

June
2021

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 : 46 अंक : 114 11 जून 2021
Vol.: 46 Issue : 114 11 June 2021



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	1-8
	DRDO Technology News	1-4
1.	Despite world's biggest Navy, why China will struggle to match Indian, American Submarines in the Indo-Pacific?	1
2.	With Rafale Jets at helm, Indian Air Force could have outnumbered, outperformed 'Invading' Chinese Jets – Experts	3
	COVID 19: DRDO's Contribution	5-8
3.	Assam opens 300-bed Covid hospital in stadium; built in 20 days by DRDO	5
4.	300-bed COVID hospital in Guwahati made ready in less than a month	6
5.	NE's 1st DRDO Covid hospital in Assam	7
6.	डीआरडीओ के अस्थायी कोविड हॉस्पिटल में भर्ती हुए पांच मरीज	8
	Defence News	9-10
	Defence Strategic: National/International	9-10
7.	Russia to introduce new turboshaft engines to Asian market	9
	Science & Technology News	11-16
8.	Mystery object caused by spontaneous symmetry breaking revealed	11
9.	Observing quantum coherence from photons scattered in free-space	13
10.	Researchers use transoceanic fiber link for geophysical sensing	14
	COVID-19 Research News	16-16
11.	New research reveals the effects of Covid-19 on human kidney cells	16



Fri, 11 June 2021

Despite world's biggest Navy, why China will struggle to match Indian, American Submarines in the Indo-Pacific?

By Anupama Ghosh

In the increasingly tense waters of the Indo-Pacific, the submarine fleets of the US, India, and China are emerging as new weapons of power projection.

India's Modi government has recently approved a \$6.14-billion program for the development of six conventional submarines.

The move is in sync with the US' Indo-Pacific strategy, being projected through the QUAD bloc, to counter China's rising aggression in the region.

It's worth mentioning that India's second nuclear-powered ballistic missile submarine (SSBN) Arighat is slated to be commissioned later this year. As a major partner of the US-led QUAD, India is enhancing its submarine fleet.



[File: INS Chakra – Wikipedia](#)

Tenders to be floated

The Indian Navy will now issue tenders for the six submarines. The Request for Proposals (RFP) “envisages indigenous construction of six conventional submarines equipped with the state-of-the-art Air Independent Propulsion (AIP) system”.

In 2017, India's Ministry of Defence had introduced a policy, which permits selected private-sector companies to manufacture arms and platforms, including submarines, in a partnership model with foreign original equipment manufacturers (OEMs).

The six submarines will be the first platforms to be built under the strategic partnership model.

Two Indian companies, the state-run Mazgaon Dockyard Limited (MDL) and Larsen & Toubro, have already been finalized by the MOD.

The ministry has also shortlisted five foreign vendors — Rubin Design Bureau of Russia, Naval Group of France, Navantia of Spain, German company ThyssenKrupp Marine Systems (TKMS) and the South Korean firm Daewoo Shipbuilding & Marine Engineering, according to Defense News.

Submarine Fleets in Indo-Pacific

With the rising tensions between Washington and Beijing over the Taiwan Strait and the rest of the South China Sea, the Indo-Pacific is becoming an active theater where countries — China and the QUAD — are enhancing their undersea deterrence capabilities.

A study titled, ‘The Future of the Undersea Deterrent: A Global Survey’ by Australian National University’s National Security College focuses on SSBN plans of these countries.

India

In 2016, India had commissioned its first SSBN Arihant, which positioned it as the only non-permanent member country of the United Nations Security Council (UNSC) to build SSBN. The second vessel in the league INS Arighat is expected to be commissioned in 2021.

The Arihant is equipped with 12 short-range K-15 ballistic missiles with a range of 700 to 1,000 km. It can also be adapted to launch four K-4 ballistic missiles with a range of 3,000 to 3,500 km. This range makes the Arihant capable of targeting both Pakistan and China.

Noting the country’s favorable geography in the Indian Ocean, Rear Adm. Sudarshan Shrikhande (retired), the former head of the Indian Naval Intelligence, stated, “Like the United States, India has geographic advantages for SSBNs to go on open ocean patrol, once they field long-range SLBMs.

We need to move beyond bastions where an enemy’s offensive ASW (anti-submarine warfare) is effective, as well as our own resources needed for defensive ASW, would be reduced.”

The US

Nikkei Asia reported, the US intends to replace its Ohio class SSBN by 2031 and will accordingly release \$5 billion through the 2022 budget request. The requested sum will be allocated to acquire the Columbia-class SSBN, the most significant program of the US Navy.

A Congressional report was quoted in the study, which had also noted that the “Columbia-class program will be funded, even if it comes at the expense of funding for other Navy programs”.

It is expected that 14 Ohio-class SSBNs will be replaced by 12 Columbia-class SSBNs. Unlike the Ohio class, which needs to go through a long upgrade for nuclear refueling, the Columbia class does not require a refuel.

It is equipped with one reactor core which lasts throughout its life. This provision of the Columbia-class will make it possible for the US navy to operate 10 SSBNs at any given time.

The American nuclear strategy is based on three important points — first, land-based intercontinental missiles, second the air-based strategic bombers, and the third, the submarine-launched ballistic missiles.

The third — the SSBNs — remain undersea and therefore, undetected for longer periods of time, hence they are considered the most survivable nuclear assets.

Providing the rationale behind the US insistence on acquiring the Columbia class SSBN, the Nikkei Asia report quoted Tom Shugart, a former submariner and now a senior fellow at the Centre for a New American Security, as saying that a “reliable, survivable nuclear deterrent” is “the No.1 priority” of any program.

China

Defense experts believe that China has six Jin-class SSBNs (Type 094). These SSBNs have the capacity of carrying 12 JL-2 ballistic missiles with a range of 7,200 km, which enable China to mount long-distance attacks.

