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Wed, 02 March 2022

Few months after China, DRDO's 'big breakthrough' in Quantum tech powers India into the elite club

At a time when the entire media attention is focused on the Ukraine crisis, India's Defence Research and Development Organisation (DRDO) has quietly achieved a breakthrough in quantum communications. This breakthrough comes approximately four months after China announced a major achievement in another form of this technology.

On February 23, a team of scientists from DRDO and IIT Delhi successfully demonstrated the Quantum Key Distribution (QKD) link between Prayagraj and Vindhyachal in the northern Indian state of Uttar Pradesh, a distance of more than 100 kilometers.

This secure key transfer was demonstrated over a commercial-grade optical fiber already available in the field. "The performance parameters measured were found to be repetitively within the reported international standards at sifted key rates of up to 10 KHz," the Ministry of Defence said in a press release.

"With this success, the country has demonstrated indigenous technology of secure key transfer for bootstrapping military-grade communication security key hierarchy. This technology will enable security agencies to plan a suitable quantum communication network with indigenous technology backbone," MOD added.

QKD is a secure communications technology that enables two parties to share random secret keys that are known only to them and can be used to encrypt or decrypt messages.

A remarkable feature of QKD is that if a third party tries to eavesdrop on this communication link, it will create detectable anomalies for the two communicating sides. To eavesdrop on the key means that the key has to be measured in some way and the measuring of a quantum system generates disturbances in it.

A secure key can only be generated if the eavesdropping is below a certain threshold, otherwise, the communication is aborted, thus achieving a very highly secure communication.

In December 2020, a similar demonstration was held between two DRDO facilities in Hyderabad—the Defence Research and Development Laboratory (DRDL) and Research Centre Imarat (RCI) – over a much shorter distance of 12 kilometers.

Later in the same month, DRDO Young Scientists Laboratory developed a Quantum Random Number Generation (QRNG) which "detects random quantum events and converts those into a stream of binary digits". Random numbers have important roles in many fields, such as Quantum Communication, cryptography (key generation, key wrapping, authentication etc.), scientific simulations, lotteries and fundamental physics experiments, MOD said in a previous release.



For representational purposes only (Image: Shutterstock)

Of late, major economies and defense powers across the world are engaged in a global quantum race as this technology holds enormous significance from a geopolitical point of view.

Quantum networks can potentially enable un-hackable communications and in the future, powerful quantum computers that can perform highly complex calculations could theoretically crack much of the encryptions used to secure e-mails and Internet transactions.

China Leading the Race?

Among the countries that have formulated ambitious plans and allocated huge resources for the development of quantum tech are, the US, Canada, several European countries, China, Japan and South Korea.

However, senior DRDO scientists and defense officials say that progress in India needs to be seen particularly in the context of several claims made by China.

“My concern is China leading the race. It established the first Quantum Satellite Network and distributed entangled photons between three terrestrial base stations separated by 1200 km. Quantum is at the heart of China’s 13th five-year plan.

Chinese dominated in Quantum Computing patents in the last four years. As if this was not enough, the global investments in quantum computing are also growing”, said India’s National Cyber Security Coordinator, Lieutenant General Rajesh Pant in an International Symposium on Quantum Information Technology held in Pune in 2019.

In September 2021, Chinese state media claimed that researchers from Shanghai Jiaotong University and Jiangxi Normal University achieved “a crucial breakthrough” with the construction of a 15-user quantum secure direct communication (QSDC) network.

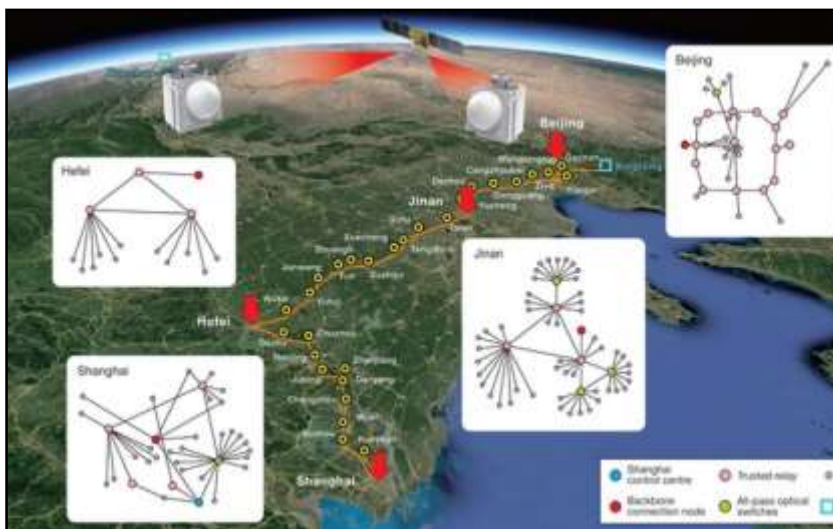
QSDC is another form of quantum-based communication technology which can be used to directly transmit information over a secure quantum channel, much different from the QKD that can only be used to share keys for encryption.

In the last week of January 2022, a team of scientists from the University of Science and Technology of China led by associate professor Zhou Zongquan claimed that they have developed a quantum computer that has a memory that can store and update quantum information as a calculation is proceeding, unlike the existing ones that forget a calculation as soon as it is done.

The Chinese scientists said that this breakthrough had brought them a step closer to developing a code-breaking machine.

The technological developments in this field are currently in nascent stages, meaning they have no known practical applications so far but the emergence of quantum technologies is certainly a threat to present-day security systems and therefore the country which manages to operate these technologies first will definitely tip the balance of power in its favor significantly.

