

Oct
2020

समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

खंड : 45 अंक : 240 13 अक्टूबर 2020
Volume: 45 Issue: 240 13 October 2020



रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र
Defence Scientific Information & Documentation Centre
मेटकॉफ हाउस, दिल्ली - 110 054
Metcalf House, Delhi - 110 054

CONTENTS

S. No.	TITLE	Page No.
	DRDO News	1-4
	DRDO Technology News	1-4
1.	The DRDO's rapid-fire tests India Today Insight	1
2.	India's most secretive 'Stealth Drone' project uncovered; aims to counter Dassault, Boeing & Northrop UCAVs	3
3.	DRDO fires Nirbhay cruise missile into sea, hits abort after 8 minutes	4
	Defence News	5-12
	Defence Strategic National/International	5-12
4.	Pakistan, China creating border dispute under a mission: Rajnath Singh	5
5.	54 done, BRO rushes to build 48 bridges that can shoulder T-90 main battle tanks	6
6.	PLA rotates LAC troops, shows hand	7
7.	China tracking Indian underwater activities in Ladakh's Pangong Tso	8
8.	UAE firm selected for carbines in talks with Indian defence majors to set up plant	11
9.	Indian Navy scraps tender to procure 4 Landing Platform Docks at Rs 20k cr	12
	Science & Technology News	13-23
10.	The current state of space debris	13
11.	Direct visualization of electromagnetic wave dynamics by laser-free ultrafast electron microscopy	17
12.	Revealing the reason behind jet formation at the tip of laser optical fiber	21
	COVID-19 Research News	22-23
13.	Explained: The drugs, vaccines being repurposed for Covid-19 treatment and what new research says	22



Tue, 13 Oct 2020

The DRDO's rapid-fire tests | **India Today Insight**

The Defence Research and Development Organisation has carried out more missile tests over the past month than at any other time in its recent past. Why this is happening

By Sabdeep Unnithan

Delhi: On October 12, the DRDO's (Defence Research and Development Organisation's) indigenously designed and developed 1,000-kilometre cruise missile, Nirbhay, was test-fired from the integrated test range on A.P.J. Abdul Kalam Island off the coast of Odisha. It was the seventh test of the land-attack missile, and the first test using an indigenously built turbo-engine. The test was unfortunately a failure—the missile developed a snag and the test had to be aborted eight minutes after launch. But it was just one disappointment in a series of successful missiles tests over the past month.

Since September 7, the DRDO has carried out ten test firings of a wide array of missiles—roughly one every three days. These missiles range from the nuclear-capable Shaurya—a ground-launched variant of the submarine-launched B-05 ballistic missile—the air-launched Anti Radiation Missile 'Rudram' and tactical missiles like the yet to be named laser-guided Anti Tank Guided Missile.

On September 7, the DRDO successfully tested the Hypersonic Technology Demonstration Vehicle—a scramjet-powered cruise vehicle which achieved a velocity of nearly 2 kilometres per second and which will serve as the test platform for a future range of hypersonic cruise missiles. Similarly, on October 5, the Supersonic Missile Assisted Release of Torpedo (SMART) was test-fired—a high-speed missile which delivers a lightweight torpedo to attack enemy submarines over 600 km away.

Top DRDO officials said the wide range of tests were a validation of the organisation achieving self-sufficiency in missile technology. "We have an array of boosters, warheads and seekers—you give us the mission, we will give you the missile," says a senior official. However, the question remains—why the rapidfire tests? Top DRDO officials say it has more to do with Covid-19 pandemic and the lockdowns and much less with the current border tensions with China. A majority of the DRDO's 52 laboratories functioned through the lockdown, but as the movement of personnel was restricted, several planned tests had to be postponed. (The officials declined to state which tests had been postponed.)

"All programs will continue as per their schedules. DRDO launch activity is done as per program requirements and it is being done now without any restrictions of COVID," a DRDO spokesperson said.



Rudram-1, India's first indigenous anti-radiation missile, is launched from a Sukhoi-30 MKI on Oct. 9. (ANI)

Some tests were of missiles already in use by the three branches of the Indian armed forces, but with modifications. The September 30 test-firing of the BrahMos supersonic cruise missile, for instance, used an indigenously built rocket booster, airframe and power distribution system. Its developers at BrahMos Aerospace, an Indo-Russian joint venture, call the test firing one of a series of steps to increase the indigenous content of these missiles.

Missile tests—especially of those with longer ranges, over 100 kilometres—are complex affairs, with launch windows decided months in advance. The countdown begins once a mission objective for the system is decided. The project team readies the launcher and the command and control systems and books launch slots at the Interim Test Range at Balasore, Odisha. The DRDO headquarters in Delhi coordinates clearances from three ministries and the Prime Minister’s Office. Political clearance for each test comes from the Defence Minister and the National Security Adviser. The tests are also cleared by the MEA’s Disarmament and International Security Affairs Division, which deals with disarmament, non-proliferation issues, confidence and security building measures in regional and multilateral forums. The

Airports Authority of India issues a Notice to Airmen—a ‘NOTAM’, in industry parlance—warning them of the tests. Indian Navy warships and Coast Guard ships are also tasked with clearing the range and to track the missile telemetry.

With test firings slated to continue over the next few days on both the western and eastern coasts of India, the DRDO has plenty of activity lined up to keep everyone on their toes.

<https://www.indiatoday.in/india-today-insight/story/the-drdo-s-rapid-fire-tests-1730960-2020-10-12>



BATTERY OF TESTS

The DRDO (Defence Research and Development Organisation) has conducted 10 missile tests over the past month—roughly one every three days

The DRDO's SMART platform (supersonic missile assisted release of torpedo) being test-fired from a launch pad A.P.J. Abdul Kalam Island

- 7 SEPTEMBER**
Hypersonic technology demonstration vehicle
- 22 SEPTEMBER**
ABHYAS high speed expendable aerial target
- 22 SEPTEMBER**
Laser-guided anti-tank guided missile
- 24 SEPTEMBER**
Prithvi missile
- 30 SEPTEMBER**
BrahMos (with indigenous booster and airframe)
- 1 OCTOBER**
Laser-guided anti-tank guided missile
- 3 OCTOBER**
Shaurya tactical ballistic missile
- ◀ 5 OCTOBER**
Supersonic missile assisted release of torpedo (SMART)
- 9 OCTOBER**
RUDRAM anti-radiation missile
- 12 OCTOBER**
Nirbhay cruise missile

Text: SANDEEP UNNITHAN
Graphic: TANMOY CHAKRABORTY

India's most secretive 'Stealth Drone' project uncovered; aims to counter Dassault, Boeing & Northrop UCAVs

By Ayush Jain

One of India's most ambitious aerospace projects known as the "Ghatak" translating to Lethal, has made a new surprise debut in a video released by the Indian Institute of Technology (IIT-Kanpur) – the institution which has been working on the project for quite some time.

The DRDO's "Ghatak", or what was previously known as "AURA", is probably the most secretive aircraft project of the Indian government, which is aimed to develop an unmanned stealth deep penetration strike bomber for the Indian Armed Forces (expectedly the IAF).

The design is based on the flying wing concept, which is a tailless and undefined fuselage concept.

The new appearance made was during a lecture on UAV aerodynamics shared about two weeks ago, and the craft is known as SWiFT (Stealth Wing Flying Testbed) and resembles the Ghatak UAV physically.

According to the sources, the image is the first appearance of Ghatak scaled-down prototype with its undercarriage and landing gear.

In the video, more than one model of the flying wing SWiFT can be seen, and the institution is reportedly studying the viability of achieving lower radar cross-section and conducting wind-tunnel tests, making a crucial base for future Indian aircraft projects in the aviation sector.

The technologies associated with the project are expected to be 100% indigenously developed, however, controversies still prevail over the powerplant. In 2018, it was reported that the early prototypes would be powered by the Russian NPO Saturn 36MT turbofan engine.

It is expected that by the time Ghatak would be ready to fly, India would have successfully developed its own aircraft engine "Kaveri" and technologies associated with it. The engine will be developed in collaboration with French company Safran, which also came as an offset clause with the Rafale deal.

Other than IIT Kanpur, IIT-Bombay has also collaborated for the design and testing of the serpentine air intake duct (also known as S-duct inlet) for the engine.

The Ghatak is now a fully funded and sanctioned national defence project, and will likely see large-scale private sector participation going forward, given its many linkages with India's AMCA fifth-generation stealth fighter program, told LiveFist. It also revealed the details of the connection between IIT Kanpur and the Ghatak project back in 2018.



The SWiFT/Ghatak UCAV scale model in one of the laboratories of the Indian Institute of Technology Kanpur. (Screenshot from IIT-Kanpur's YouTube video)



Currently, various nations are working on the development of such aircraft with comparable roles of stealth bombing and reconnaissance, including the Russian Sukhoi S-70 Okhotnik, which made its maiden flight in August 2019.

Similar projects also include the British BAE Systems Taranis, German/Spanish EADS Barracuda, American Boeing X-45 and Northrop Grumman X-47B, French Dassault nEUROn, Lockheed Martin's RQ-170 and the Russian Mikoyan Skat.

<https://eurasianimes.com/indias-most-secretive-stealth-drone-project-uncovered-as-it-aims-to-counter-dassault-boeing-northrop-ucavs/>



Tue, 13 Oct 2020

DRDO fires Nirbhay cruise missile into sea, hits abort after 8 minutes

Nirbhay missiles will be formally inducted by the military after the next round of trials expected in a few months

By Shishir Gupta

New Delhi: The Defence Research and Development Organisation (DRDO) on Monday launched the 800-km range Nirbhay cruise missile from Odisha's test facility into the Bay of Bengal but decided to abort the trial a few minutes later.