Thus the Jin-class SSBNs can target distant regions like Alaska and Hawaii from their protected bases near China or south of Japan.

Experts note that Chinese SSBN operations are deeply impeded by the geography of China.

Stephen Freuhling, associate dean of the ANU College of Asia and the Pacific, explained in the report, that the “SSBNs of the US, Britain, India, and Pakistan have direct access to the world’s ocean basins, those of China do not”.

The country finds itself circled by shallow waters, and the Chinese SSBNs also face the uphill task of passing various choke points in a bid to enter the much deeper and safer waters of the Pacific Ocean.

It is believed that one of the prime reasons behind China's recent push to build and militarized islands on the South China Sea, is to create a safe haven for its SSBN fleet to pass through, without US detection.

Experts are of the opinion that even though China may be catching up with the US through the development of its military, undersea warfare and the SSBNs still provide the much-needed edge to the US over China.

American naval analyst Norman Friedman stated that it may take China many more decades to "produce a sea-based missile with sufficient range to reach anywhere in the United States from the South China Sea".

Pakistan

Pakistan has been wary of the QUAD and its growing influence in the Indo-Pacific. While the country has to do much more to catch up with its neighbor India, its all-weather ally China may provide it a significant push as far as submarines are concerned.

It is reported that China will be providing Pakistan with eight modified Type 093 and Type 041 Yuan-class diesel-electric submarines. The first batch of the submarines is expected to be delivered by 2023, and the others by 2028.

<https://eurasianimes.com/despite-worlds-biggest-navy-why-china-will-struggle-to-match-indian-american-submarines-in-the-indo-pacific/>



Fri, 11 June 2021

With Rafale Jets at helm, Indian Air Force could have outnumbered, outperformed ‘Invading’ Chinese Jets – Experts

By Anupama Ghosh

While the Indian Air Force remains equipped with powerful Rafale and Su-30MKI fighter jets, China displayed its own military prowess when it conducted large-scale drills comprising around two dozens fighter jets near eastern Ladakh.

News agency ANI reported quoting senior defense officials that 21-22 Chinese jets including the J-11s and a few J-16 fighters took part in the drills opposite the Indian territory in eastern Ladakh.

It is believed the PLA aircraft took off from bases such as Hotan, Gar Gunsa, Kashgar in Xinjiang and Tibet regions of China. Some of these airbases have been renovated recently to enable operations by all types of fighters.

Some reports indicated that the real numbers of the fighters present at the different airbases are difficult to ascertain. The Chinese aircraft remained well within their territory during the aerial drills, Indian officials told ANI.

The Indian and Chinese militaries have been engaged in a border standoff for almost a year now. In February, they had agreed to disengage from the Pangong Tso area in eastern Ladakh and their discussions to ease tensions at other friction points are still on.



[File Image: Rafale at Aero India 2017 – Wikimedia Commons](#)

However, the Chinese side continues to deploy advanced weaponry near the Line of Actual Control, the de facto Himalayan border that divides the two countries.

India keeping a close eye

The Indian Air Force reportedly was on high alert and kept a close eye on the latest aerial exercise of the Chinese fighter jets. Further, satellites and additional forms of surveillance were used by the Indian security agencies to keep a close tab on Chinese activities.

China has also arranged its air defense system in the area. In April, The EurAsian Times reported on how the Chinese PLA Army & Air Force have for the first time set up a combined air defense system somewhere close to the Indian border.

The Chinese military mouthpiece, The PLA Daily had then said, “The integration of air defense across services and arms is a solid step to deepen joint operations.”

The move is in sync with Chinese President Xi Jinping’s idea of having combined military training for the PLA troops.

To counter the rising Chinese aggression, India has also positioned its air defense missiles in the region. It is believed that the Akash missile system has been deployed by the Air Force, which is capable of targeting high-speed combat aircraft and drones.

IAF Deploys Rafales

Regular sorties are reportedly conducted by the Indian Air Force (IAF) in Ladakh. “After the summer deployments of the Chinese troops and Air Force this year, the Indian Air Force has also been regularly deploying detachments of its fighters including the MiG-29s in Ladakh’, an official told ANI.

It is believed that the IAF has also positioned its Sukhoi-30 MKI, Mirage 2000 and Jaguar fighter aircraft in the area to counter the Chinese threat.

The strength and capability of the IAF have been further increased with the addition of the Rafale fighters into its ranks. The IAF has been using the French-made fighters equipped with the most advanced beyond visual range Meteor air-to-air missiles with a range of 150 km, regularly in the areas of Ladakh.

IAF is set to operationalize its second Rafale squadron at the strategically located Hasimara Air Force Station in the eastern state of West Bengal, close to the China border.

The Ambala airbase in the north Indian state of Punjab houses Rafale’s first squadron, nicknamed “Golden Arrows”.

IAF vs PLAAF?

Air Marshal Anil Chopra (retired) earlier told The EurAsian Times if the Chinese PLA Air Force (PLAAF) had deployed 100 combat aircraft in Ladakh during last year’s border standoff, India has the capability of fielding as many as 250 aircraft in the area.

“They cannot deploy more than this (100) because they have just three airfields in that area. The closest is Gar Gunza civil airport with a small air force enclave. It is at over 10,000 feet altitude, and can accommodate only a few military aircraft.”

Hotan is their main PLAAF base, around 350 kilometers from the area of action, and that can take on 50-60 aircraft. The third is Kashgar, around 600 km from the place of action.

“Yes many Chinese fighter aircraft, mostly J-11 (Su-27 variant), and J-10 have been seen,” Chopra had said.

The newer J-20 fifth-generation stealth has also operated in the region but is not locally deployed. Also, H-6K bombers with 6 cruise missiles each have been sighted at Hotan.

