

July
2022

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 : 47 अंक: 135 16-18 जुलाई 2022

Vol.: 47 Issue: 135 16-18 July 2022



रक्षा विज्ञान पुस्तकालय

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DDO News

DRDO Technology News

 **The Indian EXPRESS**

Sun, 17 Jul 2022

Centre Wants to Turn India into Global Drone Hub: DRDO Chairman

Defence Research and Development Organisation (DRDO) chairman Dr G Satheesh Reddy Saturday said the Centre wants to turn India into a global drone hub. Speaking at the inauguration of Aero Innovation and Skill Centre (AISC) in Bengaluru, Reddy said: “As far as the drone sector is concerned, India is working on its application in defence and civilian sectors. We need to hand-hold the youngsters to boost innovations and the AISC is a way forward.

The government is clear that everything should be made in the country and Prime Minister Narendra Modi’s call is very clear that we should make world-class products so that the world looks up to us. Today, in the defence and aerospace sectors, there are products which we earlier used to import but are now being made here.”A part of the Aeronautical Society of India (AeSI), AISC Bengaluru will facilitate aspiring entrepreneurs and start-ups to conduct research and development in aerospace sectors. Around 15-20 start-ups will be part of the AISC as of now. The start-ups and entrepreneurs will be mentored by experts from the DRDO, Hindustan Aeronautics Limited (HAL) and the Indian Space Research Organisation (ISRO), officials said.

The DRDO chairman added that most IIT graduates used to go abroad for higher education and job opportunities even a decade ago, but around 75 per cent graduates are now opting to stay back in India and work in several sectors, such as aerospace and defence technology, among others. “If we are talking about rolling an aircraft in four years, it is because of the ecosystem that exists today. India will become the largest exporter from the largest importer,” he said. Software and cloud services provider Altair India and the AeSI also signed an MoU to bridge the skill gap between the industry and academics and to nurture the start-up ecosystem in the aerospace and defence sectors. As a technology partner, Altair will extend support in terms of free access to technology, solutions and mentorship to AeSI and AISC aspirants.

<https://indianexpress.com/article/india/centre-wants-to-turn-india-into-global-drone-hub-drdo-chairman-8034909/>

Thu, 15 Jul 2022

India's Missile Woman Tessy Thomas to Receive APJ Award 2022

Dr Tessy Thomas, Scientist and Director General (Aero Systems) at Defense Research and Development Organisation (DRDO), also known as India's missile woman, will be awarded APJ Award 2022. The selection committee, headed by AP Majeed Khan, Chancellor of Noorul Islam University in association with NINS Medicity, announced the award recently. A release said that Noorul Islam Centre for Higher Education at Kumarakovil in Kanniyakumari district and NIMS Medicity have been jointly organising the award since 2019 to recognise government officials who have achieved excellence and achievements in their respective field of work.



India's Missile Woman Dr Tessy Thomas

Governor of Kerala Arif Mohammad Khan will present the award at a ceremony which will be held at NIMS Medicity, Neyyartinkarai on Tuesday (July 19) at 11 am. The awardee will be receiving a cash prize of Rs 1 lakh, a certificate of appreciation and a commemorative trophy, the release added. It is to be noted that Tessy Thomas is the first woman scientist to head India's missile programme.

<https://www.newindianexpress.com/good-news/2022/jul/15/first-woman-scientist-to-head-indias-missile-programme-tessy-thomas-to-receiveapj-award-2476649.amp>

DRDO On Twitter



DRDO ✓ @DRDO_India · Jul 15

अनुसंधान तथा विकास स्थापन (इंजी.) में दिनांक 14 जुलाई 2022 को अखिल भारतीय राजभाषा वैज्ञानिक संगोष्ठी का उद्घाटन मुख्य अतिथि माननीय श्री गिरीश भालचन्द्र बापट, सदस्य, लोकसभा व अध्यक्ष, प्राक्कलन समिति, भारत सरकार के कर कमलों द्वारा किया गया।

[@GirishBapatBJP](#)

[@SpokespersonMoD](#)



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दो दिवसीय इस संगोष्ठी में विभिन्न विषयों पर कुल 72 लेख/शोध-पत्र डीआरडीओ की लगभग 25 प्रयोगशालाओं तथा केन्द्र सरकार के अन्य कार्यालयों से प्रस्तुत किये जा रहे हैं। मुख्य अतिथि ने अपने संबोधन में डीआरडीओ में किए जा रहे कार्यों की सराहना की।

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Defence Ministry Sets Up Panel for Performance, Efficiency Audit

The ministry added that this newly introduced audit is a “major shift” from the existing transaction-based compliance audit, which will aim to enhance overall efficiency. The Union defence ministry on Friday set up an apex committee to conduct “performance and efficiency” audits of the armed forces. The audit is expected to provide valuable inputs, including any specific shortcomings to the top level of the ministry.

“This kind of audit is expected to provide valuable inputs to the top management of the ministry of specific shortcomings, if any, in planning and execution of projects, and suggest systemic improvements in internal controls, soundness of financial procedures, identification of risk factors, etc,” the defence ministry statement read. As per the statement, the broad areas included under the audit comprise capital procurement, provisioning, logistics, inventory levels, maintenance of platforms/ assets, role and performance of Authority Holding Sealed Particulars (AHSP) among other things.

The ministry added that this newly introduced audit is a “major shift” from the existing transaction-based compliance audit, which will aim to enhance overall efficiency. The committee, headed by the defence secretary, will advise Union minister Rajnath Singh on measures for overall improvement in strengthening of internal oversight and risk management framework in various aspects of functioning of the ministry. The panel includes the vice chiefs of the army, navy and air force; Secretary of Defence (Finance); Chief Integrated Staff Committee; Controller General of Defence Accounts (CGDA); Director General (Acquisition) and other senior officials of the ministry and the Defence Research and Development Organization (DRDO).