"The missile was fired at 10.30 am from the testing facility," a government official told Hindustan Times. "But the missile developed a snag and the trial was aborted 8 minutes later," the official said.

Nirbhay was the 10th missile to be fired by the DRDO during the last 35 days, an average of a missile every four days. India's emphasis on fast-tracking development and deployment of the new-age stand-off weapons is a response to China's mobilisation of troops and support elements in the East Ladakh sector.



Nirbhay long-range, sub-sonic cruise missile roars off the launch pad in 2019

People familiar with the matter said the DRDO would conduct another trial in a few months that would pave the way for the missile's full-fledged induction into Indian military and deployment on the borders.

A limited number of Nirbhay missiles had been moved earlier to the border with China before Monday's eighth round of test firing.

Nirbhay is a subsonic missile, flying at a speed of 0.7 Mach, with sea-skimming and terrain-hugging capability that helps the missile stay under enemy radar to avoid detection. The missile has a loitering capability that allows the delivery platform to manoeuvre mid-flight and at the end to hit the target. The missile's launch is powered by a solid rocket booster developed by DRDO's Advanced Systems Laboratory, which unlike liquid propellant, are easier to handle.

The conventional warhead missiles, capable of deep penetration to strike high-value targets with precision, are launched from mobile platforms.

Mondy's tests were conducted as part of an effort by the DRDO to expedite development of missiles along the LAC amid the stand-off with China's People's Liberation Army at multiple points in East Ladakh.

Officials said scientists needed to analyse the data generated during the tests to figure the tweaks that may be needed to be carried out.

<https://www.hindustantimes.com/india-news/drdo-fires-nirbhay-cruise-missile-into-sea-hits-abort-after-8-minutes/story-pwMlu7YRVvgiHuhAOP2rfl.html>

 **The Indian EXPRESS**

Tue, 13 Oct 2020

Pakistan, China creating border dispute under a mission: Rajnath Singh

Amid the border standoff with China, India is expediting work on several key projects including on a strategic road linking Darcha in Himachal Pradesh with Ladakh that will criss-cross a number of high-altitude snow-bound passes

By Deeptiman Tiwary

New Delhi: Amid talks with the Chinese to resolve the military standoff along the Line of Actual Control in Ladakh, Defence Minister Rajnath Singh said Monday that China and Pakistan have been creating border disputes “under a mission”.

Inaugurating 44 bridges built by the Border Roads Organisation (BRO) in seven border states and Union Territories, and signalling the start of work on the Nechiphu tunnel on the road to Tawang in Arunachal Pradesh, Singh said, “You are aware of the situation on our eastern and northern borders. It appears as if border disputes are being created under a mission, first by Pakistan and now even China.”

“The two countries share 7,000 km of border with us and often in some sector or the other, there is tension. Despite such problems, the nation, under the able and visionary leadership of Prime Minister Narendra Modi, is not just dealing with these challenges with great determination, but also bringing about crucial changes in all sectors,” he said.

The bridges in J&K (10), Ladakh (8), Himachal Pradesh (2), Punjab (4), Uttarakhand (8), Arunachal Pradesh (8) and Sikkim (4) were dedicated to the nation by Singh at a virtual conference.

He said these bridges will help in the movement of ration and military equipment for security forces posted in remote border areas even during winter when heavy snowfall often cuts off supply lines. He said the bridges will also ease the life of civilians living in remote border areas.

“These roads are not only for strategic needs, but they also reflect equal participation of all stakeholders in the development of the nation,” Singh said.

He complimented the BRO for working tirelessly even during the pandemic.

“Every sector of the country, from agriculture and industry to our security system, has been impacted by Covid-19 ...The BRO has continued operations in the North Eastern states, Uttarakhand, Himachal Pradesh and the Union Territories of Jammu & Kashmir, and Ladakh. The BRO continued its work while ensuring that snow clearance is not delayed at remote locations,” he said.



Singh said these bridges will help movement of ration and military equipment to sustain security forces posted in remote border areas even during the winter when heavy snowfall often cuts off supply lines. (Twitter/Rajnath Singh)

“I am happy to know that over 2200 km of roads have been cut by the BRO during the last two years, using the latest technologies, and state-of-the-art equipment. Also, surfacing was carried out on about 4200 km of roads,” he said.

Amid the border standoff with China, India is expediting work on several key projects, including a strategic road linking Darcha in Himachal Pradesh with Ladakh that will criss-cross a number of high-altitude snow-bound passes. The nearly 290-km-long road will be crucial for the movement of troops and heavy weaponry into the frontier bases of the Ladakh region, and will provide a crucial link to the Kargil region.

Singh also laid the foundation stone of the strategically important Nechipu tunnel on the road to Tawang in Arunachal Pradesh. This 450 metre, two-lane tunnel will ensure all-weather connectivity, besides providing safe and secure passage through accident-prone areas.

Lt Gen Harpal Singh, DG BRO, said the 44 bridges are of strategic importance and have been designed to facilitate movement of heavy civil and military traffic in border areas.

He said that in addition to expediting road construction, the BRO has laid special emphasis on construction of bridges by completing 28 major bridges last year, and 102 major bridges are being completed this year. He said 54 of these bridges have already been completed. Over 60 Bailey Bridges have also been constructed by the BRO to meet immediate requirements of the armed forces and people living in remote areas.

<https://indianexpress.com/article/india/pakistan-china-creating-border-dispute-under-a-mission-rajnath-singh-6722035/>



Tue, 13 Oct 2020

54 done, BRO rushes to build 48 bridges that can shoulder T-90 main battle tanks

30 of the 44 bridges commissioned on Monday fall on the route to the Line of Actual Control from Ladakh to Arunachal Pradesh

By Shishir Gupta

New Delhi: Defence Minister Rajnath Singh on Thursday formally opened 44 bridges built by the army's Border Roads Organisation, or BRO, delivering what the government described as a record-breaking performance. The 44 are among the 102 bridges that are being built by the BRO. These bridges are designed to withstand movement of India's heaviest battle tanks.

An official said 30 of the 44 bridges commissioned on Monday fall on the route to the Line of Actual Control from Ladakh to Arunachal Pradesh.

These are class 70 bridges; technicalise for bridges that can bear the weight of 70 tonne vehicles.

India's heaviest battle tank Arjun is about 60 tonnes. The T-90 Bhishma tanks that were moved to locations in the East Ladakh sector after China's People's Liberation Army signalled its reluctance to step back from the Line of Actual Control weigh about 45 tonnes.

These bridges would improve connectivity and permit faster development of troops and support elements that would vastly improve the capability of the armed forces to respond to any situation along the LAC.

The government had earlier doubled the BRO's annual targets to build 102 bridges this year against an annual average of 50 bridges.

India needs to catch up with China which has invested heavily in ramping up border infrastructure for decades. “We had already lost too much time and could not allow a business-as-

usual approach,” said a BRO official, a reference to the decision taken by previous governments not to upgrade border infrastructure.

Prime Minister Narendra Modi had alluded to this decision when he opened the Atal tunnel earlier this month, blaming previous governments for their misplaced priorities and lack of political will to focus on border roads along the border with China.

PM Modi had, since taking charge after a landslide win in 2014, focused on strengthening infrastructure along the India-China border.

It is a reflection of the government’s hard push in this context that the BRO’s annual budget, which ranged between Rs 3,300 crore and Rs 46,00 crore in 2008-2016, saw a substantial rise and is pegged at over Rs 11,000 crore in 2020-21, an official statement said.

At Monday’s event to formally open the 44 bridges, defence minister Rajnath Singh showered praises on the BRO and its chief Lt Gen Harpal Singh for delivering on its targets in the most hostile terrain and weather conditions.

Lt Gen Harpal Singh said the BRO the 44 bridges commissioned on Monday are in addition to the 10 bridges completed earlier in the year. Lt Gen Singh said the fresh round of 44 bridges are located in Jammu and Kashmir (10), Ladakh (8), Himachal Pradesh (2), Punjab (4), Uttarakhand (8), Arunachal Pradesh (8) and Sikkim (4).

“These bridges of various spans, constructed by BRO, range from 30 metres to 484 metres are of strategic importance and have been designed to facilitate movement of heavy civil and military traffic in border areas,” he said, underscoring that some of these bridges were in locations that made building a 30-metre long bridge far more difficult than to make even a 1,000-metre long bridge.

<https://www.hindustantimes.com/india-news/army-s-bro-building-100-bridges-by-march-most-of-them-near-china-border/story-56XIHQA8yE05IHLDEptZqM.html>



Tue, 13 Oct 2020

PLA rotates LAC troops, shows hand

According to military commanders, the PLA has moved an additional brigade north of Pangong Tso for rotating troops from the Finger Four mountainous spur to keep up the morale of the deployed troops

By Shishir Gupta

New Delhi: The People’s Liberation Army (PLA) has started rotating troops on the north bank of Pangong Tso, signalling that it has no immediate plans of either disengagement or de-escalation in Ladakh. The 7th round of India-China military-diplomatic talks began in Chushul on Monday with the XIV Corps Commander meeting the South Xinjiang military district commander to discuss comprehensive disengagement.

According to military commanders, the PLA has moved an additional brigade north of Pangong Tso for rotating troops from the Finger Four mountainous spur to keep up the morale of the deployed troops. “Given that both sides are deployed at {an altitude of} nearly 18,000 feet on Finger Four and the weather is deteriorating, the PLA is rotating 200 troops at a time so that front-line troops are fresh and motivated. This clearly means that PLA has no plans for disengagement at



Pangong Tso lake is seen near the India China border in India's Ladakh area.(AP)

least this winter,” said a senior official who requested anonymity.