“In comparison to China, the IAF has nearly 10 airfields within 350 km of the area of action and IAF has the capability to field around 250 aircraft,” the veteran fighter pilot maintained.

<https://eurasianimes.com/with-rafales-su-30mkis-indian-air-force-could-have-outnumbered-outperformed-invading-chinese-jets-experts/>

Assam opens 300-bed Covid hospital in stadium; built in 20 days by DRDO

Set up in an area of 3,200 sq m, the hospital at Sarusajai Stadium has 200 beds in general ward with oxygen facility and 100 ICU beds. It also has an X-ray room, pharmacy, ultrasound and ECG room and laboratory

By Utpal Parashar

The Assam government on Thursday opened a 300-bed Covid-19 hospital at a stadium complex in Guwahati to combat the ongoing pandemic.

Constructed in 20 days at a cost of ₹21.46 cr, the hospital was built with help from Defence Research and Development Organisation (DRDO) and handed over to state government, which completed first month in office on Thursday.

Set up in an area of 3,200 sq m, the hospital in Sarusajai Stadium has 200 beds in general ward with oxygen facility and 100 intensive care unit (ICU) beds. It also has an X-ray room, pharmacy, ultrasound and ECG room and laboratory.



Assam health minister Keshab Mahanta (first from left) inspects the Covid-19 hospital at Sarusajai Stadium in Guwahati on Wednesday, a day before its inauguration. (Photo: Keshab Mahanta/Twitter)

“Since assuming office, we have been able to set up 390 ICU beds and 2,684 oxygen beds all over the state to cater to Covid-19 patients,” chief minister Himanta Biswa Sarma said after inaugurating the new facility.

“Due to our advanced planning, we have been able to cater to oxygen needs of our patients as well as supply it to neighbouring states in the northeast to help them tackle the situation. The new facility will immensely aid our fight against the pandemic,” he added.

On May 10, the day the new Cabinet took oath, the state recorded 5,803 positive Covid cases. Within the next 10 days, the figure rose to 6,573 cases on May 20—the highest-ever daily cases for the state. Nearly 80-90 deaths from the disease were reported daily then and hospitals were filled to the brim with patients.

The daily numbers have now come down to around 3,800 cases and about 40 deaths. The positivity rate, which is a measure of the number of cases turning up positive out of the total tested, hovered at 9% a month ago. It has now decreased to nearly 3%. The state has over 49,000 active Covid cases at present.

<https://www.hindustantimes.com/india-news/assam-opens-300-bed-covid-hospital-in-stadium-built-in-20-days-by-drdo-101623304934056.html>

300-bed COVID hospital in Guwahati made ready in less than a month

“Additional infrastructure to reduce patient load in other hospitals in Assam”

Guwahati: A 300-bed COVID Care Hospital built in collaboration with the Defence Research and Development Organisation (DRDO) at Sarusajai Sports Complex here has been made ready in less than a month’s time.

In addition, a 20-bed ICU and 32 oxygen-supported beds are also ready to cater patients at Kalapahar COVID Care Hospital.

Inaugurating the new facilities here on Thursday, Assam chief minister Himanta Biswa Sarma said that with these additional ICU and oxygen-supported beds, COVID-19 treatment at the MMC Hospital in Panbazar and Singimari Hospital, on the outskirts of the city, would come to a halt and that they could cater to non-COVID patients.

“Moreover, more COVID patients from other parts of lower Assam and central Assam can be accommodated at GMCH as another 200 ICU beds are coming up there in the next 10 days,” Sarma said.

Commenting on the new DRDO-assisted facility at Sarusajai, he said the development was a significant step in the state’s fight against COVID-19.

“With adequate ICU beds and oxygen at our disposal, we can ensure effective treatment. We are therefore grateful to DRDO India for having been a generous partner in this critical project, which has been made ready in a short span of time. This also is a fine example of Centre-state collaboration,” he said.

Constructed at a cost of Rs 21.46 crore, the hospital will act as an annex to the Guwahati Medical College and Hospital and fortify Assam’s COVID management capabilities, besides easing the burden on other hospitals of the state.

The 300-bed hospital is equipped with a liquid oxygen tank to ensure continuous supply of oxygen to patients. The tank will be refilled weekly.

“The hospital will have a life span of five years which can be further extended. It has 100 ICU beds while oxygen facilities can be made available to the other 200 beds as well,” the chief minister said.

<https://theshillongtimes.com/2021/06/10/300-bed-covid-hospital-in-guwahati-made-ready-in-less-than-a-month/>



Fri, 11 June 2021

NE's 1st DRDO Covid hospital in Assam

The DRDO supported first ever 300-bed Covid hospital in northeast India was inaugurated in Guwahati on Thursday by Assam Chief Minister Himanta Biswa Sarma. The modern Covid Care Hospital was set up by converting a portion of the Sarusajai Sports Complex in Guwahati and it will act as an annexe to the Gauhati Medical College and Hospital.

Sarma said the new hospital was built at a cost of Rs 21.46 crores and in association with DRDO (Defence Research and Development Organisation). The state owned Oil India Limited and ICICI Bank have extended financial support to the tune of Rs 2 crore and Rs 1.5 crore respectively for the project, which would give a renewed push to Assam's Covid-19 management capabilities.

The Chief Minister thanked DRDO for setting up the hospital within a record period of around 20 days and for having been a generous partner in this critical project. "This is an excellent example of centre-state collaboration and collective spirit to deal with the pandemic."

Saying that the hospital would have a life span of five years, which can be extended with minimum infrastructure boost up, Sarma informed that there will be 100 ICU beds available in the hospital and oxygen facility could also be made available in another 200 beds.

