.indiatimes.com/india/isro-developing-green-propulsion-to-launch-all-rockets-with-green-fuel-soon-sivan/articleshow/81712625.cms>

The Indian EXPRESS

Sat, 27 March 2021

Explained: What is NISAR, the joint Earth-Observing mission of NASA and ISRO?

*The satellite will be launched in 2022 from the Satish Dhawan Space Center in Sriharikota
By Mehr Gill*

New Delhi: NASA and ISRO are collaborating on developing a satellite called NISAR, which will detect movements of the planet’s surface as small as 0.4 inches over areas about half the size of a tennis court.

The satellite will be launched in 2022 from the Satish Dhawan Space Center in Sriharikota, India, into a near-polar orbit and will scan the globe every 12 days over the course of its three-year mission of imaging the Earth’s land, ice sheets and sea ice to give an “unprecedented” view of the planet.

What is NISAR?

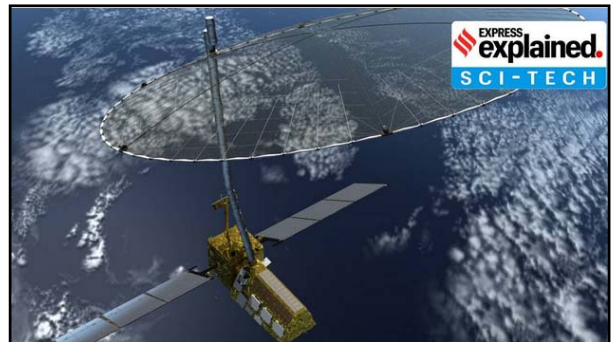
It’s an SUV-sized satellite that is being jointly developed by the space agencies of the US and India. The partnership agreement was signed between NASA and ISRO in September 2014, according to which NASA will provide one of the radars for the satellite, a high-rate communication subsystem for science data, GPS receivers and a payload data subsystem. ISRO, on the other hand, will provide the spacecraft bus, the second type of radar (called the S-band radar), the launch vehicle and associated launch services.

Significantly, NISAR will be equipped with the largest reflector antenna ever launched by NASA and its primary goals include tracking subtle changes in the Earth’s surface, spotting warning signs of imminent volcanic eruptions, helping to monitor groundwater supplies and tracking the rate at which ice sheets are melting.

The name NISAR is short for NASA-ISRO-SAR. SAR here refers to the synthetic aperture radar that NASA will use to measure changes in the surface of the Earth. Essentially, SAR refers to a technique for producing high-resolution images. Because of the precision, the radar can penetrate clouds and darkness, which means that it can collect data day and night in any weather.

During the course of three years, the images will allow scientists to track changes in croplands, hazard sites and will help them to monitor crises such as volcanic eruptions. “The images will be detailed enough to show local changes and broad enough to measure regional trends. As the mission continues for years, the data will allow for better understanding of the causes and consequences of land surface changes, increasing our ability to manage resources and prepare for and cope with global change,” NASA has said.

The images will be able to capture changes in the Earth caused by certain activities. For instance, drawing drinking water from an underground aquifer can leave signs on the surface. If too



Artist concept of the Nasa-Isro synthetic aperture radar (NISAR) satellite in orbit. (Source: NASA)

much of it is drawn out, the ground begins to sink, which is what scientists believe the images will be able to show them.

“NISAR is an all-weather satellite that’s going to give us an unprecedented ability to look at how Earth’s surface is changing,” Paul Rosen, NISAR project scientist at JPL was quoted as saying in a NASA statement.

<https://indianexpress.com/article/explained/nasa-isro-joint-mission-nisar-7246785/>



Sat, 27 March 2021

Scientists put additive manufactured foams to the test

By Michael Padilla

Lawrence Livermore National Laboratory (LLNL) scientists recently published the results of a three-week experimental campaign at the Lab's Jupiter Laser Facility to test the performance of laser-heated additive manufactured foams.

The project helps support two major Laboratory focus areas, including helping to advance additive manufacturing and by enabling improvements in performance of hohlraums—which are laser-heated cavities that produce an X-ray radiation drive that implodes a deuterium-filled capsule.

