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Thu, 14 Jul 2022

A Look at India's Indigenously-Developed Advanced High-Speed Expendable Aerial Target Drone ABHYAS

Developed and designed by DRDO, ABHYAS is a 75-kg drone that will be used as a target for various missile systems. Capable of attaining an altitude of more than five kilometres at half the speed of sound, it can also be used as a decoy aircraft. The air vehicle was launched using twin under-slung boosters, which provide the initial acceleration to the vehicle. (Image: DRDO). India on Wednesday successfully flight-tested the indigenously-developed High-speed Expendable Aerial Target (HEAT), ABHYAS from the Integrated Test Range (ITR) in Chandipur off the Odisha coast. The performance of the aircraft at low altitude, including sustained level and high manoeuvrability, was demonstrated during the test flight.



The target aircraft was flown from a ground-based controller in a pre-designated low-altitude flight path, which was monitored by various tracking sensors deployed by ITR, including radar and an electro-optical targeting system.

What Is It?

Developed and designed by Aeronautical Development Establishment of Defence Research and Development Organisation (DRDO), ABHYAS is a drone that will be used as a target for various missile systems.

It can also be used as a decoy aircraft, if needed.

As per The Week, ABHYAS is designed to offer a realistic threat scenario for the practice of weapon systems. But it is much more than an aerial target . Besides for training purpose, it can be used for multiple things. It is the country's first locally developed system. The services can launch it with the help of a laptop anywhere, as per the report.

How Does It Work?

Capable of fully-autonomous flight, the target aircraft runs on a gas turbine engine is equipped with a micro-electromechanical systems-based inertial navigation system. It also has a flight control computer for guidance and control along with a radio altimeter for very low-altitude flight and a data link for encrypted communication. Having a length of 2,385 mm and diameter of 180 mm, the drone weighs around 75 kg. With a speed of Mach 0.5, it can attain an altitude of more than five kilometres and can cover a distance of 400 kilometers. According to DRDO, the test vehicle met “the user requirement of 5 km flying altitude, vehicle speed of 0.5 Mach [half the speed of sound], endurance of 30 minutes and 2G turn capability”. The air vehicle was launched using twin under-slung boosters, which provide the initial acceleration to the vehicle. It is powered by a small gas turbine engine to sustain a long endurance flight at high subsonic speed.

What Experts Said

A scientist privy to the development of the system told The Week, “The primary purpose is to sharpen the existing air-defence mechanism that is why it is named as ABHYAS (means practice). These targets imitate fighter aircraft. These are peacetime operations to hone your skills.” “If intelligently used, ABHYAS can cause huge damage to the enemy by its multiple applications. It is a very good aerial asset,” said former ADE director PS Krishnan who launched the project. “ABHYAS has multiple applications. Its Radar Cross Section is increased 50 times to imitate a fighter jet. It also has a potential to be converted into a high speed subsonic missile. It can act as a decoy and also function as a jammer platform,” a scientist explained. “It is capable to carry warheads. But in its present form ABHYAS is not meant for that. But in near future, it can be used depending upon your requirement.”

Defence minister Rajnath Singh congratulated DRDO and the armed forces for the successful flight trial of ABHYAS, and said that the development of this system will meet the requirements of aerial targets. DRDO chairman G Satheesh Reddy lauded the efforts of the teams associated with the design, development and testing of the system. The DRDO earlier conducted a successful ABHYAS flight test in 2019 in Odisha.

<http://www.indiandefensenews.in/2022/07/a-look-at-indias-indigenously-developed.html?m=1>



Press Information Bureau
Government of India

Ministry of Defence

Wed, 13 Jul 2022 2:39PM

Raksha Mantri Shri Rajnath Singh Exhorts Non-Official Directors of DPSUs to Safeguard National Interests by Striving to Achieve ‘Aatmanirbhar Bharat’

Terms them as vigil keepers who can guide DPSUs to become world’s best through constructive suggestions

Raksha Mantri Shri Rajnath Singh has exhorted the Non-Official Directors (NODs) of Defence Public Sector Undertakings (DPSUs) to ensure smooth implementation of various initiatives taken by the Government towards achieving ‘Aatmanirbharta in Defence’. He was addressing the CMDs and NODs of DPSUs during first-of-its kind workshop organised by Department of Defence Production in New Delhi on July 13, 2022. Shri Rajnath Singh asserted that the country is witnessing a transitional phase towards self-reliance and active & collective efforts are central to realise Prime Minister Shri Narendra Modi’s vision of ‘Aatmanirbhar Bharat’.

Shri Rajnath Singh listed out various initiatives taken by MoD to achieve self-reliance, including simplification of acquisition process of defence equipment/platforms under Defence Acquisition Procedure 2020; flexibility in Offset guidelines; increase in FDI limit to 74% under Automatic Route and up to 100% under government route; simplification of process of obtaining license; launch of Innovations for Defence Excellence (iDEX) initiative and enhanced use of Artificial Intelligence in the defence sector. He added that MoD has set a target of Rs 1.75 lakh crore of defence production by 2025, which includes export of Rs 35,000 crore. He exuded confidence that the DPSUs will play a major role in achieving this goal with a contribution of 70-80 per cent, urging CMDs & NODs to work hand-in-hand to ensure that these public sector companies find place among world’s best in different fields.

The Raksha Mantri described NODs as a bridge between DPSUs and MoD, which not only strengthens corporate governance in public sector companies, but also ensures that the work is carried out as per the policies of the Government. Identifying freedom in giving suggestions as their biggest strength, he called upon the NODs to scrutinise the performance of the management according to the objectives of the government; make value addition to the decision making through positive inputs & constructive criticism and protect the interests of the DPSUs, the Government and above all the nation. Shri Rajnath Singh termed NODs as vigil keepers who

keep a close watch on the strategy, performance, risk management, resources, key appointments, CSR, sustainable development and standards of conduct of DPSUs. He highlighted the valuable contribution of NODs in helping the DPSUs reach their goals, urging them to introduce best practices prevalent in the private sector and share insights & guidance in policy making. The NODs must encourage the DPSUs for greater R&D and motivate them for sensible risks, he added. Lauding the DPSUs for their outstanding performance in recent years, the Raksha Mantri called upon the CMDs to take appropriate action on the suggestions of NODs.

In his closing remarks, Raksha Rajya Mantri Shri Ajay Bhatt called upon the CMDs of DPSUs to tap the potential of NODs who possess a proper balance of skills, experience, freedom and knowledge of the private sector. He pointed out that the NODs can promote the principles of corporate governance and enhance the credibility & accountability of DPSUs, thereby improving their efficiency. He urged the NODs to strike a balance between the interests of the management & shareholders and contribute in decision making. Throwing light on the roles and responsibilities of NODs, Defence Secretary Dr Ajay Kumar urged them to provide a thrust to the efforts of DPSUs towards self-reliance. He called upon them to provide valuable suggestions to develop indigenous state-of-the-art technologies/equipment for the Armed Forces and increase exports, with focus on enhancing collaboration with the industry, academia & start-ups. He emphasised on the need for active involvement of NODs to make the DPSUs globally competitive. He called for formulating a roadmap that can place 20 Indian defence manufacturing companies among the world's top 100 defence enterprises by 2047.