Moreover, a liquid oxygen tank has been set up to provide continuous supply of oxygen to patients which shall be refilled weekly. Sarma said that during the first 30 days of the new government 465 ICU beds including beds with ventilation facility, 2684 oxygen supported beds were added in the medical institutions. Moreover, 200 ICU beds at GMCH would be made functional in the next ten days, he said, adding that the government is working to set up at least 15 ICU beds in every district hospital.

In view of flood and erosion affecting a large population every year in Assam, the Chief Minister urged DRDO to consider setting up makeshift housing facilities in different parts of the state so that flood affected people could take shelter there. He also informed that 1,000 Paediatric Intensive Care Units (PICU) would be set up to strengthen health infrastructure for children needing critical treatment.

<http://www.nagalandpost.com/ne-s-1st-drdo-covid-hospital-in-assam/234805.html>

डीआरडीओ के अस्थायी कोविड हॉस्पिटल में भर्ती हुए पांच मरीज

राजकीय मेडिकल कॉलेज परिसर स्थित जनरल बीसी जोशी अस्थायी कोविड अस्पताल में पांच मरीजों को भर्ती कर दिया गया है। कोरोना संक्रमित एक मरीज अल्मोड़ा का है और चार मरीजों को डा. सुशीला तिवारी कोविड अस्पताल से शिफ्ट किया गया है।

By Skand Shukla

हल्द्वानी: राजकीय मेडिकल कॉलेज परिसर स्थित जनरल बीसी जोशी अस्थायी कोविड अस्पताल में पांच मरीजों को भर्ती कर दिया गया है। कोरोना संक्रमित एक मरीज अल्मोड़ा का है और चार मरीजों को डा. सुशीला तिवारी कोविड अस्पताल से शिफ्ट किया गया है।

एसटीएच के चिकित्सा अधीक्षक डा. अरुण जोशी ने बताया कि अब अधिकांश कोरोना संक्रमित मरीजों को अस्थायी कोविड अस्पताल में ही भर्ती किया जाएगा। अल्मोड़ा से रेफर होकर पहुंचे कोरोना संक्रमित बुजुर्ग को कोविड अस्पताल में भर्ती किया गया। वहीं एसटीएच में भर्ती कम गंभीर मरीजों को भी वहां पर शिफ्ट कर दिया गया। वहां पर 25 डाक्टर व 20 से अधिक पैरामेडिकल स्टाफ की इयूटी लगा दी गई है। जांच व भोजन समेत अन्य सुविधाएं उपलब्ध करा दी गई है।



32 आइसीयू व 320 ऑक्सीजन बेड खाली

एसटीएच में कोरोना संक्रमित 84 मरीज हैं। चिकित्सा अधीक्षक डा. जोशी ने बताया कि नैनीताल जिले के एक मरीज की मौत हो गई। 30 मरीजों की हालत गंभीर है। वहीं जिले में कोरोना संक्रमित 60 लोग संक्रमित पाए गए हैं।

ब्लैक फंगस एक और मरीज भर्ती

एसटीएच में ब्लैक फंगस का एक और मरीज भर्ती हो गया है। डा. जोशी ने बताया कि लालकुआं निवासी 42 वर्षीय मरीज में ब्लैक फंगस के संदिग्ध लक्षण हैं। मरीज की जांच चल रही है। साथ ही इलाज शुरू कर दिया गया है। वहीं अस्पताल में ब्लैक फंगस के 20 मरीज भर्ती हैं।

<https://www.jagran.com/uttarakhand/nainital-five-patients-admitted-to-drdo-temporary-covid-hospital-21726878.html>

Fri, 11 June 2021

Russia to introduce new turboshaft engines to Asian market

“In 2019-2020 the UEC’s share in the global helicopter engine market was between 10 and 12 percent. The corporation now has two such engines in its portfolio of export-oriented products, namely Klimov VK-2500 and Klimov TV7-117V,” according to a UEC representative

By Anthony Bell

Russia’s United Engine Corporation (UEC, a subsidiary of state corporation Rostec) is expanding its portfolio of turboshaft engines for helicopters.

“In 2019-2020 the UEC’s share in the global helicopter engine market was between 10 and 12 percent. The corporation now has two such engines in its portfolio of export-oriented products, namely Klimov VK-2500 and Klimov TV7-117V,” according to a UEC representative.

The UEC’s market share in the helicopter engine cluster will increase to 18-20 percent by 2035. “The introduction of new Klimov VK-650V and Klimov VK-1600V engines and the adaptation of all family of Russian helicopter engines to foreign-made platforms in UEC’s traditional markets, namely the countries of South-East Asia will be the main reasons behind the anticipated growth,” said the UEC representative.

The share of helicopter engines in the structure of UEC’s current revenue is between six and nine percent, he noted.

The above-mentioned engines are produced by JSC UEC-Klimov (a subsidiary of UEC). VK-2500 has replaced the Soviet-designed TV3-117 helicopter motors and is intended for Mil Mi-8/17, MI-24/35, and Kamov Ka-52 rotorcraft. Having the power output between 2,000 h.p. and 2,700 h.p. (depending on the mode), VK-2500 entered serial production in 2014. TV7-117V is primarily intended for the Russian Helicopters’ (a subsidiary of Rostec) newest Mi-38 medium utility rotorcraft; however, it can be modified to both existing and advanced Russian-made (and even Soviet-made) transport and combat helicopters. TV7-117V also entered serial production – UEC is reported to have a backlog of orders for approximately 250 such engines through 2030.

The VK-650V engine with a power output of 650 h.p. is primarily intended for Ka-226T light utility rotorcraft, while 1,600-h.p. VK-1600V is set to power the newest Ka-62 medium utility rotorcraft. The serial manufacturing of both engines will commence in 2024.