<https://eurasianimes.com/drdo-quantum-tech-powers-india-into-the-elite-club/>



Chinese scientists claim to have established the world’s first integrated quantum communication network. (Credit: University of Science and Technology of China)

भारतीय सेना के T-90 टैंक के लिए नाइट विजन टेक्नॉलजी अब प्राइवेट कंपनी को भी, DRDO का फैसला

डीआरडीओ ने टी-90 टैंक के लिए रात में देख सकने वाली तकनीक को अब निजी क्षेत्र को ट्रांसफर किया है। गौरतलब है कि भारतीय सेना के पास 2000 से ज्यादा टी-90 टैंक हैं।

By पूनम पाण्डे, Edited by Satyakam Abhishek

नई दिल्ली: स्वदेशी रक्षा इंडस्ट्री को बढ़ावा देने के लिए भारत में कई तरह से काम हो रहा है। रक्षा मंत्रालय के तहत आने वाले डीआरडीओ ने T-90 टैंक के लिए नाइट साइट (रात में भी आराम से देख सकें) की टेक्नॉलजी कानपुर बेस्ड डिफेंस कंपनी एमकेयू को ट्रांसफर की है। यह पहली प्राइवेट कंपनी है जिसे डीआरडीओ ने यह टेक्नॉलजी ट्रांसफर की है।



भारतीय सेना के पास अभी 2000 से ज्यादा T-90 भीष्म टैंक हैं, 120 से ज्यादा अर्जुन टैंक हैं और 2400 के करीब टी-72 टैंक हैं। T-90 भारतीय सेना का मेन बैटल टैंक है। एमकेयू के डायरेक्टर वैभव गुप्ता के मुताबिक भारत में टी-90 टैंक के लिए ड्राइवर नाइट साइट बनाने के लिए डीआरडीओ के साथ मिलकर काम करने में एमकेयू इच्छुक था। मकसद यह है कि ऐसी डिवाइस विकसित की जाए जो टी-90 के साथ ही टी सीरीज के दूसरे टैंक, बीएमपी (इंफैंट्री फाइटिंग वीइकल) और दूसरे आर्म्ड वीइकल में भी फिट हो सके। नाइट साइट Netro TD 5100 से आर्मी का रिस्क कम होगा। नाइट साइट बेहतर होने पर टैंक में बैठे सैनिक की ताकत भी बढ़ेगी।

भारतीय सेना के बैटल टैंक में नाइट साइट होने से टैंक को बेहतर तरीके से ऑपरेट करने में भी मदद मिलेगी साथ ही आस पास के एरिया पर भी सटीक नजर रहेगी। टैंक में इस तरह के सेंसर की कमी से रात के वक्त ऑपरेशन में टैंक कमांडर और ऑपरेटर को कई तरह की दिक्कतों का सामना करना पड़ता है। टैंक को नाइट साइट मिलने से टैंक की डिटेक्शन रेंज भी बढ़ेगी साथ ही ज्यादा स्पीड में मूव कर सकेगा।

<https://navbharattimes.indiatimes.com/india/drdo-night-vision-technology-and-t-90-tank-mku-latest-news/articleshow/89919177.cms?miniv=true>

DRDO on Twitter



01 March 2022

Defence News

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Tue, 01 March 2022 4:06PM

Air Marshal S Prabhakaran assumes Command of IAF's Western Air Command

Air Marshal Sree Kumar Prabhakaran assumed command of Delhi based Western Air Command (WAC) on 01 March 2022.

The Air Marshal is a graduate of National Defence Academy, Pune and was commissioned into the IAF as a fighter pilot on 22 December 1983. He is an alumnus of Defence Services Staff College (DSSC) Wellington and National Defence College, New Delhi.



An experienced MiG-21 pilot and a category 'A' qualified flying instructor, Air Marshal Prabhakaran has nearly 5000 hours of flying experience.

In a service career spanning over 38 years, the Air Marshal has tenanted important command and staff appointments. These include command of two flying stations and IAF's Surya Kiran

Aerobatic Team (SKAT). He has served as Directing Staff at DSSC, Commandant of the College of Air Warfare (CAW), Defence Attaché at the Indian Mission at Cairo, Egypt, Assistant Chief of Air Staff Intelligence [ACAS (Int)], Director General (Inspection & Safety) and Senior Air Staff Officer of the Gandhinagar based South Western Air Command. He was Commandant of the Air Force Academy, Hyderabad prior to taking over the present appointment.

The Air Officer is a recipient of Vayu Sena Medal and Ati Vishisht Seva Medal.

Air Marshal S Prabhakaran succeeds Air Marshal Amit Dev who superannuated on 28 Feb 22 after more than 39 years of distinguished service in IAF.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1802096>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 01 March 2022 4:06PM

एयर मार्शल श्रीकुमार प्रभाकरण ने भारतीय वायु सेना की पश्चिमी वायु कमान का प्रभार संभाला

एयर मार्शल श्रीकुमार प्रभाकरण ने 01 मार्च 2022 को दिल्ली स्थित पश्चिम वायु कमान के वायु अफसर कमांडिंग-इन-चीफ का कार्यभार संभाला।

एयर मार्शल राष्ट्रीय रक्षा अकादमी पुणे से स्नातक हैं और उन्होंने भारतीय वायुसेना में लड़ाकू पायलट के रूप में 22 दिसंबर 1983 को कमीशन प्राप्त किया। वह डिफेंस सर्विसेज स्टाफ कॉलेज वेलिंगटन और नेशनल डिफेंस कॉलेज, नई दिल्ली के पूर्व छात्र हैं। एक अनुभवी मिग-21 पायलट और श्रेणी "A" योग्यता के उड़ान प्रशिक्षक, एयर मार्शल प्रभाकरण को लगभग 5000 घंटे की उड़ान का अनुभव है।