The aim of the workshop was to sensitise the NODs about their role and responsibilities and help them to improve the performance of DPSUs. The NODs play a significant role in the Board of Central Public Sector Enterprises. They help in bringing an independent judgement, bring an objective view in the evaluation of the performance of Board & Management; facilitate quality standards for products and services of the company; balance the interests of the stakeholders and encourage in adopting green technologies and resource conservation practices by the company.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1841184>



Thu, 14 Jul 2022

Defence Ministry Targets Rs 1.75 Lakh Cr of Defence Production by 2025

Raksha Mantri Shri Rajnath Singh has exhorted the Non-Official Directors (NODs) of Defence Public Sector Undertakings (DPSUs) to ensure smooth implementation of various initiatives taken by the Government towards achieving 'Atmanirbharta in Defence'. He was addressing the CMDs and NODs of DPSUs during first-of-its kind workshop organised by Department of Defence Production in New Delhi on July 13, 2022. Shri Rajnath Singh asserted that the country is witnessing a transitional phase towards self-reliance and active & collective efforts are central to realise Prime Minister Shri Narendra Modi's vision of 'Aatmanirbhar Bharat'.

Shri Rajnath Singh listed out various initiatives taken by MoD to achieve self-reliance, including simplification of acquisition process of defence equipment/platforms under Defence Acquisition Procedure 2020; flexibility in Offset guidelines; increase in FDI limit to 74% under Automatic Route and up to 100% under government route; simplification of process of obtaining license; launch of Innovations for Defence Excellence (iDEX) initiative and enhanced use of Artificial Intelligence in the defence sector.



He added that MoD has set a target of Rs 1.75 lakh crore of defence production by 2025, which includes export of Rs 35,000 crore. He exuded confidence that the DPSUs will play a major role in achieving this goal with a contribution of 70-80 per cent, urging CMDs & NODs to work hand-in-hand to ensure that these public sector companies find place among world's best in different fields. The Raksha Mantri described NODs as a bridge between DPSUs and MoD, which not only strengthens corporate governance in public sector companies, but also ensures that the work is carried out as per the policies of the Government. Identifying freedom in giving suggestions as their biggest strength, he called upon the NODs to scrutinise the performance of the management according to the objectives of the government; make value addition to the decision making through positive inputs & constructive criticism and protect the interests of the DPSUs, the Government and above all the nation.

Shri Rajnath Singh termed NODs as vigil keepers who keep a close watch on the strategy, performance, risk management, resources, key appointments, CSR, sustainable development and standards of conduct of DPSUs. He highlighted the valuable contribution of NODs in helping the DPSUs reach their goals, urging them to introduce best practices prevalent in the private sector and share insights & guidance in policy making. The NODs must encourage the DPSUs for greater R&D and motivate them for sensible risks, he added. Lauding the DPSUs for their outstanding performance in recent years, the Raksha Mantri called upon the CMDs to take appropriate action on the suggestions of NODs. In his closing remarks, Raksha Rajya Mantri Shri Ajay Bhatt called upon the CMDs of DPSUs to tap the potential of NODs who possess a proper balance of skills, experience, freedom and knowledge of the private sector. He pointed out that the NODs can promote the principles of corporate governance and enhance the credibility & accountability of DPSUs, thereby improving their efficiency. He urged the NODs to strike a balance between the interests of the management & shareholders and contribute in decision making.

Throwing light on the roles and responsibilities of NODs, Defence Secretary Dr Ajay Kumar urged them to provide a thrust to the efforts of DPSUs towards self-reliance. He called upon them to provide valuable suggestions to develop indigenous state-of-the-art technologies/equipment for the Armed Forces and increase exports, with focus on enhancing collaboration with the industry, academia & start-ups. He emphasised on the need for active involvement of NODs to make the DPSUs globally competitive. He called for formulating a

roadmap that can place 20 Indian defence manufacturing companies among the world's top 100 defence enterprises by 2047. The aim of the workshop was to sensitise the NODs about their role and responsibilities and help them to improve the performance of DPSUs. The NODs play a significant role in the Board of Central Public Sector Enterprises. They help in bringing an independent judgement, bring an objective view in the evaluation of the performance of Board & Management; facilitate quality standards for products and services of the company; balance the interests of the stakeholders and encourage in adopting green technologies and resource conservation practices by the company.

<http://www.indiandefensenews.in/2022/07/defence-ministry-targets-rs-175-lakh-cr.html?m=1>

Business Standard

Thu, 14 Jul 2022

India is Witnessing Transitional Phase Toward Self-Reliance in Defence Sector: Rajnath Singh

Singh said senior officials of defence PSUs should work together to ensure that their companies are among world's best. Speaking at an event, Singh said the defence ministry has set a target of Rs 1.75 lakh crore of defence production by 2025, which includes export of Rs 35,000 crore. Singh was addressing the Chairman and Managing Directors (CMDs) and Non-Official Directors (NODs) of Defence Public Sector Undertakings (DPSUs) during first-of-its kind workshop organised by Department of Defence Production in New Delhi on 13 July 2022. He exuded confidence that the defence public sector undertakings (PSUs) will play a major role in achieving this goal with a contribution of 70-80%, urging chairman and managing directors and non-official directors to work hand in hand to ensure that their companies find a place among world's best in different fields.

Singh listed various initiatives taken by the defence ministry to achieve self-reliance, including simplification of acquisition process of defence equipment and platforms under Defence Acquisition Procedure 2020 and an increase in FDI limit to 74% under automatic route and up to 100% under government route. Singh called for formulating a roadmap that can place 20 Indian defence manufacturing companies among the world's top 100 defence enterprises by 2047.

https://www.business-standard.com/article/news-cm/india-is-witnessing-transitional-phase-toward-self-reliance-in-defence-sector-rajnath-singh-122071400184_1.html

Thu, 14 Jul 2022

Love to Wear Camouflage? Beware! Indian Army Warns Shopkeepers Selling Unauthorised Combat Uniforms

In an effort to stem unauthorised proliferation of new pattern combat dress of the Indian Army, Military Police along with Delhi police are carrying out an awareness campaign in the Delhi Cantonment. Talking to Financial Express Online, sources said, “In April 2022, on the new combat uniform which was unveiled in January this year, the Indian Army has already established the ownership on the pattern and design. They have applied to the Office of the Controller General of Patents, Designs and Trade Marks. And now the Intellectual Property Rights (IPR) processes are expected soon.” According to sources, by August, the newly introduced combat uniform is going to be available through the Central Procurement and Canteen Stores Department (CSD). All Army personnel will buy the material from the CSD and get it stitched as per their measurements and this will be to supplement the combat uniforms which have been issued to them as part of personal kit under Life Cycle Clothing.

Security Concerns

According to sources two major issues have been flagged in respect of the new combat uniform. These include: Security concern and the fear of serving personnel wearing unauthorised pattern combat dress. The major cause of concern is security — because of the uncontrolled proliferation of existing combat uniforms, there have been vulnerabilities in security in the military establishments. Now, the Indian Army has chalked out plans to take tough action against the dealers who are selling unauthorised but almost similar looking uniforms (read patterns) and fabric. There are several shops stocking and selling unauthorised variants of the new combat pattern of the Indian Army. Because of this unauthorised material being available in the market, there is fear that any inimical elements would easily buy the material and get it tailored and then try to get into the military establishments.

Two Pronged Approach

Sources have confirmed to Financial Express Online that instructions have been issued which have prohibited any serving Army personnel to purchase the new patterned uniform from unauthorised vendors. Once the IPR process is completed, the Army will be able to take legal action and subsequently prosecute the unauthorised shopkeeper selling the combat dress material. Earlier this week on Monday keeping in line with the security requirements, in coordination with Army authorities Delhi police went around sensitizing the shopkeepers in the Delhi Cantonment area. The purpose of this intervention was to dissuade them from selling unauthorised combat uniforms. “In the interest of national security, they have agreed to cooperate with the authorities,” sources said.