As mentioned earlier, UEC targets Asian market as a primary one. The countries of the region operate a large number of Mil and Kamov rotorcraft powered by ageing TV2-117 or early TV3-117 engines. Moreover, some Klimov power plants have completed special trials under Asia’s harsh climatic conditions: in particular, a Mi-17V-5 utility helicopter powered by VK-2500 engines



The UEC’s market share in the helicopter engine cluster will increase to 18-20 percent by 2035.

has already passed through several tests in the mountains of Tibet, confirming its reliability in mountain air.

The Indian Air Force (IAF) is among the largest operators of utility rotorcraft in Asia. According to the World Air Forces 2021 handbook published by the London-based magazine Flight International, the military service has deployed the fourth in the world inventory of combat helicopters, which comprises 775 rotary-wing aircraft (or four percent of the global helicopter inventory). The IAF is reported to be operating 223 Mi-8/17 utility rotorcraft and 15 Mi-24/35 gunships. This inventory is powered by 476 engines, and there are some spare motors to replace those in service in cases of emergency. The proportion of the engines in the Indian service is not disclosed; at the same time, one can state that the IAF is a large operator of TV2-117/TV3-117-type motors also. Those powerplants can be replaced with brand new VK-2500s. UEC-Klimov also upgrades existing TV3-117 engines to the VK-2500 standard.

The number of other suppliers of engines for Soviet- and Russian-made helicopters (first of all, Mi-8- and Mi-24-family platforms) is rather limited, with the Ukrainian-based JSC Motor Sich being the largest one. At the same time, the enterprise is now in a turmoil: in mid-March President Volodimir Zelensky scrapped a proposed deal suggesting large foreign investments in the company and signed a presidential decree to nationalize Motor Sich. This urgent measure infuriated all potential investors, both domestic and foreign ones; therefore, nobody seems to do any short-term external investments in enterprise. While Kyiv is in efforts to calm down its foreign economic partners, Motor Sich is not in its best shape: despite having some orders (including export ones) for production of brand new engines and maintenance of existing ones, the company just has no funds to provide quality works. Its backlog of orders is shrinking due to drops in quality of manufacturing processes; moreover, any potential customer keeps in mind the nationalization case and has no intention to buy critically important products (engines in this very case), services, support, and technologies from a company that cannot fully guarantee punctual implementation of an order.

Motor Sich also offers its own medium utility rotorcraft, namely Mi-8MSB. However, this rotary-wing aircraft is, in fact, a used helicopter by two TV3-117VMA-SMB1V Series 4E turboshaft engines designed by the company. The designer of the baseline rotorcraft, Mil company (now is integrated in the Russian Helicopters' National Helicopter-Building Center named after Mil and Kamov), provides no guarantee for Mi-8MSB and its derivatives, and does not support these rotorcraft.

It should also be mentioned that Motor Sich does not upgrade its TV3-117-family power plants to modern standards and does not fit them with any full authority digital engine control (FADEC) systems. The enterprise just overhauls its helicopter motors, as it has no funds for development of any FADEC devices for its turboshaft motors. Therefore, the Ukrainian enterprise cannot participate in any full-scale upgrade and re-motorization of Mi-8 and Mi-24 rotorcraft.

Motor Sich seems to be the only near-peer competitor to UEC in terms of helicopter engines for Soviet- and Russian-made rotary-wing platforms. However, the abovementioned financial and political issues dramatically hinder the development of the enterprise, dropping it off the list of the largest manufacturers of helicopter engines and making it an unreliable supplier of products and services.

Some Eastern European companies, such as Belarus' Orsha Aircraft Repair Plant (OARZ), Poland's Wojskowe Zaklady Lotnicze No.1, and Bulgaria's Avianams, provide only maintenance, repair, and overhaul (MRO) services and (in some cases) technical support. These MRO companies do not supply brand new turboshaft engines; neither do they upgrade existing TV3-117/VK-2500 motors to new standards.

(The author is an Independent Military Analyst. Views expressed are personal and do not reflect the official position or policy of Financial Express Online.)

<https://www.financialexpress.com/defence/russia-to-introduce-new-turboshaft-engines-to-asian-market/2268766/>



Fri, 11 June 2021

Mystery object caused by spontaneous symmetry breaking revealed

Hiromitsu Takeuchi, a lecturer at the Graduate School of Science, Osaka City University, and a researcher at the Nambu Yoichiro Institute of Theoretical and Experimental Physics (NITEP), has theoretically identified the nature of a mysterious topological defect produced by the recently discovered non-equilibrium time evolution of spontaneous symmetry breaking (SSB). Since the SSB realized in this system is like the SSB that has been known to occur in isotropic superconductors and superfluid ^4He , it was expected to produce topological defects with vortex-like properties in the fluid, called quantum vortices. However, the topological defect observed in this experiment has a structure that bore little resemblance to the previously mentioned SSB, and its physical properties have been shrouded in mystery. In this research, the idea of applying the Joukowski transform, which is used to calculate the lift of airplane wings, to quantum vortices was introduced for the first time, and the analysis revealed that the most stable state of this mysterious topological defect is a new topological defect called a quantum elliptic vortex. The results of this research were published online in *Physical Review Letters*, considered to be one of the most prestigious journals in the field of physics.

A time- and space-dependent function called a "field" is commonly used to describe the properties of physical systems in which SSB occurs. If the motion of the field can be calculated, the behavior of the system can be predicted. However, the calculation is generally difficult because the degrees of freedom of the field are infinite.

One effective way to describe the complex motion of a field is to represent the degrees of freedom of an object floating in it, called a topological defect. The field around the "core" of a topological defect has a certain structure. Therefore, by describing the center of the core as the motion of a mass point, the motion of the field can be approximately predicted.