38 वर्षों से अधिक सेवाकाल में, एयर मार्शल प्रभाकरण ने महत्वपूर्ण कमान और स्टाफ नियुक्तियाँ की हैं, जिसमें

दो फ्लाइट बेस की कमांड एवम भारतीय वायु सेना की 'सूर्यकिरण' एरोबाटिक टीम शामिल हैं। वह स्टाफ कॉलेज, वेलिंगटन में प्रशिक्षक और कॉलेज ऑफ एयर वारफेयर (CAW) के कमांडेंट रह चुके हैं।

वह काहिरा, मिस्र में भारतीय मिशन में रक्षा अटैची, सहायक वायु सेना अध्यक्ष (आसूचना), महानिदेशक (निरीक्षण और सुरक्षा) एवम गांधीनगर स्थित दक्षिण पश्चिम वायु कमान के वरिष्ठ वायु कार्मिक अफसर के रूप में भी नियुक्त रहे हैं।

पश्चिम वायु कमान मुख्यालय में वायु अफसर कमांडिंग-इन-चीफ का कार्यभार संभालने से पहले एयर मार्शल प्रभाकरण, वायु सेना अकादमी के कमांडेंट थे।

वह वायु सेना पदक और अति विशिष्ट सेवा पदक के प्राप्तकर्ता हैं।

एयर मार्शल प्रभाकरण ने एयर मार्शल अमित देव, जो की 39 वर्षों से अधिक सेवाकाल के पश्चात 28 फ़रवरी 2022 को सेवानिवृत्त हुए, से वायु अफसर कमांडिंग-इन-चीफ का पदभार ग्रहण किया।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1802097>

AMCA Mk2 Stealth Fighter: India could dump GE Engines for French tech to power its 5th-gen combat aircraft

By Ashish Dangwal

India and France are close to signing an agreement for the joint development of a 125KN engine, which would power the former's fifth-generation Advanced Medium Combat Aircraft (AMCA), according to reports.

The deal is expected to be signed in the coming months. "The talks between the officials of DRDO and the French company Safran are going on and the final agreement is expected to be sealed in the next one or two months," an India official was quoted as saying by The Financial Express.

During his recent visit to France, India's External Affairs Minister S. Jaishankar met with French Defense Minister Florence Parly to discuss the joint collaboration for the engine development for AMCA.

When Parly had visited India last December, the partnership on the AMCA engine was one of the matters that were discussed. India's Defense Minister Rajnath Singh had also indicated a prospective collaboration with a big French company.

During Aero-India 2021, HAL's CMD mentioned a possible collaboration with a foreign company to manufacture engines for AMCA. In the same year, the government informed Parliament that it plans to work with a foreign manufacturer to produce indigenous engines for Light Combat Aircraft (LCA) variants and AMCA.

The French firm has already contributed to the development of an engine for the Advanced Light Helicopter (ALH) 'Dhruv'. Hindustan Aeronautics Limited (HAL) and Safran collaborated on the Shakti engine, which powers the ALH and its several derivatives.

AMCA And IMRH Programs

R Madhavan, chairman of the state-owned HAL, said the company is attempting to develop the next-generation AMCA and Indian Multi-Role Helicopter (IMRH) using a special purpose vehicle (SPV) model that involves private partners.

"We are trying to implement the projects through the SPV route where we want the private players to have a majority stake so that it does not become a full government entity," Madhavan said during the Ministry of Defence's webinar 'Aatmanirbharta in Defence: Call to Action' on February 26. "The procurement process will also be easy. The advantage is that it will cut procedural delays. On AMCA, we are working with DRDO."

He went on to say, "SPVs cannot raise debts based on the sponsor's assets. So, it has to create assets or they have to ensure that the financing institute has a say in the cash flows of the future. We have worked that out. There are a couple of things which are required from the government as guarantees for the SPV to function."

He went on to say that one of the things that would happen is that there will be a predetermined order quantity that should be known to the SPV from the start. Assume there are 400 helicopters; the government must inform the SPV ahead of time.



An AMCA model displayed during Aero India 2021
(Wikimedia Commons)

Second, once the design development is complete, there will be no delay in placing orders because any delay will result in the SPV having difficulty repaying the debt as well as the investment that they have made, he added.

“Private industries should also have confidence in Indian development, especially the defense public sector units. There is not much of a risk involved in the subsequent development of a new platform through the SPV route even if it is AMCA or IMRH.”

Russian Mi-17 helicopters will be replaced by IMRH. Under the special purpose vehicle (SPV) model, Union Finance Minister Nirmala Sitharaman announced that the private sector will be allowed to design and build equipment in conjunction with the Defence Research Development Organisation (DRDO) and other organizations.

The provision for the creation of a special purpose vehicle (SPV) for the design, development, and manufacturing of significant defense equipment aims to enable concurrent engineering and production in shorter timeframes.

Last week, at an event, Girish S. Deodhare, Director-General of the Aeronautical Development Agency under MOD, stated that the AMCA configuration and preliminary service quality requirements (PSQR) have been frozen.

The aircraft’s preliminary design review is complete, and the critical design review (CDR) is scheduled for later this year. The aircraft is projected to be built in 2024, with the first flight taking place in 2025.

The AMCA will be produced in stealth and non-stealth versions and will be built in two phases: an AMCA MK1 with an existing GE414 engine and an AMCA Mk2 with a jointly developed enhanced, more powerful engine, according to Deodhare.

Officials stated that once the agreement with France is signed, the development of the aircraft and engine will proceed in parallel to meet the deadlines.

<https://eurasianimes.com/india-could-dump-ge-engines-for-french-tech-to-power-aircraft/>

THE TIMES OF INDIA

Wed, 02 March 2022

IAF’s base repair depot sets up new tech incubation cell

Pune: The Lohegaon-based Base Repair Depot (BRD) of the Indian Air Force (IAF) in the city has set up a new technology incubation cell to repair avionics components by evolving evolving repair technologies.