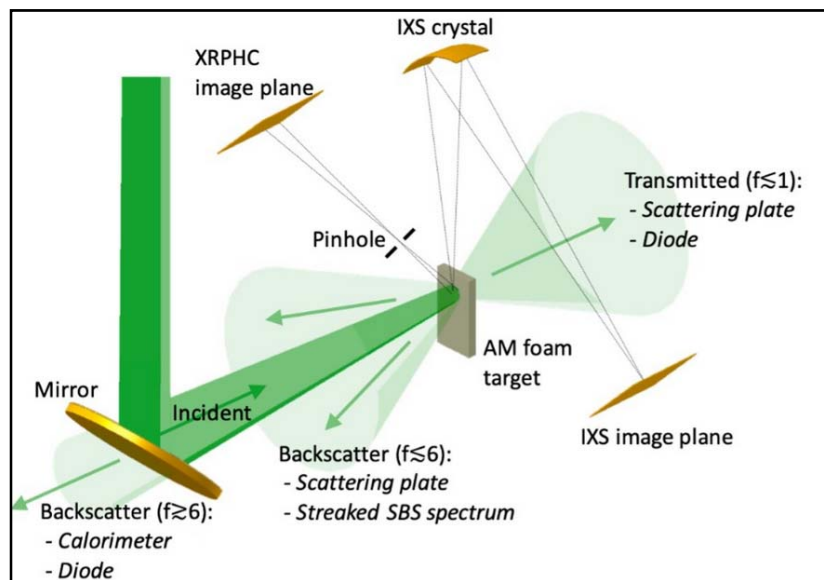
The work also supports the advancement of the state-of-the-art in high energy density science. In particular, by enabling more efficient hohlraums, it should help reach the inertial confinement fusion (ICF) program goal of achieving ignition in the laboratory.

Oggie Jones, lead author of the work which was featured in *Physics of Plasmas*, said to the team's knowledge this was first time experiments have been made on laser-heated structured additive manufactured foams.

The major findings in the research showed that laser-heated additive manufactured foams behaved in many ways similarly to chemical (aerogel) foams of similar densities. The amount of backscattered laser light for a given laser intensity and the propagation speed of a thermal wave though the plasma were similar.

"This was true even though the additive manufactured foams have filamentary structures of order 100 times thicker than chemical foams of the same density," Jones said. "The additive manufactured foams themselves were also found to behave fairly independently of the scale size."

The team tested geometrically similar additive manufactured foams, one with 0.5 micron-thick filaments and one with 10-micron thick filaments. The backscatter and X-ray image signatures



LLNL researchers present new experimental data on laser-heated additive manufactured foams. Samples of four different types of printed manufactured foams were heated using a single 527 nm laser beam at the Jupiter Laser Facility. This image depicts one of the experiments performed using forward and backward unabsorbed and scattered light. Credit: Lawrence Livermore National Laboratory

were nearly indistinguishable. The team found that published foam analytical models were generally able to explain the measured thermal propagation speeds and temperatures measured in the experiments.

Jones explained that the use of foam materials in hohlraums opens up new design possibilities in indirect drive in inertial confinement fusion. In particular, foams can be placed inside the hohlraum to line the walls.

"If the density of the foam is carefully selected, it is possible to change how the hohlraum wall material expands with time and thus potentially improve the symmetry of the radiation drive onto the ICF capsule," he said.

In addition, very low density foams doped with various elements can be used to tailor the plasma conditions inside the hohlraum and potentially mitigate laser plasma interactions (laser backscatter). Additive manufactured foams allow the finest control over the plasma conditions. Density and dopant gradients can be built into the foam. Since these foams are inside the hohlraum, the way they are heated by the laser is key to understanding their overall impact on hohlraum performance.

The experiments used a single 527-nanometer (green) laser beam. The laser pulse was 200 joules, about two nanoseconds in duration and resulted in a peak laser intensity of 3×10^{14} W/cm² on the foam targets. During a week of beam time, the team shot approximately 20 different foam targets.