This situation is similar to how the future change in wind direction can be predicted to some extent by looking at the path of the eye of a typhoon. In materials where SSB typically occurs, such as superconductors and superfluids, this "wind" corresponds to current without resistance and flow without friction, respectively. Since the structure of the field around the core can be predicted according to the symmetry breaking, it has been thought that the behavior of topological defects,

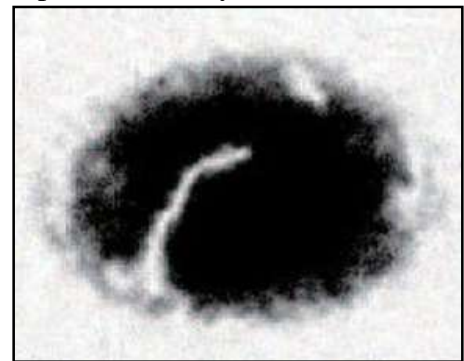


Figure 1: Composite defect in a ^{23}Na superfluid confined in a pancake-shaped two-dimensional "electromagnetic container". The blacker color indicates a region of high fluid density. The core of the topological defect corresponds to the white region in the center of the picture. Credit: *Phys. Rev. Lett.* 122, 095301 (2019)

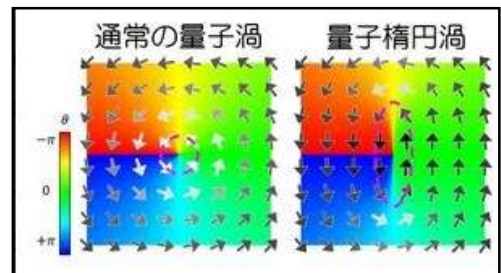


Figure 2: Flow (numerical calculation) around an ordinary rotationally symmetric quantum vortex (left) and a quantum elliptic vortex (right). The arrows indicate the direction of the flow; the whiter the color, the stronger the flow. The outline of the core is outlined by dashed lines. The background color represents the phase θ of the macroscopic wave function (complex function) corresponding to the superfluid field. Credit: Osaka City University

and hence the behavior of the field, can be understood if the symmetry breaking is understood on a global scale.

A phenomenon that refutes this idea was recently observed by Professor Shin's experimental group at Seoul National University [Phys. Rev. Lett. 122, 095301 (2019)]. Since the symmetry breaking in this experimental system is similar to that in well-known ordinary superconductors and superfluids, the shape of the core of the topological defect, called a quantum vortex, is expected to be round like the eye of a typhoon in a two-dimensional cross section.

However, the actual cross-sectional structure of the phase defect observed was completely different. Figure 1 shows an experimental photograph of the structure corresponding to the cross section of a topological defect caused by a sudden phase transition. At the time, this topological defect was considered to be a compound of two known topological defects (composite defect) and was interpreted as a transient state that occurs temporarily during the phase transition process near the critical point.

In this study, to clarify the physical properties of the composite defect observed in the experiment, Hiromitsu Takeuchi introduced the idea of applying the Joukowski transform, which is used to calculate the lift of an airplane wing, to the quantum vortex. Based on this idea, the topological defect observed in the experiment is eventually stabilized as a new topological defect called a quantum elliptic vortex. Ordinary quantum vortices have a rotationally symmetric flow in their cross-section, like an eye of a typhoon (Fig. 2, left). However, the cross section of the newly proposed quantum elliptic vortex spontaneously breaks the rotational symmetry and forms a flow along the ellipse. It was previously thought that the external shape of a topological defect was determined based on the way the global SSB of the physical system occurs, but this result clearly overturns that perception.

It is theoretically known that such a strange structure occurs near the critical point of the phase transition, and that the local SSB inside the core of the topological defect is deeply involved in its stability.

Although SSB has been studied for a long time, there is no general understanding of how the local SSB inside the core occurs and how it affects the physical properties of topological defects. Topological defects appear not only in special materials such as superconductors, but also in a variety of physical systems ranging from relatively familiar materials such as crystals and liquid crystals to cutting-edge science and technology such as spintronics, and they are considered to play important roles in a rotating neutron star and the phase transition dynamics in the early universe. There is hope that new developments in SSBs, such as Takeuchi's discovery, will be brought about by improvements in experimental techniques and corresponding advances in theory, and that they will have a ripple effect on the entire field of physics.

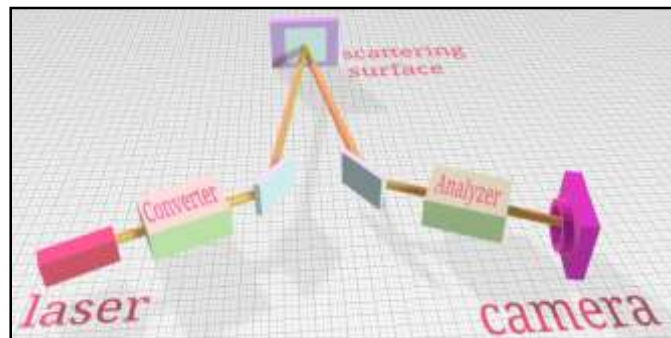
More information: Hiromitsu Takeuchi, Quantum Elliptic Vortex in a Nematic-Spin Bose-Einstein Condensate, *Physical Review Letters* (2021). DOI: [10.1103/PhysRevLett.126.195302](https://doi.org/10.1103/PhysRevLett.126.195302)

Journal information: [Physical Review Letters](https://phys.org/news/2021-06-mystery-spontaneous-symmetry-revealed.html)
<https://phys.org/news/2021-06-mystery-spontaneous-symmetry-revealed.html>

Observing quantum coherence from photons scattered in free-space

Quantum coherence is a key ingredient of many fundamental tests and applications in quantum technology, including quantum communication, imaging, computing, sensing and metrology. However, the transfer of quantum coherence in free-space has so far been limited to direct line-of-sight channels, as atmospheric turbulence and scattering degrade the quality of coherence severely.