The cell would play a critical role in achieving the goals of ‘Atmanirbhar Bharat’, said the IAF officers.

Air Marshal Shashiker Choudhary, Air Officer Commanding-in-Chief, Maintenance Command, visited the base and appreciated the work being carried out at the cell on Tuesday.

“Air Marshal Choudhary reviewed the tasks executed by the depot and was briefed about the leading role played by the depot in supporting various legacy as well as the latest ground support and avionics systems. He appreciated the various indigenization tasks executed by the depot through the adoption of innovative techniques to repair avionics components,” stated a statement issued by the Defence PRO, Pune.

Choudhary, while emphasizing the need for being self-reliant, exhorted the air warriors of the depot to innovate and engage with academia, local industries as well as start-ups for identifying and developing home-grown solutions of operational importance.

<https://timesofindia.indiatimes.com/city/pune/iafs-base-repair-depot-sets-up-new-tech-incubation-cell/articleshow/89933737.cms>



Explained: How dependent is India on Russian weapons?

Russia's invasion of Ukraine has long-term implications for India, most significantly on the decades old defence trade between the two. How strong are India's ties with Russia, and what is the value of weapons India has bought from Russia?

By Krishn Kaushik

New Delhi: Even as the most immediate impact of Russia's invasion of Ukraine on India is the evacuation of thousands of Indian students who are stuck there, it is becoming clear there will be long-term implications too.

New Delhi has been trying to walk a fine line, negotiating its relationships with the United States and other Western nations on one side, and the historically deep and strategic ties with Russia on the other, even as its stand is becoming incrementally critical to Russia as its forces continue to fight in Ukrainian cities.



Russian army tanks are loaded onto railway platforms after drills near Ukraine. (AP Photo/File)

However, both the sanctions imposed by the United States and other countries on Russia, and how Russia views Delhi's slowly shifting stand are going to have a long-term impact, most significantly on the decades old defence trade between the two.

How strong are Indian and Russian defence ties?

India was reliant, almost solely on the British, and other Western nations for its arms imports immediately after Independence. But this dependence weaned, and by the 1970s India was importing several weapons systems from the USSR, making it country's largest defence importer for decades when it came to both basic and sophisticated weapons systems. In fact, it has provided some of the most sensitive and important weapons platforms that India has required from time to time including nuclear submarines, aircraft carriers, tanks, guns, fighter jets, and missiles.

According to several people, the defence trade, which remains significant, is one of the important causes why India has not taken a critical stand openly against Russia. However, India-Russian ties cannot be viewed only from that perspective.

The legacy of buying weapons from Russia has made India somewhat dependent on it, and even though India has tried to expand the base of countries from which it buys new military systems, Russian-origin weapons still have the lion's share. According to one estimate, the share of Russian-origin weapons and platforms across Indian armed forces is as high as 85 per cent.

According to an April 2020 working paper published by Sameer Lalwani of the Stimson Center, along with other researchers, the "breadth of Russian-origin platforms in the Indian military—which our analysis suggests composes 85 percent of major Indian weapons systems rather than the 60 percent figure often cited—have created a 'lock-in' effect, while the depth of relative support to India's technology base and strategic systems have engendered a relatively high degree of indebtedness and trust in key strategic circles.

However, it added that the paper found "scant evidence that India's extended arms collaboration and geopolitical relationship with Russia have led to a diffusion of strategic thinking that has directly or indirectly shaped military doctrine."

What is the value of weapons India has bought from Russia?

Russia is the second largest arms exporter in the world, following only the United States. In the five-year period between 2016 and 2020 America's share in the global arms trade was 37 per cent, compared to 20 per cent of Russia's, as per the Stockholm International Peace Research Institute (SIPRI), which tracks the global arms trade and military expenditure.

For Russia, India is the largest importer, and for India, Russia the largest exporter when it comes to arms transfer. Between 2000 and 2020, Russia accounted for 66.5 per cent of India's arms imports. Of the \$53.85 billion spent by India during the period on arms imports, \$35.82 billion went to Russia. During the same period imports from the US were worth \$4.4 billion, and from Israel it was worth US\$ 4.1 billion.

According to a SIPRI report on international arms transfer trends published in March 2021, between 2016 and 2020 Russia delivered major arms to 45 states. "India remained the main recipient of Russian arms in 2016–20, accounting for 23 per cent of the total, followed by China (18 per cent).

Russia's share in Indian arms imports was down to about 50 per cent between 2016 and 2020, but it still remained the largest single importer. SIPRI noted that although "several large Russian arms deals with India, including for combat aircraft, were completed by 2020, India placed new orders for a variety of Russian arms in 2019–20. The ensuing deliveries will probably lead to an increase in Russian arms exports in the coming five years."

What are the kinds of weapons Russia has given India?

Almost everything, over the years. At the moment there are two major defence deals between India and Russia that might be jeopardised by the current crisis. First, and most significant, is the deal to buy five units of the state-of-the-art S-400 Triumf air-defence system. It is among the most advanced in the world, and India placed an order for five units for around \$5 billion in 2018. The first unit was delivered in December 2021, and has been deployed at an Indian Air Force base in Punjab.

The deal has been under the threat of American sanctions, even as the US had not decided on it yet. But the fresh round of sanctions on Russia could sound alarm bells for it.

Similarly, India and Russia had just signed a deal to manufacture around 6 lakh AK 203 rifles at a factory in Amethi.

But apart from these ongoing projects, Russia has also pitched to make six AIP-powered conventional submarines for the Navy under the P75-I project, along with four other international bidders. The final call is yet to be taken.