The assessment of the Indian side is that comprehensive disengagement will be a long-drawn process despite the inherent risk of a flare-up as the PLA will occupy positions south of Pangong Tso the moment they are vacated by the Indian Army. While PLA has come up to its perception of the Line of Actual Control (LAC) on the north bank, Indian Army troops have come up to its perception of the LAC on the south bank by pre-empting the PLA all along the Rezang La Rechin la ridgeline.

Even though winter is expected to set in by the end of this month and take a turn for the worse, the Indian Army is prepared to stay on the heights all along the 1,597 km LAC in Ladakh. The Indian army commanders have learned from the fact that the Sumdorong Chu standoff in Arunachal Pradesh that started in 1986 was fully resolved through comprehensive disengagement by November 1995 — after nine years of continuous deployment. While the Sumdorong Chu standoff was resolved, the Indian Army has been sitting on the Salto Ridge since Operation Meghdoot was launched in April 1984 — 36 years and counting.

While the PLA aggression in the Galwan Valley and north of Pangong Tso was pre-planned with military objectives in mind, the Chinese were not prepared for either the June 15 flare-up or the August 29-30 pre-emption. It is quite evident that PLA commanders thought that the Indian Army would accept the aggression as fait accompli and move on. However, with both sides deployed in full at the LAC in Ladakh, the chances of an accident are high and thus distance is being kept between the front-line troops.

Even though the PLA’s Western Theatre Command is deployed all along the Ladakh LAC and in depth, the Chinese problems have been complicated by the standoff with the US over Taiwan. The PLA is currently stretched, with its South and Northern Theatre Commands also deployed to pressurize Taiwan, with the US Navy active in the South China Sea. What happens next in Taiwan largely depends on the US posture after the November Presidential election outcome, but either way American policy towards China has hardened.

<https://www.hindustantimes.com/india-news/pla-rotates-lac-troops-shows-hand/story-BTArWOVpwKeuPCrPcVY9FJ.html>



Tue, 13 Oct 2020

China tracking Indian underwater activities in Ladakh's Pangong Tso

Latest satellite imagery shows China is tracking the depths of Pangong Tso as well through new techniques used for anti-submarine warfare by navies around the world

By Col Vinayak Bhat (Retd)

New Delhi: Since the time the Indo-China border standoff began, the People's Liberation Army Ground Force (PLAGF) has been keeping the surface of Pangong Tso under surveillance through high-speed patrol crafts such as Type 305 and Type 928D boats copied from Swedish CB-90 boats.

But latest satellite imagery shows China is now tracking the depths of Pangong Tso as well through new techniques used for anti-submarine warfare by navies around the world.

On July 31, India Today OSINT team had reported the presence of at least 13 boats between Finger 4 and Finger 8. The boat squadron was boosted by at least eight new boats from a major base at Rimutang to Kunrak Fort and Finger 5, barely 2.5 km from Finger 4.

And now, latest satellite images from depth areas, especially Chinese military airports, show a trend not noticed before.

PLAAF sub-surface reconnaissance

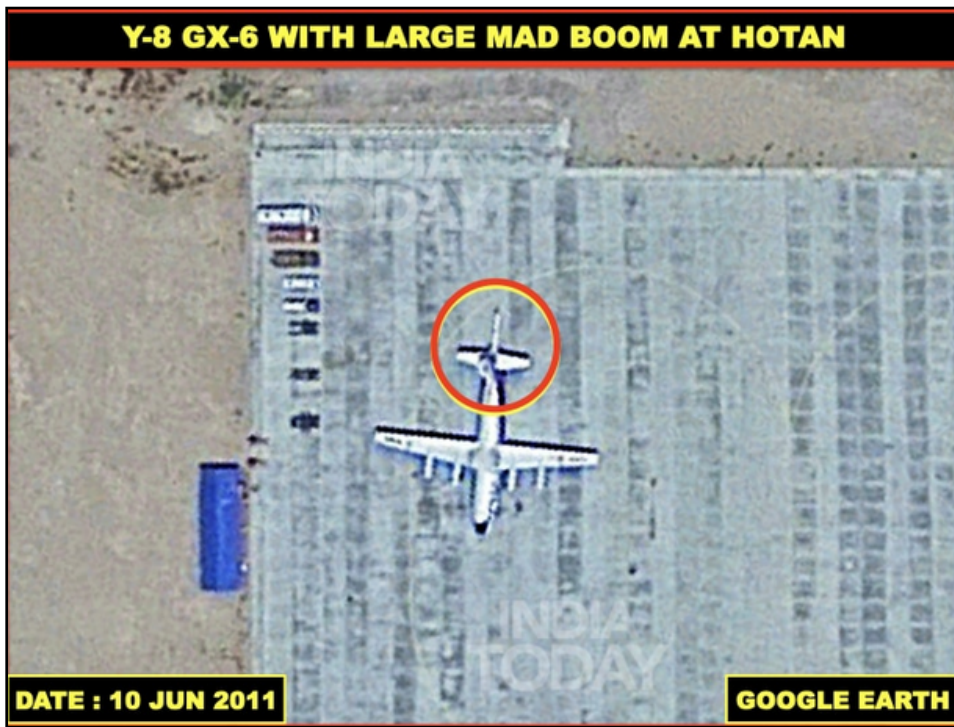
The PLA Air Force has started closely monitoring underwater activities in Pangong Tso. It is using special aircraft attached with a magnetic anomaly detector (MAD) boom at the tail end for reconnaissance of the lake.

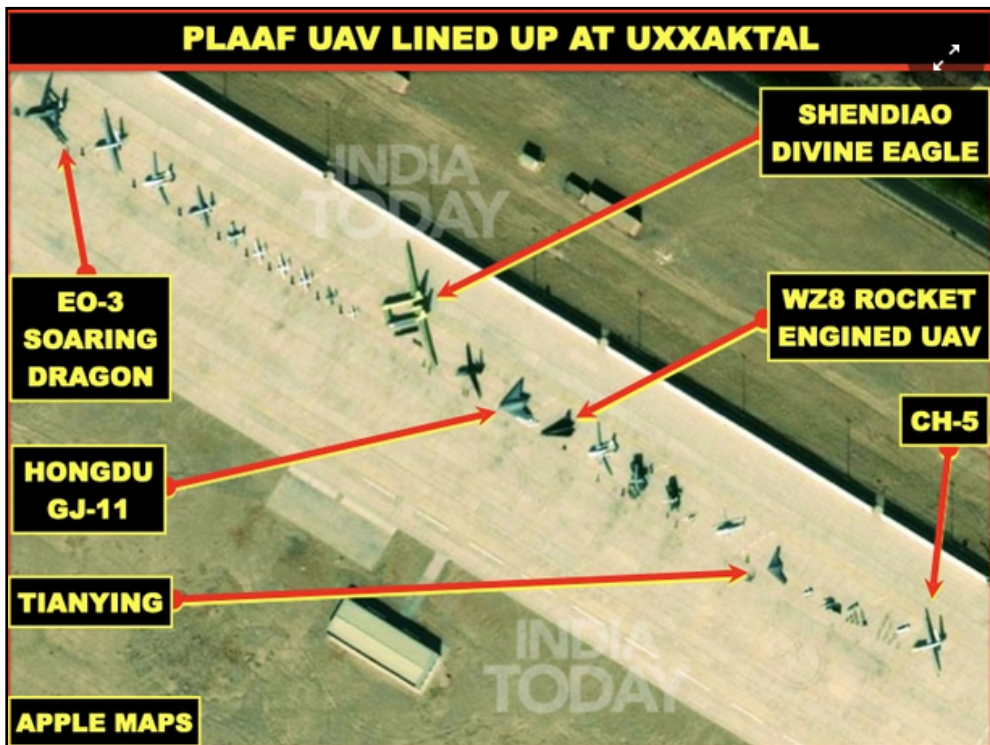
These special aircraft, such as Y-8 GX6 or Shanxi Y-8 transporter's Gaoxin-6 or High New 6 variant, are used for anti-surface as well as anti-submarine warfare by the PLA Navy.

The instruments onboard can detect minute variations in the Earth's magnetic field, which is used to detect submarines, but also minerals and rare soil hidden under the surface. These aircraft have been observed on satellite imagery at Hotan, Korla and Wudun.



Pangong Tso lake in Ladakh. (File photo: Reuters)





Latest satellite imagery of Wudun airport indicates that a Y-8 GX6 was parked there on August 24. This aircraft has a smaller MAD boom than previous versions. The aircraft is in yellow primer, indicating that it is still under trial. There are at least four aircraft with such new and shorter MAD booms at the Xian-Yanliang airbase where they are manufactured.

Chinese surface surveillance

Since the Doklam standoff, China has increased air activities along the Indo-Tibet border. In fact, surveillance along the border has increased in the last three years. China has been keeping an eye on Indian areas through unmanned aerial vehicles (UAVs) located at Lhasa, Shigatse, Hotan, Akesu, Wudun and Uxxaktal.

China recently conducted an exercise to test the Wingloong 2 UAV under adverse weather conditions and communication outage. The rocket-powered hypersonic UAV was first tested from Uxxaktal airbase last year indicating very strongly that it was used against India.

The Indian Navy's P8-I surveillance aircraft is also being used for detecting such underwater activities by China's PLA in Pangong Tso and Spangur Tso areas in Eastern Ladakh. However, India needs to be more cautious of these sub-surface activities and keep monitoring them.

<https://www.indiatoday.in/news-analysis/story/china-tracking-indian-underwater-activities-pangong-tso-ladakh-1730957-2020-10-12>

THE ECONOMIC TIMES

Tue, 13 Oct 2020

UAE firm selected for carbines in talks with Indian defence majors to set up plant

By Manu Pubby

Synopsis

Caracal International, which was selected to supply 93, 895 new generation carbines, did not disclose the names of its Indian partners but said that it is willing to transfer technology and move production here, in an exclusive interview with ET.