Elijah Kemp served as lead experimentalist on this project and coauthors included Steve Langer, Benjamin Winjum, Dick Berger, James Oakdale, Mikhail Belyaev, Juergen Biener, Monika Biener, Derek Mariscal, Jose Milovich, Michael Stadermann, Phil Sterne and Scott Wilks.

A second paper on this research, focused on numerical simulations of these experiments, also has been accepted for publication by Plasma Physics and Controlled Fusion. Authors include Jose Milovich, Ogden Jones, Dick Berger, Elijah Kemp, James Oakdale, Juergen Biener, Mike Belyaev, Derek Mariscal, Steve Langer, Phil Sterne, Scott Sepke and Michael Stadermann.

The novel foam targets were produced at LLNL by a group led by Stadermann, Juergen Biener and Oakdale.

The work was funded by LLNL's Weapons and Complex Integration Laboratory Directed Research and Development (LDRD) program titled "Foams in Hohlraums."

This research has led to a follow-on LDRD project titled "Foam Fills for LPI Suppression." In this project, researchers will explore specific low-density foam fill configurations that lead to reduced backscatter in ICF hohlraums.

"If successful, this research could enable hohlraums to operate at fill densities that did not work with simple helium gas fills," Jones said. "This would open up an area of design space that was previously closed due to excessive laser backscatter."

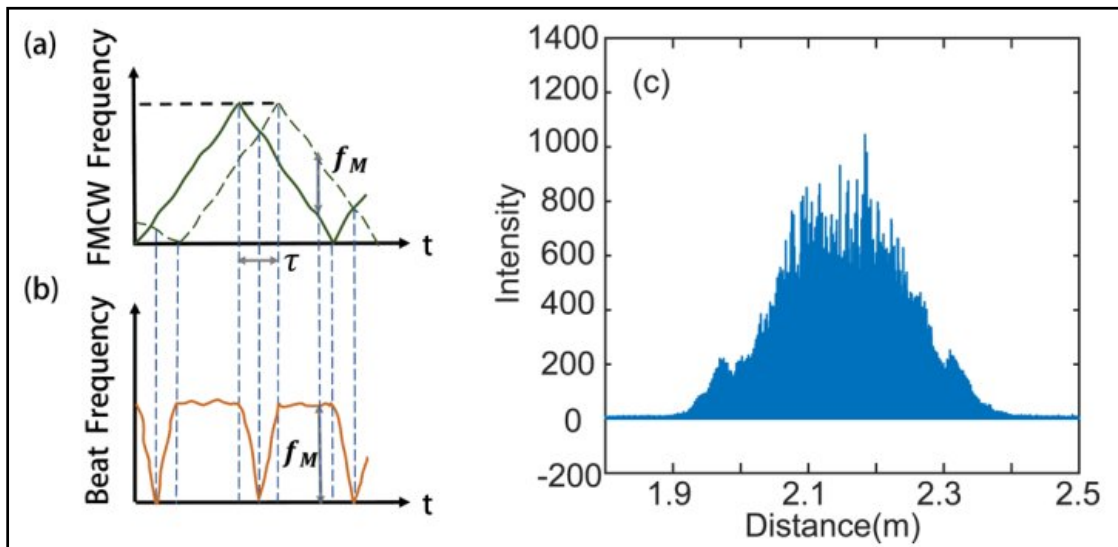
More information: O. S. Jones et al. Experimental and calculational investigation of laser-heated additive manufactured foams, *Physics of Plasmas* (2021). [DOI: 10.1063/5.0032023](https://doi.org/10.1063/5.0032023)

Journal information: [Physics of Plasmas](https://phys.org/news/2021-03-scientists-additive-foams.html)
<https://phys.org/news/2021-03-scientists-additive-foams.html>

LiDAR acquires ranging signals with micron accuracy

By Zhang Nannan

Light Detection And Ranging (LiDAR) has been well known as it offers high ranging accuracy, and shows promising prospects in autonomous vehicles and various field. Traditional frequency modulated continuous wave (FMCW) LiDAR ranging is based on heterodyne detection, calculating unknown distance by extracting the frequency of the interference signal. However, such technique suffers from frequency modulation (FM) nonlinearity, which leads to inaccurate ranging results.