All you want to know about the new uniform

Financial Express Online had reported earlier this year that the new patterned and designed combat uniform was unveiled during the annual Army day Parade in New Delhi. All the soldiers

of the Indian army will now be seen in the combat uniform, which will also cater for gender specific changes for women combatants. The Army plans to provide the best quality, stronger and operational digital camouflage pattern, which is suitable for all terrains, it is lighter, and stronger. The new uniform is unique said sources as the creation of it has an exclusive digital camouflage pattern – which is contemporary & functional design. The fabric is more breathable and stronger. And it is because of this reason that the Indian Army wants to adopt control measures in an effort to maintain its exclusivity.

A deliberate roll-out plan

The Indian Army Headquarters has plans to roll out with the new design and pattern gradually. And the aim is to ensure that the entire Army has the new combat uniform by 2025. This has been done keeping in mind the availability of the stocks and the life of the present uniforms the personnel are wearing. This new uniform has been designed based on the collaboration between the Indian Army and National Institute of Fashion Technology (NIFT). Financial Express Online had reported in January that the NIFT had a team of eight members – professors and students who worked on the design of the uniform based on the specifications and requirements of the army.

What is different?

It is effective operationally; designed ergonomically. Now, there is no need to have different sets of uniforms for different terrains. So far there are different sets of uniforms for desert warfare, jungle warfare. Besides the disruptive pattern, there are few changes in the new uniform. The fabric is very light, and the design is to protect the personnel against the tough climatic conditions in different terrain. It is very comfortable, according to the Indian Army and it has camouflage and will now increase survivability. The NIFT had experimented with four different fabrics; and eight different designs and almost 15 different patterns before the final design was firmed up and locked.

About the Fabric

It is a combination of cotton and polyester – 70:30 ratio. And, more durable during summers and winters.

The Disruptive Pattern

There is a mix of colours. Earthen shades, and Olive Green—as the uniform is meant to be worn during summers and extreme weather conditions and will be worn in different terrains. The new uniform is multi-terrain friendly, and will also act as a camouflage. The soldiers will not tuck in, and there will be a T-shirt inside with a digital disruptive pattern and is more like a pixelated design. And for women officers, slight modifications have been made.

What was the need to change the uniform?

The change has been done due to security concerns. And the changes have been made after several rounds of discussions with all the stakeholders and also studying the uniform patterns and designs of other countries.

<https://www.financialexpress.com/defence/love-to-wear-camouflage-beware-indian-army-warns-shopkeepers-selling-unauthorised-combat-uniforms/2592819/lite/>



Tue, 12 Jul 2022

India Will Soon Have Two Aircraft Carriers as Debate Continues for Third One

India will soon add to its Naval muscle as 'INS Vikrant', after successfully completing its fourth phase of sea trials, is ready to be commissioned in the Indian Navy on the nation's Independence Day. Codenamed IAC-1, India's largest indigenous warship weighs 44,000 tonnes. The INS Vikrant has been designed by the Indian Navy's Directorate of Naval Design (DND) and was built at Cochin Shipyard Limited (CSL), a public sector shipyard, which falls under the Ministry of Shipping. India has only one aircraft carrier as of today - the INS Vikramaditya. It is of Russian origin. The IAC-1 is built at a cost of Rs 23,000 crore and is named after India's first aircraft carrier INS Vikrant, a 19,500-tonne warship operated by the Navy from 1961 and decommissioned in 1997. It played a crucial role in the 1971 Indo-Pak war.

The IAC-1 will be the fourth aircraft carrier to be operated by Indian Navy. India bought INS Vikrant and INS Viraat from the UK and commissioned them in 1961 and 1987 respectively. INS Vikramaditya was bought from Russia in 2013 and belongs to the Kiev class of carriers. INS Vikrant will operate MiG-29K fighter jets, Kamov-31 helicopters and MH-60R multi-role helicopters. Aircraft carriers are command and control vessels that also double as mobile airbases. However, they are not just tools of war. They serve a function of military diplomacy as well. India has a coastline of about 7,500 km. The country is surrounded by the Bay of Bengal in the east, the Arabian Sea in the west, and the Indian Ocean to the south. The fact that INS Vikrant is made in India gives it all the more edge and adds credibility to India's make-in-India push. The earlier aircraft carriers were either built by the British or the Russians. With the commissioning of the Vikrant, India will join a list of select few nations -- the US, the UK, Russia, France and China -- which have the capability to build aircraft carriers.

The length of the INS Vikrant is said to be 262 metres, its height is 59m while its width is 62m. It reportedly has 14 decks and 2,300 compartments. Debate on 3rd carrier Intense debate is going on about whether India needs more aircraft carriers or submarines. The Indian Navy has 15 conventional submarines as of now and it also possesses one nuclear ballistic missile submarine, the (SSBN) INS Arihant. The need for a third aircraft carrier is also a point of discussion. It is said the third carrier can ensure two are always battle-ready while one undergoes maintenance. Reports suggest that the Indian Navy has readied the blueprint for another indigenously made aircraft carrier IAC 2, or INS Vishal. The Navy feels a third aircraft carrier is an operational necessity. However, the late Chief of Defence Staff, General Bipin Rawat had felt that the Navy did not need aircraft carriers. The Navy disagrees. Admiral Shekhar Sinha while talking to News9 said India must build one more carrier to get the total number to three.

"At present, we have just one aircraft carrier. Any maintenance will render it non available in terms of air power at sea and therefore Air Defence & Air superiority in the Indian Ocean. India needs two operational carriers at any given time for security on Eastern and Western seaboard. That implies that a total of three carriers will ensure the availability of two active and one in

maintenance. Thereafter the replacements must be built well in time before any of the three carriers is nearing the end of service life." In fact, submarines and aircraft carriers play a crucial role in wars. The aircraft carriers can prove to be instrumental in taking the war to the enemy's patch, submarines are known for their stealth and the ability to carry out lone-wolf attacks. "The debate of submarines versus carriers is an old one. Each type of platform has a specific role to play and therefore it must not be seen as either-or. It's like saying that legs be used as hands," Admiral Sinha said. "Navies are required to be developed as a five-dimensional force. Surface, sub-surface, air, space & Cyber. There is no choice if we have to be a regional power," the Admiral added. Captain DK Sharma, former Spokesperson Navy while talking to News9 said India's requirement is for three carriers, "If you look at the bigger plans we have always been working towards it. If you go back in history, the first aircraft carrier came sometime in the 60s and it was available towards the 1971 war and then after that in 1987, we got the second carrier, Viraat. Both of them operated together.

When the first one was laid off, the approval for the replacement carriers were already in place. That is what came as Vikramaditya in 2014." He stressed the need for having one more aircraft carrier. "We have laid off Viraat in 2017 and we were in dire need of one more carrier so that both east and west coasts of India are well guarded. We will have two operational carriers now, one is INS Vikramaditya and INS Vikrant. Plans for the third one are still being worked on." He went on to say, "Both, carriers and submarines, have specific roles to play, you can't compare apples with oranges. People who know the Navy are very well versed with this aspect; they understand there has to be a very fine balance between all the assets whether it's a submarine, a strategic submarine, an aircraft carrier or drones. I think we can leave that to the planners and our top leadership.