New Delhi: The UAE government-owned entity that has been selected for a contract to supply close quarter battle carbines on a fast track basis to the army says that is in talks with major Indian defence players to set up manufacturing facilities from which it can source up to 60% of the components needed.

Caracal International, which was selected to supply 93, 895 new generation carbines, did not disclose the names of its Indian partners but said that it is willing to transfer technology and move production here, in an exclusive interview with ET .

As reported, the fast track carbine procurement plan is at a tricky juncture – at a special meeting held last month, chaired by the defence secretary, it was decided that plans in the works since 2018 to import a limited number of close quarter battle carbines to meet immediate requirements are to be shelved in favour of a Make in India plan.

However, the high-powered Defence Acquisition Council (DAC) still has to ratify the decision and the army has been of the opinion that a larger order for 350,000 carbines can be processed under the Make in India initiative but the fast track procurement of 93, 895 should go ahead due to the urgent nature of the requirement.

“We already have partners in India who are suppliers that can make more than 60% of the parts. They can make the samples and they can make the parts for us. So, when Caracal wants to move in India, we already have production suppliers and the relationship is there,” said Hamad Salem Al Ameri, chief executive officer, Caracal.

The executive added that Caracal can move to a 100% Make in India model in the future as well if its government-owned intellectual property (IP) is assured to be protected. “We have already identified all the suppliers for parts and who will do what and at what price. Now, we have a lot of options in India that we are carefully exploring,” he said, adding that the UAE-based company wants to offer its larger range of small arms to the Indian market.

Responding to questions on communication from the Indian ministry on the status of the contract, Al Ameri said that Caracal has been identified as the lowest bidder and has been waiting



A file image of the CAR 816

for a final decision and that government to government channels have been opened after reports that it could be cancelled.

“Under CARACAL portfolio, we have more than 14 products for small arms. We are very serious about the Indian market... the relationship between the two nations, the history that we have makes it easy to do,” he said.

The Indian Army has been without a close quarter battle weapon for years, with officials saying that regular assault rifles are being used for the role, reducing the operational efficiency of troops. While the weapons are particularly useful in anti-terrorist operations, they also have immense utility in border operations where a clash between patrolling troops can take place at close quarters.

Sources said that the army supports initiatives by the private and public sector in developing these weapons in-house and has started engaging with companies for a larger order of 350,000 rifles that will be fully made in India, with options for exports too.

<https://economictimes.indiatimes.com/news/defence/uae-firm-selected-for-carbines-in-talks-with-indian-defence-majors-to-set-up-plant/articleshow/78621188.cms>

Business Standard

Tue, 13 Oct 2020

Indian Navy scraps tender to procure 4 Landing Platform Docks at Rs 20k cr

*The LPDs are used to transport troops, land warfare assets
such as tanks, helicopters and vessels into a war zone by sea*

New Delhi: The Indian Navy has scrapped a tender to procure four Landing Platform Docks or amphibious warships at a cost of Rs 20,000 crore, nearly seven years after launching the acquisition process, government sources said.

The withdrawal of a Request for Proposal (RFP) for the long-pending project was triggered by the Navy's requirement of new specifications for the amphibious warships which are known as Landing Platform Docks (LPDs), the sources said.

The LPDs are used to transport troops, land warfare assets such as tanks, helicopters and vessels into a war zone by sea.

In a report tabled in Parliament, the Comptroller and Auditor General had last month taken strong exception to the India Navy's failure to conclude the contract to procure the LPDs even after deciding on the acquisition in 2010.

The Navy had issued initial tender for the mega project in 2013.

"The qualitative requirement has undergone lot of changes," said an official.

The Indian Navy now plans to start a fresh bidding process for acquisition of the fleet.

Three private sector companies -- Reliance Defence and Engineering Limited (RDEL), Larsen & Toubro (L&T) and ABG Shipyard -- were in the race initially for the mega project but ABG was disqualified on account of poor financial health.

Each of the ships were likely to be in the range of 30,000 and 40,000 tonnes.

The national auditor had in September slammed the Navy for not being able to conclude the contract when it is reeling under a shortage of LPDs.

(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)

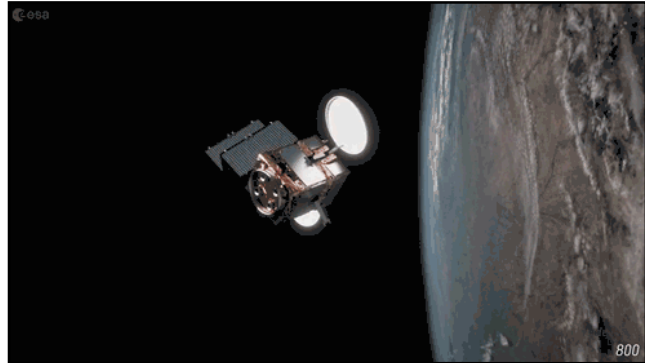
https://www.business-standard.com/article/defence/indian-navy-scraps-tender-to-procure-4-landing-platform-docks-at-rs-20k-cr-120101201440_1.html

The current state of space debris

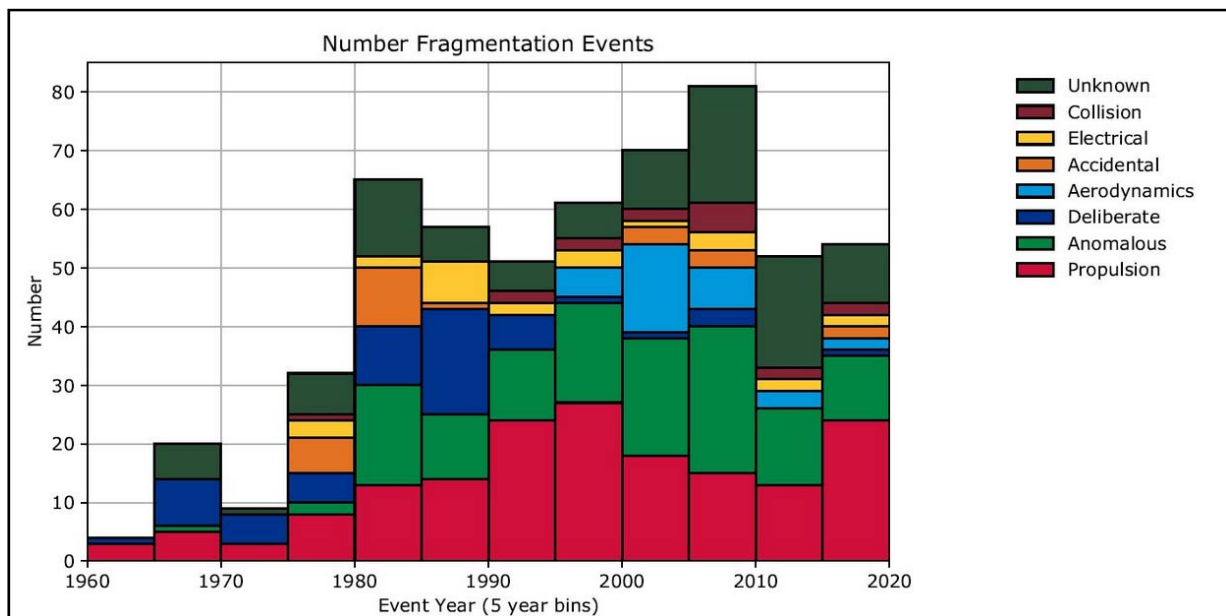
Swirling fragments of past space endeavors are trapped in orbit around Earth, threatening our future in space. Over time, the number, mass and area of these debris objects grows steadily, boosting the risk to functioning satellites.

ESA's Space Debris Office constantly monitors this ever-evolving debris situation, and every year publishes a report on the current state of the debris environment.

Since the beginning of the space age in 1957, tons of rockets, spacecraft and instruments have been launched to space. Initially, there was no plan for what to do with them at the end of their lives. Since then, numbers have continued to increase and explosions and collisions in space have created hundreds of thousands of shards of dangerous debris.



Despite progress in technology, and in understanding the space environment, the need for significantly increasing the pace in applying proposed measures to reduce debris creation has been identified at Europe's largest-ever space debris conference (more via [International Consensus on Debris Threat](#)). Credit: European Space Agency