Due to the nonlinear relationship between the laser wavelength and injection current, the spectrum of the beat signal is broadened although the laser emits a triangle signal.

To solve the problem, a research team led by Prof. Zhang Wenfu from the Xi'an Institute of Optics and Precision Mechanics (XIOPM) of the Chinese Academy of Sciences (CAS) proposed a new approach that samples the ranging signals at equal frequency intervals using microresonator soliton comb. The results were published in *Optics Letters*.

In the new system, accurate beat frequency is not required so that the data processing step is significantly simplified. Instead, the unknown distance is given by the linear relationship between the measured frequency interval and the corresponding phase of the ranging signal.

Furthermore, thanks to the stable frequency characteristics of the soliton comb ensure accurate sampling, the system is almost impervious to external interference. The optical path of the system is almost unaffected by ambient temperature and humidity since the long optical fiber is not been used.

The experiment shows the ranging error is less than 20 μm at a measuring distance of 2 meters, the promising result and the advantages described above indicate the proposed approach has a strong application potential in precision manufacturing.

More information: Linhua Jia et al. Nonlinear calibration of frequency modulated continuous wave LIDAR based on a microresonator soliton comb, *Optics Letters* (2021). DOI: [10.1364/OL.415524](https://doi.org/10.1364/OL.415524)

Journal information: [Optics Letters](#)

Provided by [Chinese Academy of Sciences](#)

<https://phys.org/news/2021-03-lidar-ranging-micron-accuracy.html>

Automated alignment of optical fibers reduces errors and cost in photonic chip production

Photonic chips can play a crucial role in applications such as autonomous driving or medical imaging due to their capacity for extremely fast and energy-efficient data transmission. However, their adoption is currently held back by the considerable cost involved in the production of these devices. Ph.D. candidate Matthijs van Gastel has developed new ways of assembling photonic devices using glue, which is accurate at the sub-micrometer scale. The researcher at the Control Systems Technology group in the department of Mechanical Engineering defended his thesis on 25 March.

In today's society, the need for data transmission is growing exponentially. Photonic chips show great potential for energy-efficient data transmission with high bandwidth. These chips are relying on information transfer based on light as opposed to electrons in the conventional electric chips.

Photonic chips enable many new applications such as sensors for autonomous driving cars or new medical imaging techniques. An increasingly important issue for enabling large scale adoption of photonic chips is their assembly and packaging. These processes are currently estimated to account for more than 50 percent of the total cost of a photonic device.

Especially the coupling of optical fibers, which are used to guide light in and out of the photonic device, is critical as they require sub-micrometer alignment. Current fiber alignment methods can either not cope with these alignment requirements or are not suitable for large-scale production. Furthermore, current methods are often labor intensive and time-consuming.

Optical fiber array

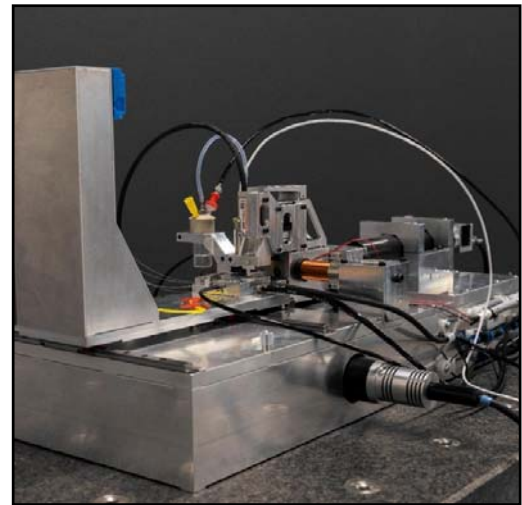
In his thesis Van Gastel describes the development of a new optical fiber array for efficient coupling of multiple fibers to photonic chips that is accurate at a sub-micrometer scale.