In fact, the first submarine India ever got was also Soviet. The first Foxtrot Class submarine bought from the USSR entered Indian service in 1967 as INS Kalvari. Of the total 16 conventional diesel-electric submarines with the Indian Navy, eight are Kilo class, of Soviet origins.

India is also in talks with Russia to lease two nuclear-ballistic submarines, Chakra 3 and Chakra 4, the first of which is expected to be delivered by 2025. Earlier too, INS Chakra 1 and INS Chakra 2 were Russian vessels, both of which were returned after their leases expired. India has one indigenously manufactured nuclear ballistic submarine commissioned, of the four that are being built. However, a lot of the technology is based on Russian platforms.

The only aircraft carrier in service with India, INS Vikramaditya is a Soviet-made Kiev-class vessel that came into service for the Indian Navy in 2013. India's first indigenously-made aircraft carrier is expected to be commissioned this year.

India's missile programme has been developed with significant help from Russia or the Soviets earlier. The BrahMos missile, which India will begin exporting soon, has been developed jointly with Russia.

Russia has also been one of main exporters of fighter aircraft to India, including hundreds of Sukhoi and MiG jets.

A US Congressional Research Service report on Russian arms sale and defence industry, published in October 2021 has quoted figures from the Military Balance 2021 report of the International Institute of Strategic Studies (IISS), a global security, political risk and military conflict think tank, that "India's present military arsenal is heavily stocked with Russian-made or Russian-designed equipment." It mentioned that the Indian Army's main battle tank force is composed predominantly of Russian T-72M1 (66 per cent) and T-90S (30 per cent).

The Indian Navy's sole operational aircraft carrier is a refurbished Soviet-era ship, and its entire complement of fighter and ground attack aircraft are Russian-made or produced in India on license (the Navy's fighter fleet comprises 43 MiG-29K/KUBs). Four of the Navy's 10 guided-missile destroyers are Russian Kashin class, and 6 of its 17 frigates are Russian Talwar class.

The Indian Air Force's 667-plane fighter ground attack (FGA) fleet is 71 per cent Russian-origin (39 per cent Su-30s, 22 per cent MiG-21s, 9 per cent MiG-29s). All six of the service's air tankers are Russian-made Il-78s.

Is India trying to expand its weapons base?

Over the last few years there has been a conscious effort to expand the weapons platform bases to not only other countries, but also domestically as well.

SIPRI noted in its international arms transfer trends report last year that between 2011–15 and 2016–20 arms imports by India decreased by 33 per cent. "Russia was the largest arms supplier to India in both 2011–15 and 2016–20. However, Russia's deliveries dropped by 53 per cent between the two periods and its share of total Indian arms imports fell from 70 to 49 per cent. In 2011–15 the USA was the second largest arms supplier to India, but in 2016–20 India's arms imports from the USA were 46 per cent lower than in the previous five-year period, making the USA the fourth largest supplier to India in 2016–20."

France and Israel were the second and third largest arms suppliers to India in 2016–20, it said.

According to the report, the "overall drop in India's arms imports between 2011–15 and 2016–20 seems to be mainly due to its complex and lengthy procurement processes, combined with its attempts to reduce its dependence on Russian arms by diversifying its network of arms suppliers. As India perceives increasing threats from Pakistan and China and as its ambitious plans to produce its own major arms have been significantly delayed, it is planning large-scale programmes for arms imports."

It added that based on India's outstanding deliveries of combat aircraft, air defence systems, ships and submarines, India's arms imports are expected to increase over the coming five years.

But it is important for India to diversify its base, to not become too reliant on any single nation, as it can become a leverage that can be exploited by that nation.

The US Congressional report had stated: "Many analysts in India and beyond conclude that the Indian military cannot operate effectively without Russian-supplied equipment and will continue to rely on Russian weapons systems in the near and middle terms... In this sense, much of Moscow's influence in India comes through its willingness to provide weapons systems and technologies that no other country will export to India. Russia also continues to offer advanced weapons platforms at relatively attractive rates."

<https://indianexpress.com/article/explained/india-russia-military-weapons-defence-ties-7795804/>

Business Standard

Wed, 02 March 2022

What does the Ukraine crisis mean for India's defence procurement?

With the US, UK and the EU ratcheting up economic sanctions against Russia, India is faced with difficult choices. Let's explore the impact of the sanctions on India's defence deals with Russia

By Krishna Veera Vanamali

New Delhi: Between 2016 and 2020, Indian defence was the main recipient of Russian arms, accounting for 23% of the total arms import, according to the Stockholm International Peace Research Institute (SIPRI). 49.4% of India's arms imports between 2016 and 2020 were from Russia and in the previous five years, Russia accounted for 69.6% of India's total arms imports.

While India's arms imports from Russia have fallen from \$3.85 billion in 2013 to \$969 million in 2020, Russia continues to be India's biggest defence supplier. The defence business between the two countries is strong, with contracts worth over \$15 billion in the pipeline.

Several Indian defence deals are vulnerable to sanctions under a 2017 US law, including the \$5.4 billion contract for five long-range ground-to-air S-400 Triumf missile systems, the deliveries of which began in November last year.

The air defence capability of India will be significantly enhanced with the induction of this system. The US has previously objected to this purchase.

Besides this, India signed a \$3 billion contract in 2019 to lease a Russian nuclear attack submarine for ten years, starting 2025.

Further, the Indian Air Force wants to buy and upgrade 21 MiG-29 fighter jets lying unused in Russia for about a billion dollars. It's also considering a new contract to buy 18 Sukhoi-30MKI fighters for over \$800 million.



A \$2 billion deal for joint production of 200 Kamov 226T light helicopters, the \$4 billion purchase of four stealth frigates, of which two are to be built in India, are also underway.