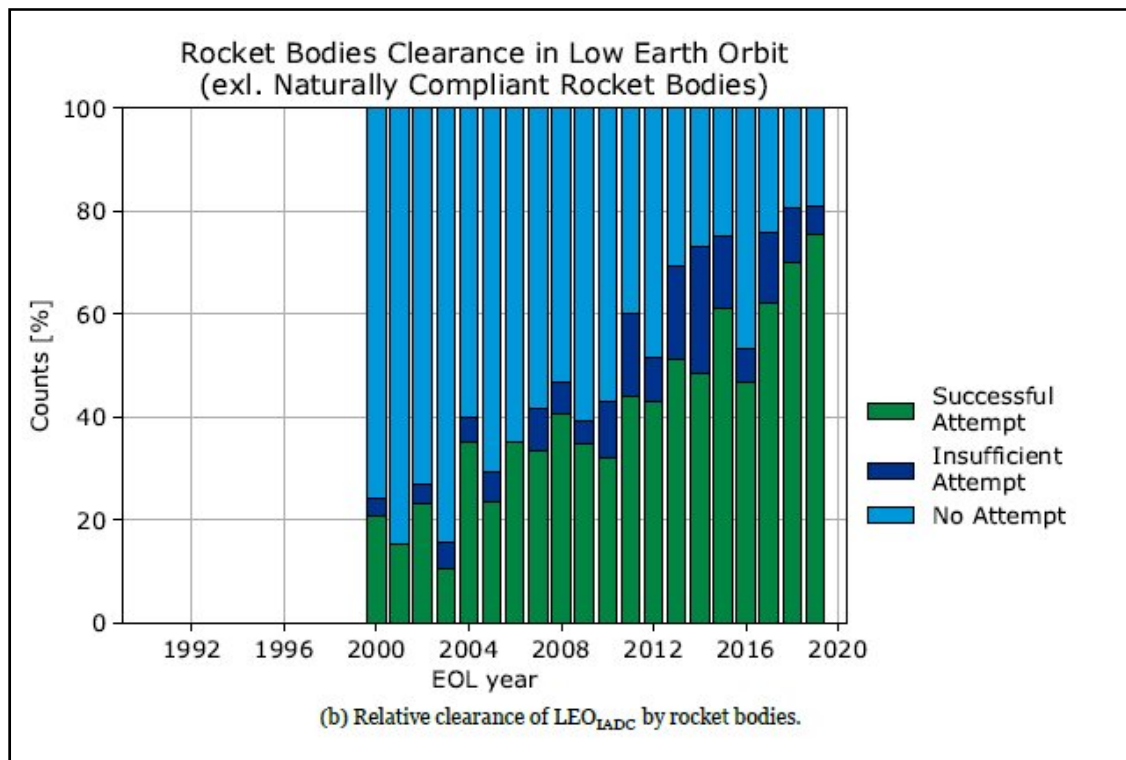


There are many ways debris can be created in space. For each “fragmentation event” thousands of pieces of dangerous debris can be added to Earth’s orbit. Credit: European Space Agency

"The biggest contributor to the current space debris problem is explosions in orbit, caused by left-over energy—fuel and batteries—onboard spacecraft and rockets. Despite measures being in place for years to prevent this, we see no decline in the number of such events. Trends towards end-of-mission disposal are improving, but at a slow pace," explains Holger Krag, Head of the Space Safety Program.

Reducing debris creation

"In view of the constant increase in space-traffic, we need to develop and provide technologies to make debris prevention measures fail-safe, and ESA is doing just that through its Space Safety Program. In parallel, regulators need to monitor the status of space systems as well as global adherence to debris mitigation under their jurisdiction more closely".



80% of rockets launched now attempt to 'clear' low-Earth orbit - the vast majority of which do so successfully - up from just over 20% at the beginning of the millennium. Credit: European Space Agency

International guidelines and standards now exist making it clear how we can reach a sustainable used of space:

- design rockets and spacecraft to minimize the amount of "shedding" – material becoming detached during launch and operation, due to the harsh conditions of space
- prevent explosions by releasing stored energy, "passivating" spacecraft once at the end of their lives
- Move defunct missions out the way of working satellites—either by de-orbiting them or moving them to a "graveyard orbit"
- Prevent in-space crashes through careful choice of orbits and by performing "collision avoidance maneuvers."

Many space agencies, private companies and other space actors are changing their behavior to adhere to these guidelines—but is this enough?

Worrying trends

We're making more and more debris

The number of debris objects, their combined mass, and the total area they take up has been steadily increasing since the beginning of the space age. This is further fuelled by a large number of in-orbit break-ups of spacecraft and rocket stages.

The total area that space debris takes up is important as it is directly related to how many collisions we expect in the future. As things stand, collisions between debris and working satellites is predicted to overtake explosions as the dominant source of debris.

Debris-creating events have become more common

On average over the last two decades, 12 accidental "fragmentations" have occurred in space every year—and this trend is unfortunately increasing. Fragmentation events describe moments in which debris is created due to collisions, explosions, electrical problems and even just the detachment of objects due to the harsh conditions in space.

On the bright side

Attempts are being made to follow the rules (not yet enough)

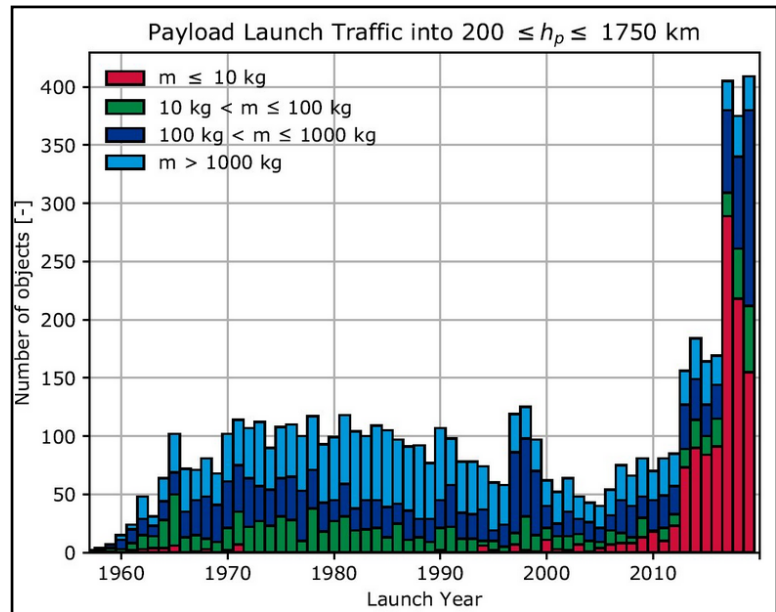
While not all satellites currently comply with international guidelines, more and more space actors are attempting to stick to the rules. In the last decade, 15-30% of objects, or payloads launched into non-compliant orbits in the low-Earth orbit region (excluding spacecraft related to human spaceflight) had attempted to comply with debris mitigation measures. Between 5% and 20% did so successfully, peaking at 35% in 2018 due to the active de-orbiting from the Iridium constellation.

More rockets are being safely disposed of

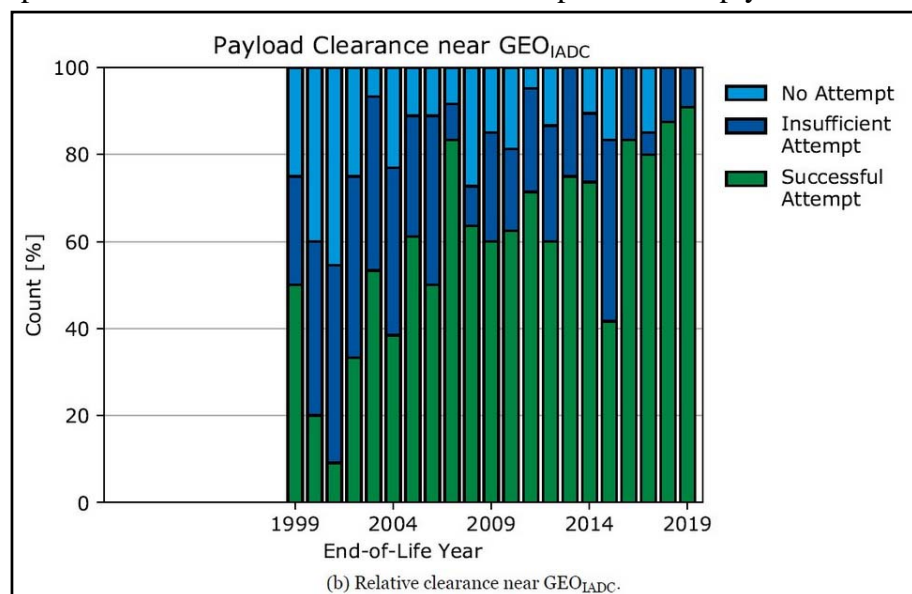
When it comes to rockets, more and more are being sustainably disposed of. Between 40 and 80% of those in a non-compliant low-Earth orbit this decade attempted to comply with debris mitigation measures. Of these, 30-70% did so successfully.

Of all the rockets launched in the last decade, 60-80% (in terms of mass) adhered to mitigation measures. Some rockets are in low-Earth orbits that lead them to decay naturally in Earth's atmosphere, but a significant amount of rockets are directed back into Earth's atmosphere where they either burn up or are made to re-enter over uninhabited areas. Such practices are increasing, with about 30% of rockets safely re-entering in a controlled manner since 2017.

This is very good news. Rocket bodies are among the largest objects we send to space and are at a high risk of being involved in catastrophic collisions. All steps to ensure they do not linger in orbit after a maximum of 24 hours from launch is to be celebrated.



The number of small satellites launched into near-Earth orbit has dramatically increased in the last 10 years, in part due to the rise of satellite constellations. Credit: European Space Agency



Several times in recent years, all satellites in geostationary orbit attempted to responsibly move out of the way once they reached the end of their mission. Credit: European Space Agency

More satellites put in low-altitude orbits where they naturally burn up

The amount of "traffic" launched into the low-Earth orbit protected region—up to 2000 km in altitude—is changing significantly, in particular due to the proliferation of small satellites and constellations.

Around 88% of small payloads launched into this region will naturally adhere to space debris mitigation measures due to their low altitude, meaning they break up in Earth's atmosphere.

Between 30-60% of all satellite mass (excluding from human spaceflight) is estimated to adhere to end-of-life guidelines for the same reason.

"The accelerating increase of satellites launched into low-Earth orbit is starkly visible in our latest report," explains Tim Florer, Head of ESA's Space Debris Office.

"We have observed fundamental changes in the way we are using space. To continue benefiting from the science, technology and data that operating in space brings, it is vital that we achieve better compliance with existing space debris mitigation guidelines in spacecraft design and operations. It cannot be stressed enough—this is essential for the sustainable use of space."

High rates of debris mitigation in geostationary orbit

Satellites launched into the geostationary protected region, 35,586—35,986 km in altitude, have very high rates of adherence to debris mitigation measures. Between 85% and 100% that reached the end of their life this decade attempted to comply with these measures, of which 60—90% did so successfully.

In geostationary orbit, there is a clear commercial interest for operators to keep their paths free from defunct satellites and debris—to not do so would put their spacecraft, and bottom line, at serious risk.