The first part of the thesis focuses on the development of the new optical fiber array. In this array multiple optical fibers are positioned next to each other and fixated to a glass plate using glue. Current fiber arrays struggle to reach the sub-micrometer accurate alignment for photonic chips since they are unable to compensate for the variance in production quality (so-called production tolerances) of optical fibers. In the new fiber array the position of the fiber is measured using a camera system to compensate for these production tolerances.

The glue can then be cured to fixate the fiber to the glass plate. Glue is prone to shrinkage that can disturb the fiber alignment. It also tends to slowly change shape over the years, which can disrupt the fiber alignment. The researcher performed simulations and experiments to investigate the suitability of the glue fixation process for fiber alignment. The results showed a very predictable behavior of the glue process making it suitable for optical fiber alignment.

Designing the fiber array assembly machine

The second part of the thesis focused on the design of an assembly machine for the newly developed optical fiber array. For this, the researcher used automatization, thus ensuring a high accuracy fiber alignment while simultaneously reducing costs and increasing throughput.



The realized fiber array assembly machine. Credit: Eindhoven University of Technology

The machine design consists of three translational motion axes to align the fibers on the substrate in the most critical alignment directions. The designed high precision motion axes are able to align the fibers with nanometer accuracy. Due to its compact and modular design, the alignment machine can be easily expanded to larger production lines.

From design to machine

During this Ph.D. research Van Gastel also built and tested a hardware realization of the machine design. The machine is able to assemble a 16-fiber array within four minutes, significantly faster than traditional fiber alignment methods, which can take between two minutes to one hour per single fiber.

Furthermore, the assembled arrays showed an approximately right to 18 times smaller alignment errors when compared to the currently employed fiber arrays.

This research can therefore be an important step for enabling large scale adaptation of photonic chips by providing a faster, more accurate and more cost-effective assembly process of optical fibers.

More information: Automated Sub-micron Accurate Optical Fiber Alignment for Photonic Applications. pure.tue.nl/ws/portalfiles/portal/20210325_Gastel.pdf
<https://phys.org/news/2021-03-automated-alignment-optical-fibers-errors.html>

COVID-19 Research News



Sun, 28 March 2021

Brazil, South Africa Covid variants are less susceptible to antibodies: Study

- *Variant forms of the novel coronavirus which were first reported in South Africa and Brazil are less efficiently inhibited by antibodies from recovered patients and vaccinated individuals, a new study confirms*

Berlin: Variant forms of the novel coronavirus which were first reported in South Africa and Brazil are less efficiently inhibited by antibodies from recovered patients and vaccinated individuals, a new study confirms.

According to the research, published in the journal Cell, recovery from COVID-19 as well as vaccination may offer only incomplete protection against these mutant virus forms.

"This is worrisome because the rapid spread of variants that might not be efficiently inhibited by antibodies could undermine our current vaccination strategy," said Stefan Pohlmann, a co-author of the study from the German Primate Center in Gottingen.

These virus variants have mutations in the spike protein -- the structure on the surface of the virus that is responsible for attachment to host cells -- the researchers said.

In order for the virus to enter a cell, they said it must first attach to the host cell surface using its spike protein, which is located on the viral envelope.

The spike protein is also the target for antibody therapies and vaccines aimed at preventing the virus from replicating in the body, they researchers added.

Based on the research, the scientists said an antibody used for COVID-19 therapy did not inhibit the South African and Brazilian coronavirus variants -- B.1.351 and P.1.

"Moreover, these variants were less well inhibited by antibodies from convalescent or vaccinated individuals, they partially bypassed the neutralising effect of the antibodies," said Jan Munch, another co-author of the study.

The study noted that vaccination or recovery from COVID-19 may offer reduced protection from SARS-CoV-2 variants B.1.351 and P.1.

"Our findings show that it is important to limit the spread of the virus as much as possible until widespread vaccination is feasible. Otherwise, we risk the emergence of new variants that cannot be effectively controlled by the currently available vaccines," said Markus Hoffmann, first author of the study.

<https://www.livemint.com/science/health/brazil-south-africa-covid-variants-are-less-susceptible-to-antibodies-study-11616929737017.html>