In a new paper published in *Light: Science & Applications*, researchers from the University of Waterloo have successfully demonstrated the transfer and recovery of quantum coherence using photons scattered in free-space for the first time. This enables new research opportunities and applications in fields ranging from quantum communication to imaging and beyond.



Each optical pulse from the laser is sent through a phase Converter, which creates two coherent pulses, while the multi-mode Analyzer measures the signals scattered off the target surface, implemented with regular bright paper. A single-photon-detector-array is used as the detection device, with 8 x 8 individual pixels which are each time-tagged separately. Credit: Shihan Sajeed, Thomas Jennewein

"The ability to transfer quantum coherence via scattered photons means that now you can do many things that previously required direct line-of-sight free-space channels," said Shihan Sajeed, lead author

on the paper and a postdoctoral fellow at the Institute for Quantum Computing (IQC) and in the Department of Physics and Astronomy at the University of Waterloo in Ontario, Canada.

Normally, if you try to send and receive photons through the air (free-space) for quantum communication, or any other quantum-encoded protocol, you need a direct line-of-sight between transmitter and receiver. Any objects in the optical path—as big as a wall or as small as a molecule—will reflect some photons and scatter others, depending on the reflectivity of the surface. Any quantum information encoded in the photons is typically lost in the scattered photons, interrupting the quantum channel.

Together with Thomas Jennewein, principal investigator of the Quantum Photonics lab at IQC, Sajeed found a way to encode quantum coherence in pairs of photon pulses sent one after the other, so that they would maintain their coherence even after scattering from a diffuse surface.

The researchers emitted a train of pulse pairs with a specific phase-coherence that could be measured from the scattered photons using quantum interference. They also used a single-photon-detector-array sensor that, in addition to solving wavefront distortions caused by atmospheric turbulence, acted as an imager, thereby allowing them to observe single-photon interference and imaging simultaneously. They placed the detector where it would only absorb scattered photons from the laser pulses, and observed a visibility of over 90%, meaning that the scattered photons maintained their quantum coherence even after smashing against an object.

Their novel technique required custom hardware to make use of the coherent light they were generating. The single photon detector array could detect one billion photons every second, with a precision of 100 picoseconds. Only cutting-edge time-tagging electronics could handle the demands of this flow of light, and the team had to design their own electronics adapter board to communicate between the detectors and the computer that would process the data.

"Our technique can help image an object with quantum signals or transmit a quantum message in a noisy environment," says Sajeed. "Scattered photons returning to our sensor will have a certain

[coherence](#), whereas noise in the environment will not, and so we can reject everything except the photons we originally sent."

Sajeed expects their findings will stimulate new research and new applications in quantum sensing, communication, and imaging in free space environments. The duo demonstrated quantum communication and imaging in their paper, but Sajeed said further research is required to find out how their techniques could be used in various practical applications.

"We believe this could be used in quantum enhanced LIDAR (Light Detection and Ranging), quantum sensing, non-line-of-sight imaging, and many other areas—the possibilities are endless," said Sajeed.

More information: Shihan Sajeed et al, Observing quantum coherence from photons scattered in free-space, *Light: Science & Applications* (2021). DOI: [10.1038/s41377-021-00565-y](https://doi.org/10.1038/s41377-021-00565-y)

Journal information: [Light: Science & Applications](#)
<https://phys.org/news/2021-06-quantum-coherence-photons-free-space.html>



Fri, 11 June 2021

Researchers use transoceanic fiber link for geophysical sensing

In a new study, researchers show that the fiber optic cables that carry data across the world's oceans can also be used to sense geophysical events and monitor ocean and seafloor conditions.

Although buoys and cabled observatories can be used to monitor parts of the ocean, the information they provide is limited to their immediate surroundings. The new approach could offer a way to use the global network of subsea fiber optic cables to study otherwise inaccessible parts of the ocean.

"Once perfected, this new technique will allow geophysical sensing in the ocean depths, which are largely unexplored because of a lack of instrumentation that works in this environment," said Zhongwen Zhan, assistant professor of geophysics at Caltech. "It could one day be used to detect earthquakes with epicenters in the ocean, allowing earlier warnings of earthquakes and tsunamis, for example."

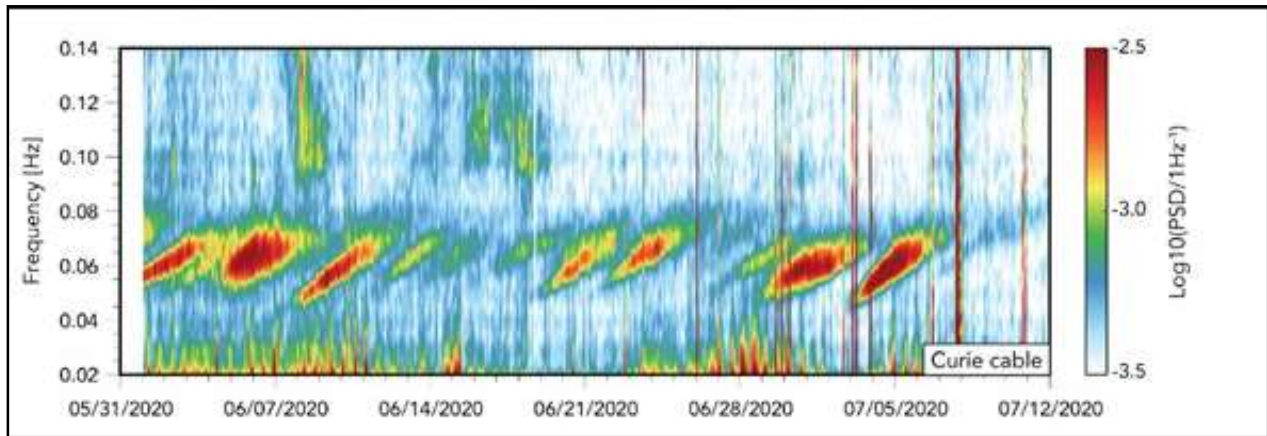


Researchers used the Curie transoceanic subsea fiber optic cable for geophysical sensing. The Curie cable connects Los Angeles, Calif., with Valparaiso, Chile. Credit: Google

In *Optica*, The Optical Society's journal for high impact research, Zhan, together with researchers from Google and the University of L'Aquila demonstrate that the new approach can detect earthquakes and ocean swells—collections of waves produced by storms. They did this using the Curie transoceanic fiber optic cable that connects Los Angeles, California with Valparaiso, Chile.