What now?

Systematic analysis of changing behaviors in space, when it comes to the adoption of debris mitigation measures, provides reasons to be cautiously optimistic—this was not the case a decade ago.

If adopted quickly, sustained investment in new technologies to passivate and dispose of missions will allow our environment to cope with the continued increase in space traffic and ever-more complex operations.

We must think of the space environment as a shared and limited natural resource. Continued creation of space debris will lead to the Kessler syndrome, when the density of objects in low Earth orbit is high enough that collisions between objects and debris create a cascade effect, each crash generating debris that then increases the likelihood of further collisions. At this point, certain orbits around Earth will become entirely inhospitable.

ESA is actively working to support the guidelines for the long-term sustainability of outer space activities from the UN Committee on the Peaceful Uses of Outer Space, including funding the world's first mission to remove a piece of debris from orbit, helping to create an international space sustainability rating and developing technologies to automate collision avoidance and reduce the impact on our environment from space missions.

Provided by [European Space Agency](https://phys.org/news/2020-10-current-state-space-debris.html)

<https://phys.org/news/2020-10-current-state-space-debris.html>

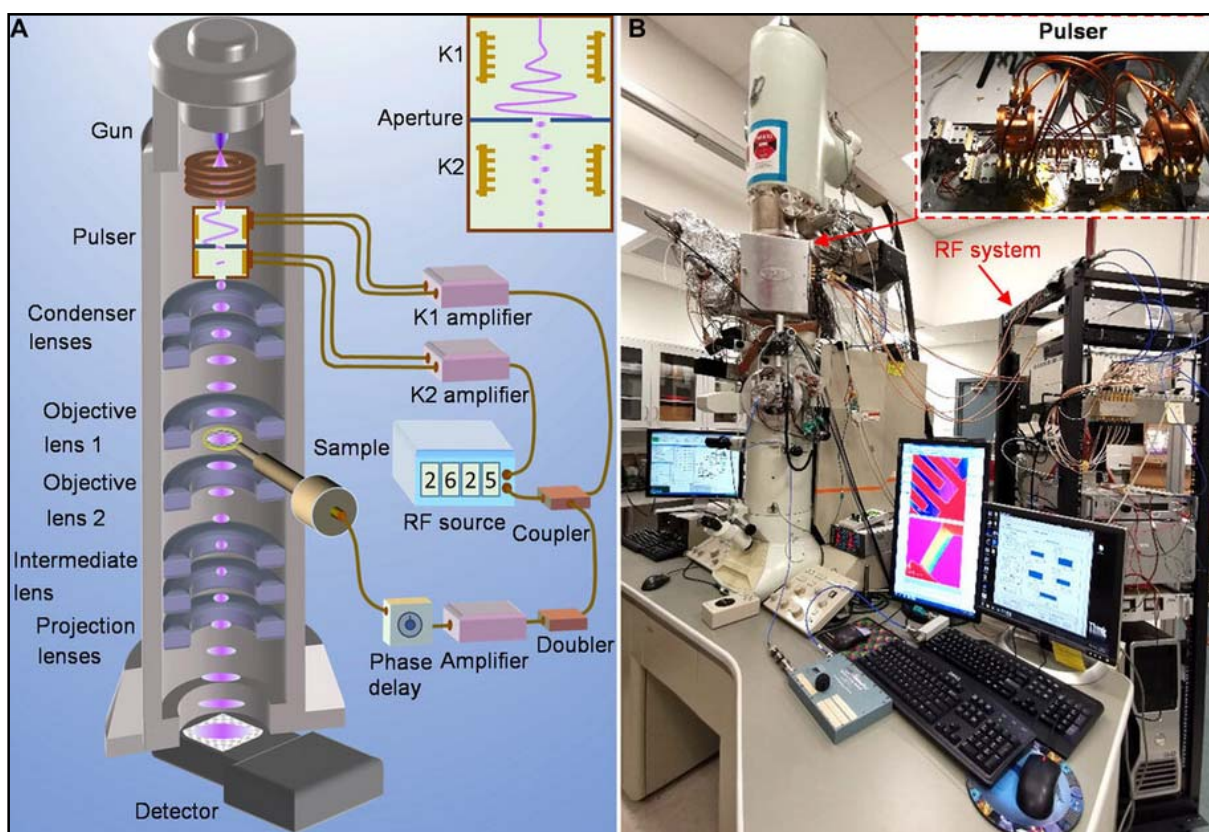


This GIF is part of a longer animation showing different types of space debris objects and different debris sizes in orbit around Earth. Credit: European Space Agency

Direct visualization of electromagnetic wave dynamics by laser-free ultrafast electron microscopy

By Thamarasee Jeewandara

Femtosecond lasers can be integrated with electron microscopes to directly image transient structures and morphologies in materials in real time and space. In a new report, Xuewen Fu and a team of scientists in condensed matter physics, microsystems, nanotechnology and materials science in China and the U.S. developed a laser-free ultrafast electron microscope (UEM) offering similar potential but without the requisite femtosecond lasers or elaborate instrumental modifications. The team created picosecond electron pulses to probe dynamic events by chopping a continuous beam with a radiofrequency (RF)-driven pulser with a pulse repetition rate tunable from 100 MHz to 12 GHz.



Laser-free UEM system. (A) Schematic of the conceptual design of the laser-free UEM. The TEM with the integration of an RF-driven pulser system and a frequency-doubled, delay-controlled RF circuit for the sample excitation is shown. The pulser is inserted between the electron gun and the standard column lens. The inset shows a schematic design of the pulser, which consists of two traveling wave metallic comb stripline elements: the modulator K1 and the demodulator K2, with a chopping aperture between them. The modulator K1 sweeps the continuous electron beam across the chopping aperture to create two electron pulses in each RF cycle, while the demodulator K2 compensates the K1-induced transverse momentum on the pulses to further rectify the shape of the chopped beam. (B) Photograph of our homebuilt laser-free UEM system based on a JEOL JEM-2100F Lorentz TEM. The TEM with the RF-driven pulser inserted between the electron gun and the standard column lens and the connected RF source are shown. The inset shows a picture of the modulator K1, the demodulator K2, and the chopping aperture inside the pulser. Photo credit: Xuewen Fu, School of Physics at Nankai University. Credit: Science Advances, doi: 10.1126/sciadv.abc3456

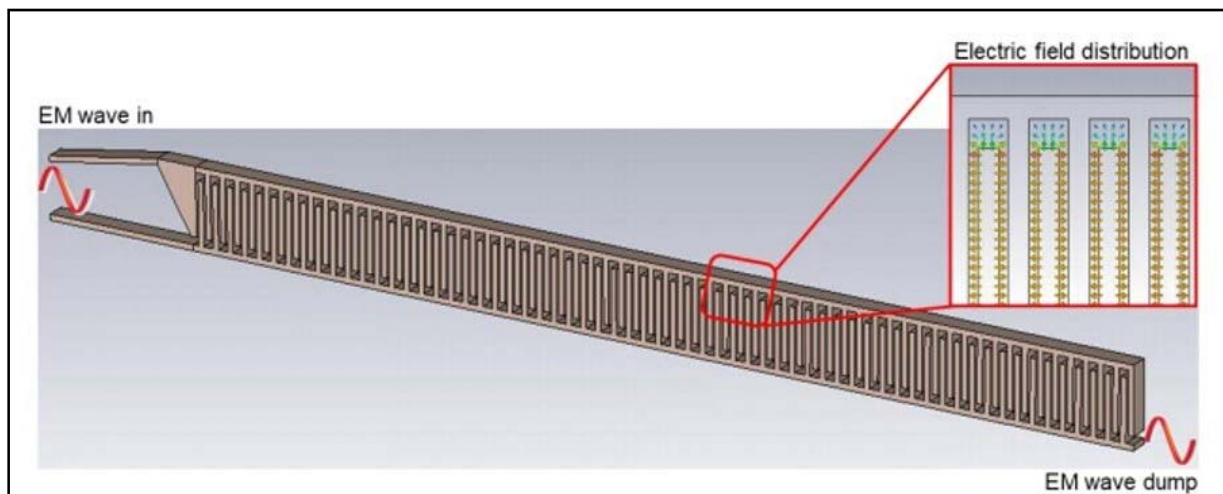
They studied gigahertz electromagnetic wave propagation dynamics as an application for the first time in this work and revealed the transient oscillating electromagnetic field on nanometer space and picosecond time scales with time-resolved polarization, amplitude and local field

enhancement. The study showed the use of laser-free, ultrafast electron microscopy (UEM) in real-space visualization for multidisciplinary research—specifically in electrodynamic devices associated with information processing technology. The research work is now published in *Science Advances*.

Modern electron microscopy and laser-free ultra-fast electron microscopy

Modern electron microscopy can allow researchers to obtain images of matter with atomic resolution due to the picometer wavelength of the high-energy electron beams, advances in aberration-correction and direct detection techniques. The method is a central tool across materials science to biology, together with progressive advances in electron crystallography, tomography and cryo-single-particle imaging. Conventionally, the electron beam of a microscope is produced by a thermionic or field emission process and such electron sources produce static images or those captured at long time-intervals due to inherent limits of conventional electron detectors. Advanced electron microscopes therefore require a strong or greater temporal resolution to investigate reaction paths in physical and chemical transitions beyond the detector limits. In this work, Fu et al. developed laser-free, ultra-fast electron microscopy by combining a prototype RF-driven electron beam pulser to create short electron pulses with a tunable repetition rate ranging from 100 MHz to 12 GHz. This method will allow researchers to record ultrafast images and detect different patterns of structural transitions.