<https://www.news9live.com/india/india-will-soon-have-two-aircraft-carriers-as-debate-continues-for-third-one-182161?infinitescroll=1>



Thu, 14 Jul 2022

Agnipath scheme: Women Sailors may be Deployed on Largest Indigenous Warship Vikrant

Some of the women sailors, who will be inducted into the navy as Agniveers early next year, are likely to be deployed on India's first indigenous aircraft carrier Vikrant, the largest warship to be built in the country and set to be commissioned into the navy in a month, people familiar with the matter said on Wednesday. Women are being recruited into the navy for the first time in the personnel below officer rank (PBOR) cadre under the government's new Agnipath model for short-term induction of soldiers in the three services, and they will be deployed on warships based on the vacancies and facilities on board, said one of the officials cited above, who asked not to be named.

The navy is set to commission Vikrant around Independence Day next month, and the carrier will significantly boost the country's naval presence and its reach. The warship, with a

displacement of 37,500 tonnes, will operate MiG-29K fighter jets, a new deck-based fighter the navy is planning to buy (it has already tested Boeing's F/A-18E Super Hornet and Dassault Aviation's Rafale-M) Kamov-31 helicopters, MH-60R multi-role helicopters and the indigenous advanced light helicopters.

To be sure, women officers in the navy are currently serving on board several warships, including the country's sole aircraft carrier INS Vikramaditya. "The navy's Agniveers, including women, are likely to be deployed on several warships after they enter service next year, including the two aircraft carriers. The navy is a gender-inclusive organisation where men and women get the same opportunities," said a second official, who also asked not to be named. Up to 20% of the 3,000 candidates that the navy plans to recruit under the Agnipath scheme – a far-reaching and hotly debated recruitment reform – this year are expected to be women, the officials said. The women will undergo the same training as men, they said. The three services will recruit 46,000 Agniveers this year, with the army and air force accounting for 40,000 and 3,000 jobs, respectively.

"Women in combat is becoming the new normal now as the services have become more open-minded. We have come a long way during the last 25 years. Deploying women sailors on board warships will inspire more of them to join the navy," said Lieutenant Commander Rajeshwari Kori (retd), who was part of a short-lived navy experiment to deploy women on warships in 1997. This comes at a time when the navy is giving women officers more opportunities to serve on board warships alongside their male counterparts, with several of them already assigned to front-line ships operating in the broad expanse of the Indian Ocean Region (IOR), as previously reported. India had on June 14 announced the new Agnipath scheme replacing the legacy system of recruitment to lower the age profile of the armed forces, ensure a fitter military and create a technically skilled war fighting force capable of meeting future challenges.

The Agnipath scheme seeks to recruit soldiers for only four years, with a provision to retain 25% of them in the regular cadre for 15 years after another round of screening. It sparked widespread protests and forced a concerted outreach by the government to scotch apprehensions about the scheme. At least six opposition MPs had on July 11 flagged concerns over the Agnipath scheme, and demanded its withdrawal during a meeting of the parliamentary consultative committee on defence. Defence minister Rajnath Singh and the three service chiefs on Monday briefed the panel on Agnipath, but some Opposition members – including those from the Congress, the Nationalist Congress Party (NCP), the Trinamool Congress (TMC) and the Rashtriya Janata Dal (RJD) – pointed out loopholes in the new recruitment scheme.

To be sure, the three services have already kicked off the recruitment process under the Agnipath scheme. It has drawn a good response from defence aspirants. The air force has received 749,899 applications, compared to 631,528 last year, which was the highest in any recruitment cycle.

<https://www.hindustantimes.com/india-news/women-sailors-may-be-deployed-on-largest-indigenous-warship-vikrant-101657737772254-amp.html>

India Intensifies Fighter Operations as China Ups Temperature Near Ladakh

India has intensified fighter operations in Ladakh, with frontline jets carrying out increased sorties including night operations, as the Chinese air force has embarked on an aggressive defence exercise across the border in Tibet. Sources said fighter aircraft including Rafales and Su 30MKIs have been operating with enhanced frequency from Leh and Thoise air bases for the past few days, even as the People's Liberation Army Air Force has activated its air defence network and is conducting a large-scale exercise involving its combat jets. On the Indian side, night flying is being undertaken with enhanced frequency, as there have been instances of Chinese fighter jets probing areas close to the contested zones in eastern Ladakh. In an instance, Chinese fighter jets flew close to a contested area at around 4 am in late June, triggering a response from the Indian side. The incident did not escalate into a bigger crisis as the Chinese combat jet did not breach the border, but a formal protest was lodged by India as per the established border talks mechanism.

Sources said the Chinese air defence network across the border, which includes the latest S-400 systems procured from Russia and locally manufactured HQ-9 systems, has been activated, and combat jets deployed at bases facing the Indian border are carrying out increased sorties. China has also moved several of its advanced J-20 fighters to an airbase close to the Indian border. Since the Galwan crisis in 2020, when the Chinese army diverted a large group of ground forces that were conducting a routine exercise to the contested areas in eastern Ladakh, Indian forces have been on high alert for any unusual activity. At the height of the crisis in 2020 and early 2021, the Indian Air Force had moved several assets to the Ladakh border, including frontline jets, combat helicopters and a range of air defence systems.

<https://economictimes.indiatimes.com/news/defence/india-intensifies-fighter-operations-as-china-raises-temperature-near-ladakh/articleshow/92836903.cms>

Eastern Ladakh Row: India, China Likely to Hold 16th Round of Military Talks on July 17

After a gap of over four months, India and China are set to resume corps commander-level talks on the eastern Ladakh border, even as the situation along the Line of Actual Control (LAC) remains tense. The 16th round of the talks is scheduled to be held on Sunday, with discussions focusing on easing of tensions at the flashpoints in Depsang plains, Patrol Point 15 and the Charding nullah at Demchock. The last round of talks was held in March, with little headway

being made in resolving the remaining flashpoints or withdrawing troops posted along the border. The situation at the LAC remains tense as both sides have deployed over 50,000 soldiers each to the frontier, with strong defences dug at forward areas. As reported by ET, the region has seen intensified air operations in the past few days as well, with the Chinese air force undertaking an air defence exercise. The Indian Air Force too has deployed frontline jets to the area and is conducting intense sorties, besides keeping a watchful eye on activities across the border.

The Chinese air defence network across the border has been activated, as part of the ongoing exercise. Chinese fighter jets had also flown close to a disputed site on the border in late June, triggering an official protest by India. On the border talks, officials said that discussions on all remaining flashpoints would be conducted, taking it ahead from the last round of talks held on March 11. From the Indian side, talks would be led by 14 Corps Commander Lt Gen Anindya Sengupta. This the longest gap between the many rounds of corps commander-level talks since they started following the Chinese intrusions at Galwan in 2020. While the previous rounds have led to a reduction in hostilities — with the Chinese side vacating their occupation along the Pangong Tso and withdrawing troops from Galwan and Gogra — there has been little to no progress in the last few rounds of discussions. On several occasions, both sides have reaffirmed that the border situation can only be defused through dialogue.