Defence expert and *Business Standard* columnist Ajai Shukla tells us what the threat of US sanctions mean for India's defence procurement deals with Russia and the options that India has.

Meanwhile, the Centre is reportedly planning to strengthen the rupee-rouble trade arrangement with Russia after the US and its Western partners decided to cut off several Russian banks from the SWIFT financial messaging system that facilitates cross-border payments.

Trade in the rupee-rouble account has increased manifold since the Narendra Modi government assumed office in 2014.

Western sanctions on Russian banks could also disrupt India-Russia trade, particularly fertilisers that are crucial for India's vast agriculture sector.

https://www.business-standard.com/podcast/current-affairs/what-does-the-ukraine-crisis-mean-for-india-s-defence-procurement-122030100079_1.html



Wed, 02 March 2022

India faces uncertainty over defence supplies from Russia and Ukraine, as also CAATSA waiver

India requires a functioning supply chain relationship with Russia for spares and support, which is critical for its military

By Dinakar Peri

New Delhi: With tensions escalating between Russia and the West over the Ukraine crisis, India, which has major defence cooperation with Moscow and also with Kyiv, faces uncertainty over timely deliveries in the near future in addition to the lingering threat of U.S. sanctions under CAATSA (Countering America's Adversaries Through Sanctions Act) over the S-400 deal.

In the past, tensions between Russia and Ukraine had considerably delayed the modernisation of the AN-32 transport fleet of the Indian Air Force (IAF).

"It is too early to say at the moment, but there could be delays in deliveries from Russia both due to their own domestic commitments as well the sanctions imposed by the West. It will take sometime to get a clearer picture," an official source said on the condition of anonymity.

The current crisis could also complicate the CAATSA waiver India is looking for from the U.S. administration, two officials independently stated. While, the S-400 deliveries began in December and are underway, a clarity on the timely completion was awaited, one of the official noted.

Several observers termed the severance of links and economic sanctions by the West on Russia “unprecedented.” In this backdrop, India requires a functioning supply chain relationship with Russia for spares and support, which is critical for its military.

To questions on possible restrictions by the U.S. on Russian equipment, former Indian Ambassador to Russia D. B. Venkatesh Varma said, “It will be very unfortunate if the U.S. has the same objective as China – to weaken the India-Russia defence relationship to the detriment of India’s defence capabilities.”

Traditional military supplier

While Russia has been a traditional military supplier sharing platforms and technologies that others wouldn’t, the cooperation has further deepened in recent years. For instance, with the \$5.43bn deal S-400 air defence systems as well as other big ticket deals, the defence trade between the two countries has crossed \$15bn since 2018.

Even today, over 60% of Indian military inventory is of Russian origin, especially with respect to fighter jets, tanks, helicopters and submarines among others, while several major deals are in the pipeline.

For instance, in December, India and Russia signed a Rs.5000 crore deal for 6.1 lakh AK-203 assault rifles to be manufactured jointly in Uttar Pradesh. Production was to begin within few months and it is expected to reach full-scale production within 2-3 years, said Alexander Mikheev, Director General of Rosoboronexport after the summit in December.

In addition, Russia is manufacturing two stealth frigates for the Navy. They are to be delivered next year onwards, while another two are being manufactured by the Goa Shipyard Limited under technology transfer. The keel of the ships has been laid and the Navy has said that the first one will be delivered in 2026 and the second one six months later.

Deal with Ukraine

India had signed a separate deal with Ukraine for eight Zorya-Mashproekt gas turbine engines for the frigates. As reported earlier by *The Hindu*, officials had said that the engines, gear boxes and specialist support will cost around \$50 mn a ship. India had taken delivery of engines for the first two frigates and handed them over to Russia for the frigates under construction there. However, the status of the engines for the frigates being built in India is not known.

India is also looking to receive the third Akula class nuclear attack submarine (SSN) sometime in 2025.

With the current offensive, the Russian defence industry may be preoccupied to supply to their own forces, a military officer observed, adding that they hoped Russia would be able to ensure timely deliveries.

As for Ukraine, it is upgrading over 100 An-32 transport aircraft of the IAF under a deal finalised in 2009. While the upgrade of 45 An-32s in Ukraine was completed in 2015, the remaining aircraft were to be upgraded by the IAF Base Repair Depot, Kanpur. Ukraine officials had stated that all contractual obligations for the local upgrade would be fulfilled by 2020, though the current status was not immediately known.

After the Balakot air strike in 2019, the IAF made an emergency procurement of R-27 air-to-air missiles for its SU-30MKI fighters. At the Aero India in February 2021, Ukraine signed four agreements worth \$70 mn, which includes sale of new weapons as well as maintenance and the upgrade of the existing ones in service with the Indian military, as reported earlier.

<https://www.thehindu.com/news/national/india-faces-uncertainty-over-defence-supplies-from-russia-and-ukraine-as-also-caatsa-waiver/article65144678.ece>



File photo of PM Modi and Russian President Vladimir Putin who had arrived for a two-day visit to sign a \$5 billion deal to buy Russian S-400 air defense systems. | Photo Credit: AP

MSME units exposed to needs of defence equipment manufacturers

Tiruchirapalli: Giving a thrust to transform Tiruchi into one of the major hubs for manufacturing major and critical fabrication and machining complements for defence, Tamil Nadu Industrial Investment Corporation teamed up with BHEL Small Industries Association (BHELSIA), and Defence Chamber of Industries and Commerce (DCIC), Tiruchi, to conduct a Business Promotion Meet involving CVRDE (Combat Vehicles Research and Development Establishment), Avadi.

Delivering the key-note address at the event conducted recently, V. Balamurugan, Director, CVRDE, explained the process to be followed by ancillary units for undertaking orders. Assuring to provide technical support to enable Tiruchi MSME units in defence supplies, Mr. Balamurugan elaborated on various parts required for manufacturing ARJUN tanks.