Going beyond carrying data

The new technique makes use of the fact that earthquakes, pressure variations or other changes in the environment of a transoceanic cable create subtle changes in the light traveling down the optical fibers. Although transoceanic fiber optic links have been used to sense geophysical events in the Mediterranean Ocean, the approach used in previous demonstrations required extremely specialized lasers that are difficult to obtain and use.



This spectrogram shows ocean swells detected with the Curie cable from June 1, 2020, to July 12, 2020. Each swell lasted for a few days. Credit: The Optical Society (OSA) & Antonio Mecozzi, University of L'Aquila

"We used standard telecommunications equipment without any extra optical components other than those already present in commercial transceivers," said Zhan. "In addition, there is no need for a dedicated light channel because the data required for sensing can be collected without disturbing the regular operation of the optical transmission system."

Most transoceanic cables use sophisticated coherent light methods to encode data in both the amplitude and phase of the transmitted light. To analyze changes in the light traveling down the cable, the researchers developed a theoretical framework for using the polarization data generated by a coherent transmission system for sensing in the deep ocean. The method they developed measures tiny changes in polarization of the transmitted light.

"Any changes in the environment of the cable will induce a tiny, but detectable difference in the light's polarization," said Zhan. "We developed the theoretical framework required to interpret polarization data in submarine cables, which will enable further quantitative understanding of submarine geophysical processes."

Putting the theory into practice

The researchers used their new approach to detect deep-sea earthquakes and ocean swells based on readings acquired from the Curie transoceanic fiber optic cable. The measurements agreed well with independent measurements made with seismometers on land.

"The stability of the polarization in the Curie submarine system is so high that we were able to detect differential changes in the optical path length of two light polarizations of just 1.5 microns over the entire length of the cable," said Zhan. "This equates to just a fraction of the wavelength for the laser light traveling down the cable."

The researchers are still working to better understand how to use the polarization data to detect various changes in the environment for an undersea optical cable.

More information: Antonio Mecozzi et al, Polarization sensing using submarine optical cables, *Optica* (2021). DOI: [10.1364/OPTICA.424307](https://doi.org/10.1364/OPTICA.424307)

Journal information: *Optica*

<https://phys.org/news/2021-06-transoceanic-fiber-link-geophysical.html>



Fri, 11 June 2021

New research reveals the effects of Covid-19 on human kidney cells

- *The virus that causes COVID-19 can infect and replicate in human kidney cells, but this does not typically lead to cell death.*
- *Kidney cells that already have features of injury may be more easily infected and develop additional injury.*

Researchers have studied human kidney cells in the lab to examine the effects of COVID-19 on kidney health. The findings appear in an upcoming issue of *JASN*.

Many individuals who develop COVID-19 also experience kidney damage, but it's unclear if this is a direct result of viral infection or a consequence of another condition or the body's response to the infection. To investigate, a team led by Benjamin Dekel, MD, PhD (Sheba Medical Center, in Israel) cultivated human kidney cells in lab dishes and infected them with the virus that causes COVID-19.



The researchers found that although the virus that causes COVID-19 could enter, infect, and replicate in human adult kidney cells, this did not typically lead to cell death. Prior to infection, the cells contained high levels of interferon signaling molecules, and the infection stimulated an inflammatory response that increased these molecules. In contrast, infection of kidney cells deficient in such molecules resulted in cell death, suggesting a protective effect.

The cells in these experiments were grown as a three-dimensional spheroid that imitates the healthy kidney or as a two-dimensional layer that mimics the cells of an acutely injured kidney. Cells that mimicked an acutely injured kidney were more prone to infection and additional injury but not cell death.

"The data indicate that it is unlikely that the virus is a primary cause of acute kidney injury seen in COVID-19 patients. It implies that if such injury takes place in the kidney by any cause, the virus might jump on the wagon to intensify it. Therefore, if we're able to limit the common scenario of acute kidney injury in the first place, then there might be the possibility to minimize potential damage caused by the virus," Dr. Dekel explained.

Reference: "Human Kidney Spheroids and Monolayers Provide Insights into SARS-CoV-2 Renal Interactions" 10 June 2021, *Journal of the American Society of Nephrology*. DOI: 10.1681/ASN.2020111546

Study co-authors from the Sheba Medical Center and the Israel Institute for Biological Research include Dorit Omer, PhD, Oren Pleniceanu, MD, PhD, Yehudit Gnatek, MSc, Michael Namestnikov, Osnat Cohen-Zontag, PhD, Sanja Goldberg, PhD, Yehudit Eden Friedman, MD, Nehemya Friedman, PhD, Michal Mandelboim, PhD, Einat B. Vitner, PhD, Hagit Achdout, PhD, Roy Avraham, PhD, Eran Zahavy, PhD, Tomer Israely, PhD, and Haim Mayan, MD.

<https://scitechdaily.com/new-research-reveals-the-effects-of-covid-19-on-human-kidney-cells/>