<https://economictimes.indiatimes.com/news/defence/eastern-ladakh-row-india-china-likely-to-hold-16th-round-of-military-talks-on-july-17/articleshow/92855763.cms>



Wed, 13 Jul 2022

India's Partnership can be 'Game Changer' in I2U2 Grouping: Former Israeli NSA

The stated purpose of the meeting of the I2U2 forum, also dubbed the new Quad, is to discuss "the food security crisis and other areas of cooperation across hemispheres" The formation of the new I2U2 grouping is a significant development where India's partnership can prove to be a "game changer", a former Israeli National Security Adviser has said ahead of the forum's first high-level meeting which Prime Minister Narendra Modi will attend virtually on Thursday. The I2U2 - comprising India, Israel, the UAE and the US - was established in October 2021 following an initiative by the four countries' foreign ministers as part of External Affairs Minister S. Jaishankar's visit to Israel. In a virtual conference, the four foreign ministers agreed to utilise complementary capabilities to fulfil overlapping interests, thus bolstering cooperation and strengthening the strategic partnership between the new Quad partners.

As Israel prepares to welcome U.S. President Joe Biden on Wednesday in a packed three-day program that includes a high-level meeting of the new I2U2 forum in which Prime Minister Modi would participate virtually, Israel's former National Security Adviser, Maj Gen Yaakov Amidror told PTI that "India can also help to enhance and expand the scope of Abraham accords bringing in new countries". "It has the ability to push others by saying that it is in the interest of

the world," said Mr. Amidror, who continues to be active with several think-tanks. Amid the building excitement around Mr. Biden's trip to the region during which Israel and the United States are expected to declare a "strategic partnership", including a joint commitment to foil Iran's nuclear ambitions using "all elements of national power", the discussion of I2U2 leaders has received wide attention. Experts believe that it has the potential to build on the Abraham accords to expand regional partnership beyond the Middle East, specifically on energy, tech and economic issues.

The stated purpose of the meeting of the I2U2 forum, also dubbed the new Quad, is to discuss "the food security crisis and other areas of cooperation across hemispheres". Israeli Prime Minister Yair Lapid and Biden in Jerusalem will be joined virtually by Prime Minister Modi and United Arab Emirates President Mohamed bin Zayed on Thursday afternoon for the discussions. The leaders' remarks at the start of the event will be broadcast live, an official release said on Tuesday. "Trade, where Israel can serve as a bridge, agriculture, food security and sophisticated technology are likely to prominently figure in the talks", Mr. Amidror said. The former Israeli NSA said that Mr. Biden's visit will definitely help build a positive momentum among Arab states looking to normalise ties with Israel and also nudge several others who are part of the "under the table crowded scene". With the Russian-Ukrainian war posing new challenges in the energy market in Europe and in the Middle East, Mr. Amidror said that Greece, Cyprus and Israel working together on natural gas pipeline projects can be an important development also in the context of the I2U2 discussions.

"Add India to this new situation, where Israel is a bridge with Europe and India another big trading partner in the whole context - it will be a game changer", he noted. The European Union, as per reports, aims to cut its reliance on Russian gas by two-thirds this year and end all Russian fossil fuel imports by 2027 due to Moscow's invasion of Ukraine. Cyprus, Greece and Israel have agreed to build the world's longest and deepest underwater power cable that will traverse the Mediterranean seabed and link their electricity grids. Dr. Oshrit Birvadker, a lecturer at IDC Herzliya and a research fellow at Jerusalem Institute for Strategy and Security, who is a foreign policy expert specialising in India, feels that one of the most important goals of Mr. Biden's visit, apart from helping to balance global oil prices and lowering US inflation ahead of the upcoming congressional elections, is to strengthen the United States' strategic alliances in the region.

"This is a direct continuation of what previous Presidents like Mr. Obama and Mr. Trump did. It is a bit reminiscent of earlier times when the United States formed identical alliances during the Cold War," Dr. Oshrit told PTI. "The I2U2 is one of many strategies designed to demonstrate the return of the American leadership to the global arena by connecting countries with common interests. The US administration sees China as a rival and tries to deal with its activities in various ways," Ms. Oshrit points out. "The U.S. is concerned with the growing Chinese presence in the Middle East, not to mention signing a 25-year strategic partnership agreement in March 2021 (with Iran) which will give Beijing a military foothold in the region. One way (of dealing with it) is, of course, to strengthen the strategic alliances", Ms. Oshrit added. Several prominent commentators in the Israeli media have also pointed out that the alliance is an effort to counter China's growing influence and foil Iran's nuclear ambitions.

Even though the forum has been touted as an economic alliance they argue that it goes hand in hand with politics and there is a major political agenda behind the grouping. Mr. Amidror points out in the context that India cannot be a part of a security alliance given its traditional ties with

Iran, but it does not stop it from being a strong economic partner. "Economic means political. This is the U.S way of dealing with its interest in the middle east and the Indian pacific by cooperating with countries who share the same vision. "A small group of this kind may push for one of the critical economic corridors, the Arab-Mediterranean corridor, which will maximize the potential and profit of any country taking part in it. For India, we know it is a net profit, mainly because of the complexity and instability presented by the INSTC path," Ms. Oshrit said.

The momentum of such a corridor strengthens India against China in competition for connectivity and is a strategic advantage for Washington. And today it is very clear that a strong India is ideal for America, she said. "Besides, by working together these countries could have the potential to prevent the global food crisis, affect food prices, keep inflation low and stabilise economies. We are all aware of the evidence of the interaction between changes in global food prices and political instability," Ms. Oshrit added. Lev Aran, a former coordinator of the Israel-India Parliamentary Friendship League and a columnist for several publications, sees India's participation in the I2U2 forum as a "final verdict" on the doubters who do not see much of a change in India's policy towards Israel and in the Middle East in general.

"It is for me the final verdict on those voices that call not to make a big deal out of this growing closeness as nothing has fundamentally changed and sides continue to play the balancing role. "Something fundamental has changed here which marks a transition in India's policy in the Middle East and I do not think that future change in governments in India would lead to backtracking in the major strides taken over the last several years", Mr. Aran said. He said most of the policymakers have slowly understood that the Palestinian issue is not the key issue in the region but a local one that the two sides have to deal with and sort out directly. Mr. Aran also sees the I2U2 forum as a part of a new profound axis which is very much a political alliance in nature as well, beyond its economic utility. "I don't think people in Tehran see it as a part of commercial cooperation. They won't buy into this argument," Mr. Aran said. The U.S. had earlier set up the Quad, the Asian Pacific Quad, with the US, Australia, India and Japan which is also seen by many as a forum to counter Chinese influence in the Indo-Pacific region.

<https://www.thehindu.com/news/national/indias-partnership-can-be-game-changer-in-i2u2-grouping-former-israeli-nsa/article65634556.ece>



Thu, 14 Jul 2022

Russia Calls Out 'Total Failure' Of US Missile Defence Program

Vyacheslav Volodin said that Pentagon making use of balloons against Russian hypersonic missiles shows the "failure" of Washington's missile defence program. Russian State Duma Speaker Vyacheslav Volodin said the fact that Pentagon will make use of balloons against Russian hypersonic missiles, shows the "failure" of Washington's missile defence program. He said that the US will next inflate underwater balloons in response to Russia's Poseidon, TASS reported. The statement of the Russian State Duma Speaker comes after a news report claiming

that the US Defence Department has planned to use more than \$27 million in the fiscal year 2023 for the use of military balloons at high altitudes, which could help to track missiles from Russia and China.