Using the method, the research team optimized the input radiofrequency (RF) power and frequency for the pulser to achieve a time-resolution of 10 picoseconds (ps) in the instrument and used the same broadband tunable RF signal to facilitate sample excitation. During the initial demonstrations of its capability to study ultrafast dynamics, Fu et al. conducted a pump-probe study on electromagnetic wave propagation dynamics in a microstrip specimen with two interdigitated combs—a basic building block of radiofrequency microelectromechanical systems (MEMS). By combining experimental outcomes with numerical simulations, the team showed the electrodynamics of a gigahertz electromagnetic (EM) wave propagation in the microstrip specimen. This phenomenon can fundamentally contribute to the functionality of most information processing devices and other imaging techniques that presently remain inaccessible for imaging due to size constrictions.

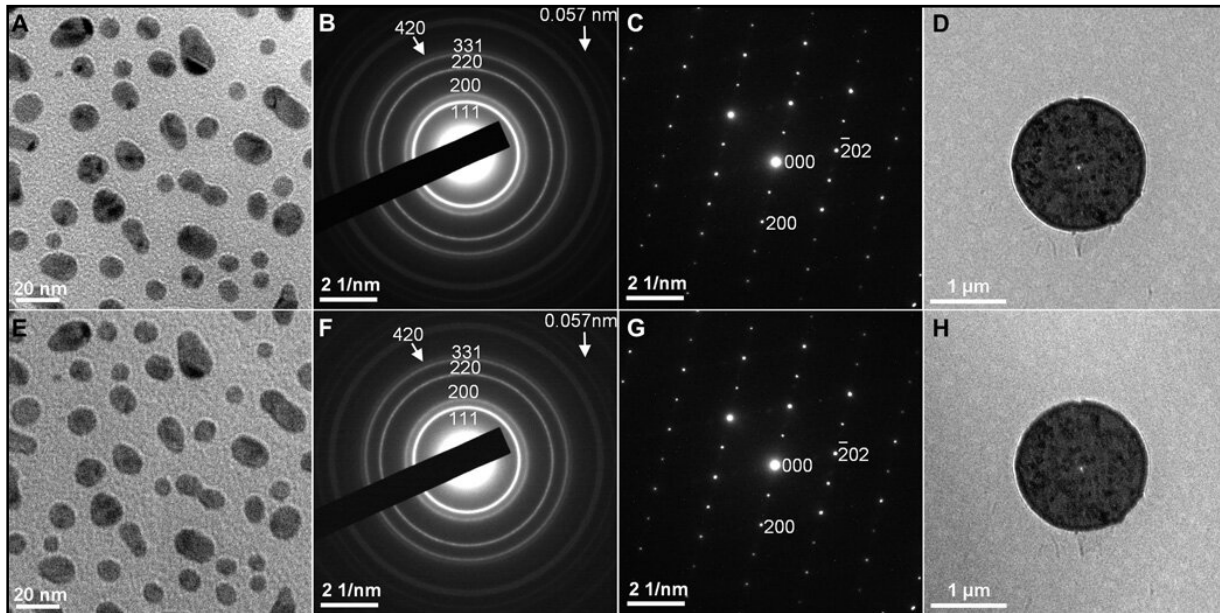


Sample modelling of a microstrip of two interdigitated combs with the same geometry and materials used in the experiment for numerical simulation. Credit: *Science Advances*, doi: [10.1126/sciadv.abc3456](https://doi.org/10.1126/sciadv.abc3456)

Conceptual design—new prototype

In the laser-free UEM (ultrafast electron microscope) the RF-driven pulser system interfaced with a transmission electron microscope (TEM). The pulser contained two traveling wave metallic comb stripline elements with a small chopping aperture between them. When the pulser was driven by a radiofrequency signal, the team recorded the generation of a sinusoidal electromagnetic wave (EM) in the modulator, while introducing an oscillating transverse momentum kick to the incoming continuous electron beam. The chopping aperture of the system partitioned the continuous beam

into periodic electron pulses. Using the current design, they established a broadband EM field with a frequency ranging from 50 MHz to 6 GHz. The scientists tested the performance of the TEM after integrating the pulser to record a set of imaging and diffraction results under a continuous beam mode and pulsed beam mode. The team examined bright-field images of gold nanoparticles in both modes that were comparable in both intensity profile and contrast. Comparable imaging quality between the pulsed beam mode and continuous beam mode showed good performance and versatility of the new laser-free UEM prototype.



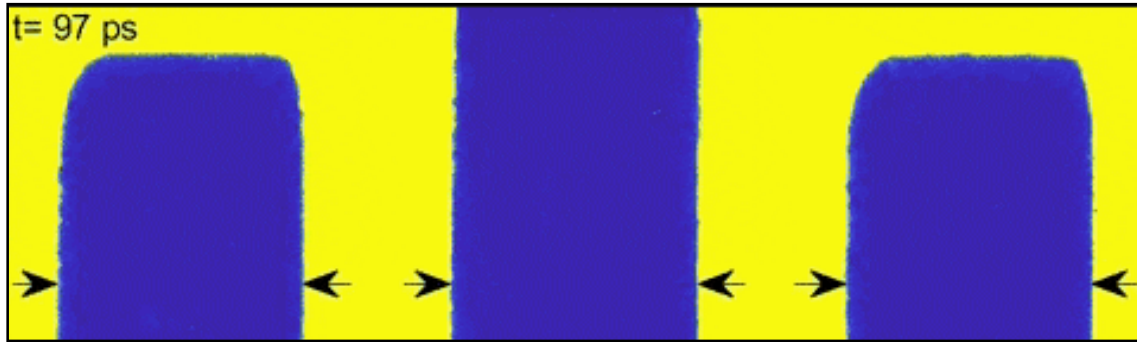
Comparison of imaging and diffraction quality between the continuous beam mode and the pulsed beam mode. Images and diffraction patterns acquired at the continuous beam mode: (A) bright-field image of gold nanoparticles, (B) diffraction pattern of gold nanoparticles, (C) diffraction pattern of a VO₂ single crystal (along [010] zone axis), and (D) out-of-focus Fresnel phase image of magnetic vortex in a circular ferromagnetic permalloy disc. Images and diffraction patterns acquired at the pulsed beam mode with the repetition rate of 5.25 GHz: (E) bright-field image of gold nanoparticles, (F) diffraction pattern of gold nanoparticles, (G) diffraction pattern of a VO₂ single crystal (along [010] zone axis), and (H) out-of-focus Fresnel phase image of magnetic vortex in a circular ferromagnetic permalloy disc. Credit: Science Advances, doi: 10.1126/sciadv.abc3456

Optimizing the experiment and proof-of-concept

The resolution of the laser-free UEM depended on the duration of the chopped electron pulses, which in turn depended on the duty cycle of the chopped electron beam. Fu et al. varied this parameter by independently changing the input RF power frequency and/or the chopping aperture size. In principle, they could use higher input RF power and a higher RF frequency with a smaller chopping aperture to achieve shorter, as well as sub-picosecond or femtosecond electron pulses to further improve the quality and resolution of imaging. The team then demonstrated the ultrafast pump-probe measurement capability of the laser-free UEM to understand the oscillating currents and fields needed to operate almost any information processing device. Fu et al. noted time-resolved images of EM propagation in the interdigitated comb structure for the first time at a magnification of 1200x, with an integral time of 1.5 seconds. They then studied the dependence of EM wave propagation dynamics on the excitation power, where the amplitude increased with increasing excitation power.

Simulated electric field distribution

To further understand the experiments, Fu et al. performed numerical simulations of EM wave propagation in a microstrip of two interdigitated combs with similar geometry and materials to the experiments, and carried out the simulation using a 3-D EM finite element analysis package. The team observed snapshots of the simulated electric field distribution around the interdigitated combs at different delay times. Since the sample is nonmagnetic, the effects of magnetic fields were negligible in the experiment. As the EM wave propagated through the interdigitated combs under investigation, a temporal oscillating electric field established between the gaps of the interdigitated combs. The simulated results were in good agreement with the experiments.



Real-time breathing of one active tine and two adjacent ground tines in the interdigitated comb structure under a 5.25 GHz electromagnetic wave excitation (power of ~1 W). Credit: *Science Advances*, doi: 10.1126/sciadv.abc3456

In this way, Xuewen Fu and colleagues engineered a laser-free ultrafast electron microscope (UEM) with high resolution in space-time, by combining a radiofrequency (RF)-driven pulser with a commercial transmission electron microscope (TEM). Using the laser-free UEM, Fu et al. studied the gigahertz electromagnetic (EM) wavelength propagation process in a microstrip containing two interdigitated combs. The team showed direct visualization of EM field oscillation with time to reveal field amplitude, polarization direction and wave propagation at the nanometer-picosecond timescale, which was hitherto inaccessible with other imaging techniques. The laser-free UEM provides a powerful path to understand electrodynamics in small devices that function across megahertz to gigahertz frequencies, such as wireless antennas, sensors and RF microelectromechanical systems (MEMS). Further optimization will allow sub-picosecond and even femtosecond wave-packets to enable femtosecond time-resolution for laser-free UEM. The work will have broad implications across materials physics to biology and mobile communication technologies.