BHELSIA president Rajappa Rajkumar said a series of such meetings had been planned to enable MSME units in Tiruchi to understand the requirements of defence equipment manufacturers. Only through taking up orders from the defence sector can the capacity established by MSME units in Tiruchi be utilised fully, he said. The TIIC had been providing continuous support to uplift the MSME units in Tiruchi, Mr. Rajkumar said.

Sukumar of DCIC emphasised on a cluster approach by the units for individual and overall development. T.V. Krishnan, Consultant, said presentations would be made to both Defence and Railway ministries shortly to showcase facilities available in Tiruchi.

SV Srinivasan General Manager in charge, BHEL-Tiruchi, assured support to MSME units for carrying out orders for supply of components for defence equipment manufacturers.

<https://www.thehindu.com/news/cities/Tiruchirapalli/msme-units-exposed-to-needs-of-defence-equipment-manufacturers/article65095002.ece>

Science & Technology News

INDIA
TODAY

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Indian Scientists use Mangalyaan to look into Sun's atmosphere

ISRO scientists used the conjunction event of May-June 2015 – a time when the Sun's activity was quite low, to study the turbulence in the solar corona.

A team of Indian scientists used the Mars Orbiter Mission, a.k.a Mangalyaan to study the Solar Corona when the Earth and Mars were on the opposite sides of the Sun. Scientists used solar conjunction to look into the atmosphere of the Sun, which remains a complex mystery.

Scientists from Space Physics Laboratory of Vikram Sarabhai Space Centre, Trivandrum; Physical Research Laboratory, Ahmedabad; and ISRO Telemetry Tracking and Command Network (ISTRAC), Bangalore used S-band radio signals coming from Mangalyaan to study the Solar Corona. Isro scientists used the conjunction event of May-June 2015 a time when the Sun's activity was quite low, to study the turbulence in the solar corona. The findings have been published in the journal Monthly Notices of the Royal Astronomical Society.

The Corona is the outer atmosphere of the Sun, where temperatures are several million degrees Kelvin, making it impossible for in-situ measurements, thereby challenging the experimenters. Scientists from the world over are trying to figure out the reason for such a high temperature of the corona, and study the solar wind that originates here. These winds are responsible for triggering geomagnetic storms on the inner planets, including Earth, creating dangerous conditions for humans to operate in space.

Isro said that the radio signals from MOM spacecraft crossing through the solar corona during the conjunction event (cf. Figure 1) consequently experience dispersive effects. The turbulence in the corona produces fluctuations in plasma density which are registered as fluctuations in the phase of radio waves passing through it.

These radio signals contain the signature of a propagating medium (solar corona) and can be spectrally analyzed to derive the turbulence spectrum of the medium. Isro scientists have obtained coronal turbulence spectrum at heliocentric distances between 4 and 20 R (1 solar radii (R) = 696,340 km). "This is the region where the solar wind primarily gets accelerated to velocities of a few hundreds of kilometers per second. The changes in turbulence regime are well reflected in spectral index values of the temporal frequency fluctuation spectrum," Isro said.

Another intriguing observation is when the results of studies by MOM are compared with similar experiments conducted by the earlier missions which spanned past solar cycles. The work based on MOM data reports an insight into the feeble maxima of solar cycle 24, which is recorded as a peculiar solar cycle in terms of overall lower activity than any other previous solar cycle.

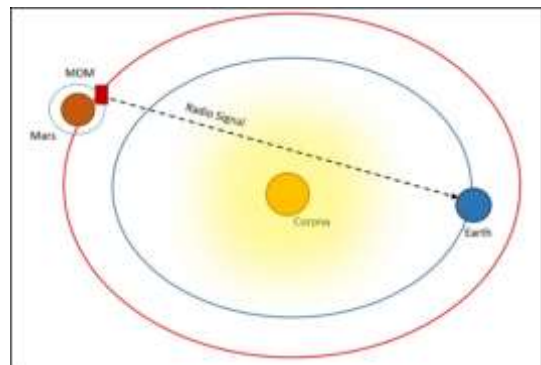
The findings come against the backdrop of Nasa's Parker Solar Probe making its 11th close approach to the Sun last week.

India's maiden mission to Mars was launched in 2013 and reached Martian orbit a year later. "The MOM was planned for a mission lifetime of 6 months, but has successfully surpassed it by a factor of 10 now in Martian orbit for more than 7 years, and is doing well in the extended mission phase," Isro said.

<https://www.indiatoday.in/science/story/mangalyaan-mars-orbiter-mission-isro-solar-corona-sun-atmosphere-geomagnetic-storms-1919404-2022-03-01>



The Corona is the outer atmosphere of the Sun. (Photo: Nasa)



Schematic of positions of Earth and MOM spacecraft relative to the Ecliptic plane of Sun (XY plane) as seen from Earth. (Photo: Isro)

 **The Indian EXPRESS**

Wed, 02 March 2022

Space technology important tool for a nation, says ISRO Chairman

Though Isro is mandated to carry out space missions of national importance for realising better communications, satellite networks for defence, weather and other purposes, the space agency also launches dedicated science-based missions.

Dr S Somanath, chairman of the Indian Space Research Organisation (ISRO), has said space technology is an important tool that a nation needs for a good command on the scientific front.

Somanath was speaking at the National Science Day celebrations, including the virtual tour of the Vainu Bappu Telescope, Kavalur, organised by the Indian Institute of Astrophysics (IIA), Bengaluru, recently.

“Space technology and rocket science have enabled human beings to send instruments into space lasting for several years. These have helped carry out observations and helped in bettering our understanding of the evolution of our Universe. Space technology is an important tool that a nation needs to have for a good command on the science front,” the Isro chief said.