Russian lawmaker calls Pentagon's tracker balloons 'failure' of US missile defence program

Russian State Duma Speaker Vyacheslav Volodin said that the US making use of balloons against Russian missiles "should be taken as a failure of the American missile defence program," TASS reported. Earlier on July 7, a news report by Politico claimed that the US Defence Department has been working to introduce balloons in its competition with China and Russia. The high-altitude inflatables which will be able to fly between 60,000-90,000 feet will be included in the Pentagon's extensive surveillance network. The balloons could be used for tracking hypersonic weapons. Pentagon has spent around about \$3.8 million (Rs 302,374,728.60) on balloon projects in the past two years and intends to use \$27.1 million (Rs 2,15,57,64,350) in the fiscal year 2023 to continue work on multiple projects.

The US Department of Defence has been carrying out tests using high-altitude balloons and solar-powered drones to gather data and help ground forces in communication and tackling issues related to satellite, the news outlet reported citing budget documents. The US Defence Department has quietly started shifting to balloon projects to gather information and send it to aircraft, Politico reported citing DoD budget justification documents. As per the news report, the Pentagon has been carrying out demonstrations to assess the involvement of high-altitude balloons and commercial satellites in an attack. Raven Aerostar, a firm that produces balloons, said that its balloon has a flight control unit, powered by batteries charged by solar panels. Russell Van Der Werff, engineering director at Raven Aerostar, stated that the balloons consist of a payload electronics package which has control over flight safety, navigation and communications.

<http://www.indiaandefensenews.in/2022/07/russia-calls-out-total-failure-of-us.html?m=1>



Thu, 14 Jul 2022

U.S. Successfully Tested Lockheed Hypersonic Missile this Week

The U.S. Air Force successfully tested a Lockheed Martin Corp hypersonic missile this week, sources familiar with the efforts said on Wednesday, amid growing concerns Russia and China have had more success developing their own hypersonic weapons. The U.S. Air Force

successfully tested its Air-Launched Rapid Response Weapon (ARRW) booster on Tuesday off the California coast, according to the sources. The ARRW is carried aloft under the wing of plane before it is launched toward its target. In previous tests, the weapon did not detach from the plane. Hypersonic weapons travel in the upper atmosphere at speeds of more than five times the speed of sound, or about 6,200 km (3,853 miles) per hour. In a separate successful hypersonic weapon test recently, the Defense Advanced Research Projects Agency (DARPA) demonstrated its Operational Fires program, two people familiar with the matter said.

The successful tests show progress among the myriad U.S. hypersonic weapons development efforts, which have in cases been beleaguered by failed tests, growing questions about cost and increasing concerns the United States is falling behind in what has become a superpower arms race. Operational Fires is a ground-launched system that will “rapidly and precisely engage critical, time-sensitive targets while penetrating modern enemy air defenses.” DARPA has requested and received \$45 million for OpFires in fiscal year 2022. One of Lockheed Martin’s concepts for the DARPA weapon is to use an existing High Mobility Artillery Rocket System (HIMARS) launcher, like those sent to Ukraine, to launch the weapon.

These successful tests come after failed a June 29 test flight of a different type of hypersonic weapon, the Common Hypersonic Glide Body, at the Pacific Missile Range Facility in Hawaii. Defense contractors hope to capitalize on the shift to hypersonic weapons not only by building them, but also by developing new detection and defeat mechanisms. Arms makers like Lockheed, Northrop Grumman Corp and Raytheon Technologies Corp have all touted their hypersonic weapons programs to investors as the world’s focus shifted to the new arms race for an emerging class of weapon.

<https://indianexpress.com/article/world/u-s-successfully-tested-lockheed-hypersonic-missile-this-week-report-8027700/>

THE ECONOMIC TIMES

Wed, 13 Jul 2022

US Navy Destroyer Patrol Triggers South China Sea Dispute

The U.S. Navy on Wednesday sailed a destroyer close to China-controlled islands in the South China Sea in what Washington said was a patrol aimed at asserting freedom of navigation through the strategic seaway. The guided-missile destroyer USS Benfold sailed past the Paracel Islands and continued thereafter with operations in the South China Sea. The operation "upheld the rights, freedoms, and lawful uses of the sea," the 7th Fleet said in a news release. Such operations are considered key to the U.S. Navy maintaining its presence in the Indo-Pacific, where China has grown its presence through a massive ship building campaign. Beijing has also alarmed the U.S., Australia and New Zealand with the signing of a mutual defense agreement with the Solomon Islands, under which it could receive Chinese troops in emergencies and possibly establish a permanent Chinese military presence. In response to the Benfold's passage, China's Southern Theater Command tracked the vessel's movements and ordered it to leave the area, Air Force Col. Tian Junli was quoted as saying on the Defense Ministry's website.

"Our troops in the military area are on high alert at all times to safeguard national sovereignty, security and peace and stability in the South China Sea," the ministry said. China claims ownership over virtually the entire strategic waterway, through which passes around USD 5 trillion in global trade each year and which holds highly valuable fish stocks and undersea mineral resources. The Philippines, Brunei, Malaysia, Vietnam and Taiwan also lay competing claims to the region.

<https://economictimes.indiatimes.com/news/defence/us-navy-destroyer-patrol-triggers-south-china-sea-dispute/articleshow/92847265.cms>

Science & Technology News



Wed, 13 Jul 2022

A Framework that could Enhance the Ability of Robots to Use Physical Tools

Researchers at I2R ASTAR Singapore and UM-CNRS LIRMM in France have recently developed a framework that could improve the ability of robots to identify objects in their surroundings that could be potential tools and then use them to complete manual tasks, even if they never encountered these objects before. Their approach, introduced in a paper published in Nature Machine Intelligence, could significantly enhance the ability of robotic systems to complete challenging tasks that might require tools, without the need for any prior tool training. "Humans are amazing at recognizing random objects in their environment as potential tools, and using them as such," Ganesh Gowrishankar, one of the researchers who carried out the study, told TechXplore. "Similar abilities can be very useful for robots and can enable them to be innovative in 'unstructured' (that is non-modeled and unpredictable) environments. For example, imagine a rescue robot in a disaster scenario being able to independently (without human help) solve tasks and pass obstacles using available debris as tools.

" While many past studies in the field of robotics have highlighted the vast potential of systems that can use tools to complete physical missions, all of the methods proposed so far required prior training with tools. This was achieved in simulation, using videos of humans or other robots using tools, or directly in the physical world, using a tool. The goal of the work by Keng Peng Tee, Gowrishankar and their colleagues, on the other hand, was to create a framework that would allow robots to identify potentially useful tools on the fly based on their shape and size, even if they never encountered these objects before and were never trained on how to use them, or any other tool, before. The researchers have been working on such a framework for several years now.



The team's robot working with household objects - an umbrella and a wipe stick.

"In our new paper, we combined our past work in human tool use, 'embodiment' and human tool characterization to develop a cognition framework that enables robots with zero tool experience to recognize objects (even ones seen for the first time) as tools for a given task, and use them immediately- just like a human," Gowrishankar said. While conducting their previous studies and reviewing existing literature, Tee and Gowrishankar discovered that humans may use the shape of their own hands or arms, and the actions made with their hand/arms, as a reference to determine whether a tool can be useful for completing a particular task. The new framework they developed is based on this idea, as it encourages robots to use their limbs to determine whether objects in their surroundings could be used as tools.