More information: Xuewen Fu et al. Direct visualization of electromagnetic wave dynamics by laser-free ultrafast electron microscopy, *Science Advances* (2020). DOI: [10.1126/sciadv.abc3456](https://doi.org/10.1126/sciadv.abc3456)

Rolf Erni et al. Atomic-Resolution Imaging with a Sub-50-pm Electron Probe, *Physical Review Letters* (2009). DOI: [10.1103/PhysRevLett.102.096101](https://doi.org/10.1103/PhysRevLett.102.096101)

P. E. Batson et al. Sub-ångstrom resolution using aberration corrected electron optics, *Nature* (2002). DOI: [10.1038/nature00972](https://doi.org/10.1038/nature00972)

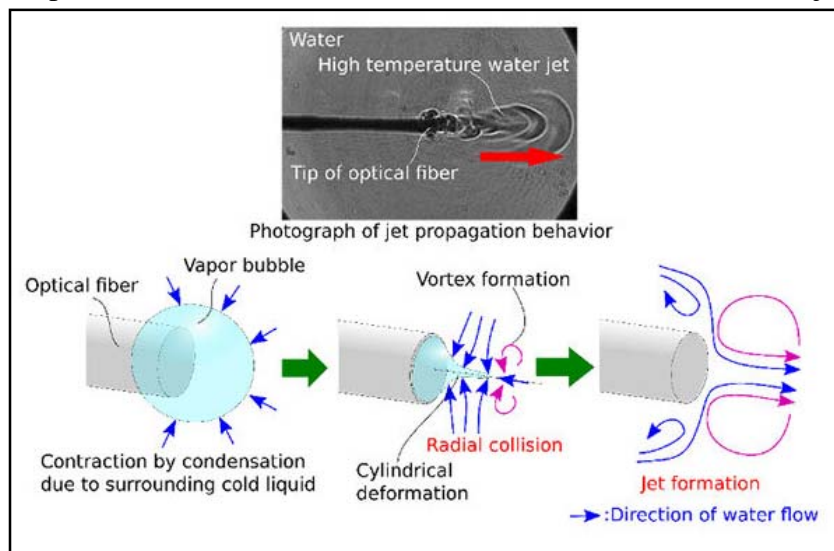
Journal information: *Science Advances* , *Physical Review Letters* , *Nature*
<https://phys.org/news/2020-10-visualization-electromagnetic-dynamics-laser-free-ultrafast.html>

Revealing the reason behind jet formation at the tip of laser optical fiber

When an optical fiber is immersed in liquid, a high-temperature, high-speed jet is discharged. Researchers expect this to be applied to medical treatment in the future. Now, a research team from Russia and Japan has explored this phenomenon further and revealed the reasons behind the jet formation.

Lasers using a thin optical fiber and combined with an endoscope and catheter can be easily transported into deep areas of the body or inside blood vessels. Traditionally, affected areas or lesions are removed by generating heat inside the tissue through laser absorption—a process known as the photothermal effect.

Yet, hydrodynamical phenomena, such as microbubble formation or high-speed jet generation from the optical fiber, show immense medical promise.



The observation of water jets in experiments and the schematics of the jet formation mechanism. Credit: Junnosuke Okajima, Tohoku University

The process of jet formation happens when the laser is irradiated to the water, causing the water to boil and a vapor bubble to form at the tip of the optical fiber. The vapor bubble grows until the laser energy absorbed in the liquid is consumed. Because of the surrounding cold liquid, condensation suddenly shrinks the vapor bubble.

Using a numerical simulation, Dr. Junnosuke Okajima from Tohoku University's Institute of Fluid Science, along with his colleagues in Russia, set out to clarify the jet formation mechanism. Their simulation investigated the relationship between the bubble deformation and the induced flow field.

When the bubble shrinks, the flow toward the tip of the optical fiber is formed. The flow deforms the bubble into the cylindrical shape. This deformation induces the collision of flow in a radial direction. This collision generates the jet forward. As a result of collision and jet formation, the vortex is formed at the tip of the deformed bubble and it grows larger.

"We found the jet velocity depends on the relationship between the size of the vapor bubble just before the shrinking and the fiber radius," said Okajima. "We will continue to develop this study and try to find the optimum condition which maximizes the jet velocity and temperature, making further laser surgical techniques more effective and safer."

More information: Roman V. Fursenko et al. Mechanism of high velocity jet formation after a gas bubble collapse near the micro fiber immersed in a liquid, *International Journal of Heat and Mass Transfer* (2020). DOI: [10.1016/j.ijheatmasstransfer.2020.120420](https://doi.org/10.1016/j.ijheatmasstransfer.2020.120420)

<https://phys.org/news/2020-10-revealing-jet-formation-laser-optical.html>



Tue, 13 Oct 2020

Explained: The drugs, vaccines being repurposed for Covid-19 treatment and what new research says

Coronavirus (Covid-19) drugs, vaccines: The BCG vaccine joins a handful of drugs like remdesivir, favipiravir, dexamethasone that have been repurposed to treat Covid-19

By Abhishek De

New Delhi: The Bacille Calmette-Guerin (BCG) vaccine, originally developed for tuberculosis a century ago, is in focus again, with scientists in the UK starting a large-scale trial on frontline health workers to gauge its effectiveness against Covid-19. As part of the global Brace study, the University of Exeter will inoculate around 1,000 healthcare workers since they are more likely to be exposed to the coronavirus. This will help researchers in knowing quickly if the vaccine is effective against Covid-19.

The BCG vaccine joins a handful of drugs like remdesivir and dexamethasone that have been repurposed to treat Covid-19. While most of the drugs have been either found to reduce viral load or cut down the risk of death among severely ill patients, there is still no specific proven treatment for the novel coronavirus yet.

Repurposed drugs, vaccines being used to treat Covid-19:

Bacille Calmette-Guerin (BCG) vaccine

The Bacille Calmette-Guerin or BCG vaccine, which is normally administered to newborn babies to protect against tuberculosis, is being tested in the UK, Australia, the Netherlands, Spain and Brazil as part of a global trial to see if it can be repurposed to help boost immunity against the novel coronavirus.

Since the BCG vaccine is proven to provide a long-lasting, general boost to the immune system, researchers hope this innate immunity will buy crucial time to develop an effective and safe Covid-19 vaccine, which is likely to be available to the public not before mid-2021.

“BCG has been shown to boost immunity in a generalised way, which may offer some protection against Covid-19,” Reuters quoted Professor John Campbell of the University of Exeter Medical School as saying.

Recent research results: In a study, published in the journal Cell Reports Medicine, scientists found that individuals dosed with BCG vaccine “did not get sick more often, or become more seriously ill” during the pandemic in comparison to those who were not vaccinated. The study, conducted in the Netherlands, also showed that those who received the vaccine did not have more symptoms.

Remdesivir

Remdesivir, an antiviral that was used for the treatment of Ebola and has been repurposed for treatment of Covid-19, has been found to obstruct the viral replication of SARS-CoV-2, basically the stage where the virus creates copies of itself. It was one of the drugs recently used to treat US President Donald Trump.

Recent research results: According to a 1,062-patient study, published in the New England Journal of Medicine, remdesivir treatment has shown to cut Covid-19 recovery time by five days.

Moreover, in patients on oxygen support, the drug reduced recovery time by seven days compared with placebo.

Favipiravir

Used as an anti-influenza drug, the anti-viral Favipiravir has shown to restrict the multiplication of the virus in the body of the host once it gets inside a host cell, thereby reducing viral load. Favipiravir has been included as a treatment protocol in several countries, including India. In June, Glenmark Pharmaceuticals launched the drug under the brand name FabiFlu, making it the first oral Favipiravir-approved medication in India for the treatment of Covid-19.

Recent research results: A study, published in the journal PNAS (Proceedings of the National Academy of Sciences of the United States of America), recently revealed that high doses of favipiravir given to hamsters significantly reduced SARS-CoV-2 levels in the lungs, improved lung pathology, and reduced virus transmission by direct contact. It must be noted that hamsters are chosen as test subjects because they closely resemble the human body's reaction to an experimental drug.

Hydroxychloroquine

Hydroxychloroquine (HCQ), traditionally used for the treatment of malaria, rheumatoid arthritis and lupus, has gained traction again after Brazilian President Jair Bolsonaro endorsed it, saying the drug helped him recover from a two-week infection. However, several studies have shown that hydroxychloroquine does not work to treat the coronavirus, with the WHO halting their Solidarity trials in May when a Lancet study suggested that the drug has potentially life-threatening effects.

Interestingly, Donald Trump, who had repeatedly touted HCQ as a “game changer” in the fight against Covid-19, himself was not given the drug when he was being treated for the infection. Trump was given an experimental antibody treatment developed by Regeneron, as well as remdesivir and dexamethasone.

Recent research results: Results of RECOVERY trials in the UK, recently published in the New England Journal of Medicine, revealed that HCQ was no better than usual care in reducing the chances of death in Covid-19 patients. For the trial, 1,561 patients were given HCQ while 3,155 were given a placebo. The study found that 27 per cent of patients in the HCQ group died as compared to 25 per cent in the standard care group in 28 days. Moreover, only 59.6 per cent of patients in the HCQ group were discharged within 28 days while 62.9 per cent recovered in the placebo group.

Coming to India, the Ministry of Health and Family Welfare last month informed the Parliament that it does not have any data to confirm the safety and effectiveness of HCQ when given to healthcare workers. “However, the drug is not recommended for severe cases and those with pre-existing cardiac disease,” the ministry said.

Dexamethasone

Typically used to treat inflammation, the low-cost, widely-used steroid dexamethasone was the first oral drug authorised by the UK government for Covid-19. Trump was recently treated with dexamethasone after his oxygen levels dropped to 93 per cent, doctors at Walter Reed National Military Medical Center had said. The steroid is used to treat a range of diseases, including rheumatism, asthma, allergies and even helps cancer patients better handle nausea triggered by chemotherapy.

Recent research results: According to research published in the August issue of Journal of Hospital Medicine, it has been found that giving dexamethasone to Covid-19 patients who are not at risk of severe illness could further endanger their health. However, a recent research, published by JAMA Network Open, has found that dexamethasone indeed reduces the number of days patients spend on mechanical ventilation.

<https://indianexpress.com/article/explained/coronavirus-covid-19-treatment-repurposed-drugs-remdesivir-favipiravir-dexamethasone-bcg-vaccine-6722274/>