Though Isro is mandated to carry out space missions of national importance for realising better communications, satellite networks for defence, weather and other purposes, the space agency also launches dedicated science-based missions.

One such mission was the Astrosat, India’s maiden multi-wavelength space-based observatory launched in and operational since 2015. About 100 scientists from IIA, Inter-University Centre for Astronomy and Astrophysics, Raman Research Institute, Physical Research Laboratory and Tata Institute of Fundamental Research collaborated for Astrosat. Another scientific mission set to be launched later in 2022 is the Aditya L1 mission to the Sun.

On the agency’s future scientific collaborations, Somanath said, “Isro will offer all the required support and encourage the Indian scientists in realising their goals for carrying out space observations for astronomy studies, through the payloads hosted by our missions”. He added that the space agency was planning to periodically host more scientific missions and was keen for closer partnerships with other scientific institutions in the country.

According to Dr K Radhakrishnan, former Isro chairman, the challenge before the scientific community now is to envision future scientific goals and build novel scientific instruments.

“To make fundamental new studies in space science, the most important aspect would be to build instruments worth doing futuristic science. The scientific community needs to envision those scientific objectives and the kind of instruments needed to be conceived and built that will provide good and reliable results,” said Radhakrishnan, who had led the successful Mars Orbiter Mission (MoM).

He noted that over 70 per cent of the space economy contributions today came from commercial operations and that India needs to continue its works in order to both retain and advance from its current global position.

<https://indianexpress.com/article/cities/pune/space-technology-isro-s-somnath-7795913/>



Dr S Somnath speaking at the Indian Institute of Astrophysics (IIA), Bengaluru. (Screenshot/YouTube)



Wed, 02 March 2022

Surprising semiconductor properties revealed with innovative new method

By Karyn Hede

A research team probing the properties of a semiconductor combined with a novel thin oxide film have observed a surprising new source of conductivity from oxygen atoms trapped inside.

Scott Chambers, a materials scientist at the Department of Energy's Pacific Northwest National Laboratory, reported the team's discovery at the Spring 2022 meeting of the American Physical Society. The research finding is described in detail in the journal *Physical Review Materials*.

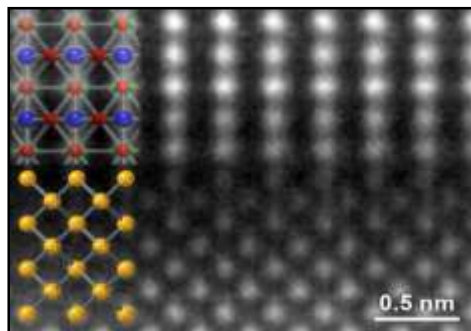
The discovery has broad implications for understanding the role of thin oxide films in future semiconductor design and manufacture. Specifically, semiconductors used in modern electronics

come in two basic flavors—n-type and p-type—depending on the electronic impurity added during crystal growth. Modern electronic devices use both n- and p-type silicon-based materials. But there is ongoing interest in developing other types of semiconductors. Chambers and his team were testing germanium in combination with a specialized thin crystalline film of lanthanum-strontium-zirconium-titanium-oxide (LSZTO).

"We are reporting on a powerful tool for probing semiconductor structure and function," said Chambers. "Hard X-ray photoelectron spectroscopy revealed in this case that atoms of oxygen, an impurity in the germanium, dominate the properties of the material system when germanium is joined to a particular oxide material. This was a big surprise."

Using the Diamond Light Source on the Harwell Science and Innovation Campus in Oxfordshire, England, the research team discovered they could learn a great deal more about the electronic properties of the germanium/LSZTO system than was possible using the typical methods.

"When we tried to probe the material with conventional techniques, the much higher conductivity of germanium essentially caused a short circuit," Chambers said. "As a result, we could learn something about the electronic properties of the Ge, which we already know a lot about, but nothing about the properties of the LSZTO film or the interface between the LSZTO film and the germanium—which we suspected might be very interesting and possibly useful for technology."



Scanning transmission electron micrograph of the interface between germanium (bottom) and LSZTO (top). The individual atoms are labeled gold: germanium, red: oxygen, green: strontium and lanthanum, blue: titanium and zirconium. Credit: Scott Chambers | Pacific Northwest National Laboratory

A new role for hard X-rays

The so-called "hard" X-rays produced by the Diamond Light Source could penetrate the material and generate information about what was going on at the atomic level.

"Our results were best interpreted in terms of oxygen impurities in the germanium being responsible for a very interesting effect," Chambers said. "The oxygen atoms near the interface donate electrons to the LSZTO film, creating holes, or the absence of electrons, in the germanium within a few atomic layers of the interface. These specialized holes resulted in behavior that totally eclipsed the semiconducting properties of both n- and p-type germanium in the different samples we prepared. This, too, was a big surprise."

The interface, where the thin-film oxide and the base semiconductor come together, is where interesting semiconducting properties often emerge. The challenge, according to Chambers, is to learn how to control the fascinating and potentially useful electric fields that forms at these interfaces by modifying the electric field at the surface. Ongoing experiments at PNNL are probing this possibility.

While the samples used in this research do not likely have the immediate potential for commercial use, the techniques and scientific discoveries made are expected to pay dividends in the longer term, Chambers said. The new scientific knowledge will help materials scientists and physicists better understand how to design new semiconductor material systems with useful properties.

More information: S. A. Chambers et al, Mapping hidden space-charge distributions across crystalline metal oxide/group IV semiconductor interfaces, *Physical Review Materials* (2022). DOI: [10.1103/PhysRevMaterials.6.015002](https://doi.org/10.1103/PhysRevMaterials.6.015002)
<https://phys.org/news/2022-03-semiconductor-properties-revealed-method.html>