"Our framework uses our discoveries to enable intuitive tool use by robots," Tee explained. "Specifically, it enables a robot to isolate the 'functionality' features of its own limb that enable a task, to use these features to recognize an object as a potential tool for the same task, and then to develop successful movements with the tool using skills (controllers) the robot already possesses." Essentially, the researchers' framework allows robots to use tools to complete any task they are capable of completing without tools (i.e., any task for which they possessed a so-called "controller"). It only requires that the robot has integrated cameras or sensors that allow it to "visually" perceive objects in its surroundings. The new framework developed by Tee, Gowrishankar and their colleagues could be used to enhance the capabilities of both existing and newly developed robots, allowing them to take better advantage of objects in their surroundings when completing a specific mission. As accurate visual perception in robots is still a technical challenge, however, the potential of the framework is currently limited.

"In its current form, our framework is based solely on visual perception," Tee said. "Therefore, it works for tools that enable 'kinematic augmentations'—extensions in the shape and size (which can be perceived visually) of our limbs. These include a large (probably majority) set of tools that we use in daily life—spoons, rakes, tongs, plates and even chairs (to climb up) etc." While the researchers' framework covers many of the simple tools we use in our day-to-day lives, in its current form it would not allow robots to identify and use tools that enable so-called "dynamic/force augmentations," such as hammers or levers. The main reason for this is that

recognizing these tools requires more than just looking at their shape and size, it also requires knowledge of their weight and dynamic properties. To recognize these tools as useful when presented with them, a robot would thus need to have a further layer of perception, which allows it to connect the visual/physical features of an object with its dynamic features. To achieve this, Gowrishankar and his colleagues are now planning to develop their framework further.

"In our next studies, we would like to extend our framework to enable dynamic tool use," Gowrishankar added. "We would also like to integrate our framework with learning techniques proposed by other tool use studies. This is necessary to enable a robot to use tools for tasks it doesn't possess a controller for (something our framework does not address), thus it could bring robots closer to the tool use capabilities of humans."

More information: Keng Peng Tee et al, A framework for tool cognition in robots without prior tool learning or observation, Nature Machine Intelligence (2022). [DOI: 10.1038/s42256-022-00500-9](https://doi.org/10.1038/s42256-022-00500-9)

<https://techxplore.com/news/2022-07-framework-ability-robots-physical-tools.html>



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Scientists Develop Novel Mechanism to Inactivate SARS-CoV-2 by Blocking Their Entry to Cells & Reducing Infection Ability

Researchers have reported the design of a new class of synthetic peptides that can not only block the entry of SARS-CoV-2 virus entry into cells but also clump the virions (virus particles) together, reducing their ability to infect. This novel approach provides an alternative mechanism to render viruses like SARS-CoV-2 inactive, promising a new class of peptides as antivirals. The rapid emergence of new strains of the SARS-CoV-2 virus has diminished the protection offered by COVID-19 vaccines calling for new approaches to prevent infection by the virus.

It is known that protein-protein interaction is often like that of a lock and a key. This interaction can be hampered by synthetic peptide that mimics, competes with, and prevents the 'key' from binding to the 'lock', or vice versa. Scientists at the Indian Institute of Science (IISc), in collaboration with researchers from the CSIR-Institute of Microbial Technology, have exploited this approach to design peptides that can bind to and block the spike protein on the surface of SARS-CoV-2 virus. This binding was further characterised extensively by cryo-electron microscopy (cryo-EM) and other biophysical methods. The research was supported under the COVID-19 IRPHA call of SERB Science and Engineering Research Board (SERB), a statutory body of Department of Science and Technology (DST). The designed peptides are helical, hairpin-shaped, each capable of pairing up with another of its kind, forming what is known as a

dimer. Each dimeric ‘bundle’ presents two ‘faces’ to interact with two target molecules. In the study published in Nature Chemical Biology, the researchers hypothesised that the two faces would bind to two separate target proteins locking all four in a complex and blocking the targets’ action. The team decided to test their hypothesis by using a peptide called SIH-5 to target the interaction between the Spike (S) protein of SARS-CoV-2 and ACE2 protein, the SARS-CoV-2 receptor in human cells.

The S protein is a trimer – a complex of three identical polypeptides. Each polypeptide contains a Receptor Binding Domain (RBD) that binds to the ACE2 receptor on the host cell surface. This interaction facilitates viral entry into the cell. The SIH-5 peptide was designed to block the binding of the RBD to human ACE2. When a SIH-5 dimer encountered an S protein, one of its faces bound tightly to one of the three RBDs on the S protein trimer, and the other face bound to an RBD from a different S protein. This ‘cross-linking’ allowed the SIH-5 to block both S proteins at the same time. Under cryo-EM, the S proteins targeted by SIH-5 appeared to be attached head-to-head, and the spike proteins were being forced to form dimers. Subsequently, the researchers showed that SIH-5 inactivated the viruses efficiently by cross-linking the spike proteins from different virus particles.

The team consisting of B Khatri, I Pramanick, SK Malladi, RS Rajmani, P Ghosh, N Sengupta, R Varadarajan, S Dutta and J Chatterjee from Indian Institute of Science (IISc), R Rahisuddin, S Kumar, N Kumar, S Kumaran and RP Ringe from CSIR-Institute of Microbial Technology, tested the peptide for toxicity in mammalian cells in the lab and found it to be safe. When hamsters were dosed with the peptide and subsequently exposed to a high dose of SARS-CoV-2, they showed decreased viral load as well as much less cell damage in the lungs compared to hamsters exposed only to the virus, demonstrating the promise of this class of peptides as antivirals. The researchers believe that with minor modifications and peptide engineering, this lab-made miniprotein could inhibit other protein-protein interactions as well.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1841204>



Wed, 13 Jul 2022

Engineers Build a Robot that Learns to Understand itself, Rather than the World Around it

As every athletic or fashion-conscious person knows, our body image is not always accurate or realistic, but it's an important piece of information that determines how we function in the world. When you get dressed or play ball, your brain is constantly planning ahead so that you can move your body without bumping, tripping, or falling over. We humans acquire our body-model as infants, and robots are following suit. A Columbia Engineering team announced today they have created a robot that—for the first time—is able to learn a model of its entire body from scratch, without any human assistance. In a new study published by Science Robotics, the researchers demonstrate how their robot created a kinematic model of itself, and then used its self-model to

plan motion, reach goals, and avoid obstacles in a variety of situations. It even automatically recognized and then compensated for damage to its body.

Robot watches itself like an infant exploring itself in a hall of mirrors. The researchers placed a robotic arm inside a circle of five streaming video cameras. The robot watched itself through the cameras as it undulated freely. Like an infant exploring itself for the first time in a hall of mirrors, the robot wiggled and contorted to learn how exactly its body moved in response to various motor commands. After about three hours, the robot stopped. Its internal deep neural network had finished learning the relationship between the robot's motor actions and the volume it occupied in its environment. "We were really curious to see how the robot imagined itself," said Hod Lipson, professor of mechanical engineering and director of Columbia's Creative Machines Lab, where the work was done. "But you can't just peek into a neural network, it's a black box." After the researchers struggled with various visualization techniques, the self-image gradually emerged. "It was a sort of gently flickering cloud that appeared to engulf the robot's three-dimensional body," said Lipson. "As the robot moved, the flickering cloud gently followed it." The robot's self-model was accurate to about 1% of its workspace.

Self-modeling robots will lead to more self-reliant autonomous systems. The ability of robots to model themselves without being assisted by engineers is important for many reasons: Not only does it save labor, but it also allows the robot to keep up with its own wear-and-tear, and even detect and compensate for damage. The authors argue that this ability is important as we need autonomous systems to be more self-reliant. A factory robot, for instance, could detect that something isn't moving right, and compensate or call for assistance. "We humans clearly have a notion of self," explained the study's first author Boyuan Chen, who led the work and is now an assistant professor at Duke University. "Close your eyes and try to imagine how your own body would move if you were to take some action, such as stretch your arms forward or take a step backward. Somewhere inside our brain we have a notion of self, a self-model that informs us what volume of our immediate surroundings we occupy, and how that volume changes as we move."

Self-awareness in robots

The work is part of Lipson's decades-long quest to find ways to grant robots some form of self-awareness. "Self-modeling is a primitive form of self-awareness," he explained. "If a robot, animal, or human, has an accurate self-model, it can function better in the world, it can make better decisions, and it has an evolutionary advantage." The researchers are aware of the limits, risks, and controversies surrounding granting machines greater autonomy through self-awareness. Lipson is quick to admit that the kind of self-awareness demonstrated in this study is, as he noted, "trivial compared to that of humans, but you have to start somewhere. We have to go slowly and carefully, so we can reap the benefits while minimizing the risks." The paper is titled "Full-body visual self-modeling of robot morphologies."

More information: Boyuan Chen, Fully body visual self-modeling of robot morphologies, *Science Robotics* (2022). [DOI:10.1126/scirobotics.abn1944](https://doi.org/10.1126/scirobotics.abn1944). www.science.org/doi/10.1126/scirobotics.abn1944

<https://techxplore.com/news/2022-07-robot-world.html>

Wed, 13 Jul 2022

Atomically-Smooth Gold Crystals help to Compress Light for Nanophotonic Applications

Korea Advanced Institute of Science and Technology (KAIST) researchers and their collaborators at home and abroad have successfully demonstrated a new platform for guiding the compressed light waves in very thin van der Waals crystals. Their method to guide the mid-infrared light with minimal loss will provide a breakthrough for the practical applications of ultra-thin dielectric crystals in next-generation optoelectronic devices based on strong light-matter interactions at the nanoscale. Phonon-polaritons are collective oscillations of ions in polar dielectrics coupled to electromagnetic waves of light, whose electromagnetic field is much more compressed compared to the light wavelength. Recently, it was demonstrated that the phonon-polaritons in thin van der Waals crystals can be compressed even further when the material is placed on top of a highly conductive metal. In such a configuration, charges in the polaritonic crystal are "reflected" in the metal, and their coupling with light results in a new type of polariton waves called the image phonon-polaritons. Highly compressed image modes provide strong light-matter interactions, but are very sensitive to the substrate roughness, which hinders their practical application.

Challenged by these limitations, four research groups combined their efforts to develop a unique experimental platform using advanced fabrication and measurement methods. Their findings were published in *Science Advances* on July 13. A KAIST research team led by Professor Min Seok Jang from the School of Electrical Engineering used a highly sensitive scanning near-field optical microscope (SNOM) to directly measure the optical fields of the hyperbolic image phonon-polaritons (HIP) propagating in a 63 nm-thick slab of hexagonal boron nitride (h-BN) on a monocrystalline gold substrate, showing the mid-infrared light waves in dielectric crystal compressed by a hundred times. Professor Jang and a research professor in his group, Sergey Menabde, successfully obtained direct images of HIP waves propagating for many wavelengths, and detected a signal from the ultra-compressed high-order HIP in a regular h-BN crystals for the first time. They showed that the phonon-polaritons in van der Waals crystals can be significantly more compressed without sacrificing their lifetime.

This became possible due to the atomically smooth surfaces of the home-grown gold crystals used as a substrate for the h-BN. Practically zero surface scattering and extremely small ohmic loss in gold at mid-infrared frequencies provide a low-loss environment for the HIP propagation. The HIP mode probed by the researchers was 2.4 times more compressed and yet exhibited a similar lifetime compared to the phonon-polaritons with a low-loss dielectric substrate, resulting in a twice-higher figure of merit in terms of the normalized propagation length. The ultra-smooth monocrystalline gold flakes used in the experiment were chemically grown by the team of Professor N. Asger Mortensen from the Center for Nano Optics at the University of Southern Denmark.

Mid-infrared spectrum is particularly important for sensing applications since many important organic molecules have absorption lines in the mid-infrared. However, a large number of molecules is required by the conventional detection methods for successful operation, whereas the ultra-compressed phonon-polariton fields can provide strong light-matter interactions at the microscopic level, thus significantly improving the detection limit down to a single molecule. The long lifetime of the HIP on monocrystalline gold will further improve the detection performance. Furthermore, the study conducted by Professor Jang and the team demonstrated the striking similarity between the HIP and the image graphene plasmons. Both image modes possess significantly more confined electromagnetic field, yet their lifetime remains unaffected by the shorter polariton wavelength. This observation provides a broader perspective on image polaritons in general, and highlights their superiority in terms of the nanolight waveguiding compared to the conventional low-dimensional polaritons in van der Waals crystals on a dielectric substrate.

Professor Jang said, "Our research demonstrated the advantages of image polaritons, and especially the image phonon-polaritons. These optical modes can be used in the future optoelectronic devices where both the low-loss propagation and the strong light-matter interaction are necessary. I hope that our results will pave the way for the realization of more efficient nanophotonic devices such as metasurfaces, optical switches, sensors, and other applications operating at infrared frequencies."

<https://phys.org/news/2022-07-atomically-smooth-gold-crystals-compress-nanophotonic.html>



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Chinese Scientists Develop Robot Fish that Gobble Up Microplastics

Robot fish that "eat" microplastics may one day help to clean up the world's polluted oceans, says a team of Chinese scientists from Sichuan University in southwest China. A robot fish is a type of bionic robot that has the shape and locomotion of a living fish. According to the reports, there have already been approximately 40 different types of fishes built in 30 designs having only the capability to flip and drift in water. But this time something new is added to this concept of robot fish. Chinese scientists came up with a new idea to the concept of robot fish, they have built fish that are soft to touch similar to that of real fishes and are just 1.3 centimeters (i.e. 0.5 inches) in size. There is an inbuilt feature to these robotic fish that helps them eat microplastics from the water body they are kept in. This feature of eating away all the microplastics might one day help in cleaning up all the polluted oceans or other water bodies. The team of Chinese scientists have already tested the efficiency of the fishes in getting rid of the microplastics, by keeping them in the shallow water where they sucked up all the microplastics away.

The main aim of the team is to enable them to collect microplastics in deeper water and provide information to analyse marine pollution in real time, said Wang Yuyan, one of the researchers

who developed the robot. "We developed such a lightweight miniaturised robot. It can be used in many ways, for example in biomedical or hazardous operations, such as a small robot that can be localised to a part of your body to help you eliminate some disease." Another amazing feature of these fishes is that they can swim upto 2.76 body lengths per second, faster than most artificial soft robots. These fishes are able to absorb pollutants and recover themselves even when it is damaged. These black robot fishes left in water can still be controlled by the scientists from outside to avoid crashing into other fishes or ships for that matter with the irradiated light feature, helping it to flap its fins and wiggle its body.

It is made keeping in mind the safety of other fishes: If it is accidentally eaten by other fish, it can be digested without any harm as it is made from polyurethane, which is also biocompatible, Wang said. The fish is able to absorb pollutants and recover itself even when it is damaged. It can swim up to 2.76 body lengths per second, faster than most artificial soft robots.

<https://www.indiatoday.in/science/story/chinese-scientists-develop-robot-fish-that-gobble-up-microplastics-1975160-2022-07-13>