<https://www.hindustantimes.com/india-news/defence-ministry-sets-up-panel-for-performance-efficiency-audit-101657909566856.html>



**Press Information Bureau
Government of India**

Ministry of Defence

Fri, 15 Jul 2022 4:26 PM

**Raksha Mantri Launches Y- 3023 Dunagiri, Project 17A
Frigate at GRSE Ltd, Kolkata**

**Indian Navy, Indian Coast Guard and other organisations need to increase
the infrastructure to stay ahead of the curve in dealing with emerging
challenges, Raksha Mantri reiterates**

Raksha Mantri Shri Rajnath Singh launched Y- 3023 Dunagiri, Project 17A frigate built by Garden Reach Shipbuilders Limited (GRSE) in Kolkata on July 15, 2022. Admiral R Hari Kumar, Chief of Naval Staff, and other senior officers from Indian Navy and Ministry of Defence were amongst the dignitaries who attended the ceremony. P17A Frigates are follow-on class of the P17 (Shivalik Class) Frigates with improved stealth features, advanced weapons and sensors and platform management systems. Seven P17A Frigates are under various stages of construction at Mazagaon Dock Limited (MDL) and GRSE. Speaking on the occasion, Raksha Mantri praised the efforts of Directorate of Naval Design and other Naval Teams in realizing the Nation's quest for self-reliance with regard to warship building. He also commended GRSE for its unstinted support in the field of ship production despite various challenges and helping Indian Navy realize its ship induction plan. Raksha Mantri said that 'Dunagiri' would be a world class stealth frigate with multidimensional capabilities to destroy enemies from sea, sky, and underwater.

Speaking about the need to increase our infrastructure and assets in the changing scenario of the world, Raksha Mantri said that economic, political and trade relations between countries are constantly evolving. Security challenges in the Indian Ocean region and Indo-Pacific are constantly increasing. In order to achieve the Prime Minister's Vision of 'SAGAR', i.e. 'Security and Growth for All in the Region' and to protect, preserve and promote India's National Maritime Interests, Indian Navy, Indian Coast Guard and other organisations have to increase the infrastructure and assets so that the country stay ahead of the curve in dealing with these challenges.

Raksha Mantri recalled the brave sons of Bengal, Jatindranath Mukherjee (Baga), Khudiram Bose and Netaji Subhash Chandra Bose, on the occasion and mentioned their unforgettable contributions to the Nation when our country is celebrating the 'Azadi Ka Amrit Mahotsav'. He also praised the role of brave women from Bengal, Begum Rukaiah, Bina Das and many others, who brought laurels not only to Bengal but to the whole country.

Speaking on the occasion, Chief of Naval Staff Admiral R. Hari Kumar said while Indian Navy's primary mandate is to preserve, protect and promote Nation's maritime interests, it also contributes substantially in building the economy of the country. He said that the Dunagiri project generated more than 3000 local employment opportunities. In addition, 29 Indian OEMs along with MSMEs across the country are contributing to this project. Thus, the Navy's budget has a significant 'plough-back' into the economy and towards Nation-building. 88% of Navy's future contracts amounting to investments of nearly Rs 1,75,000 Crore are being progressed through Indian Enterprises, he added. Smt Kala Hari Kumar, President, Navy Wives Welfare Association (NWWA) performed the traditional honours and named the ship Dunagiri. The ship received a thunderous cheer from the jubilant gathering as she embraced the welcoming waters of the `River Hooghly.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1841774>



Press Information Bureau
Government of India

Ministry of Defence

Fri, 15 Jul 2022 3:15 PM

Ministry of Defence sets up an Apex Committee for Performance and Efficiency Audit

It's a major shift from compliance audit to improve overall efficiency

The Ministry of Defence has set up an institutional mechanism comprising of an Apex committee with Defence Secretary as Chairman to conduct a Performance and Efficiency Audit into various aspects of its activities. This kind of audit is expected to provide valuable inputs to the top management of the Ministry of specific shortcomings, if any, in planning and execution of projects, and suggest systemic improvements in internal controls, soundness of financial procedures, identification of risk factors, etc. It is a major shift from the existing transaction-based compliance audit to carry out an outcome-based Performance/ Efficiency Audit aimed at enhancing overall efficiency.

The members of the committee include Vice Chiefs of the three Services, Secretary Defence (Finance), Chief of Integrated Staff Committee (CISC), Controller General of Defence Accounts (CGDA), Director General (Acquisition) and other senior officials of Ministry of Defence and Defence Research and Development Organisation (DRDO). The broad areas that have been identified for the conduct of Performance and Efficiency Audit include Defence Capital Procurements, provisioning, logistics, inventory levels, Maintenance of platforms/ assets, role

and performance of Authority Holding Sealed Particulars (AHSP) etc. the Apex committee can also recommend any other specific area for Performance and Efficiency Audit.

The committee chaired by Defence Secretary will identify specific areas for the conduct of performance and audit by CGDA and monitor performance audit reports and action taken thereon. It also shall advise Raksha Mantri on remedial measures to be adopted as well as measures for overall improvement in strengthening of internal oversight and Risk Management Framework.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1841753>



Press Information Bureau
Government of India

Ministry of Defence

Sun, 17 Jul 2022 6:06 PM

Chief of Army Staff Proceeds on A Three Day Visit to Bangladesh

Continuing with the excellent bilateral defence ties between India and Bangladesh, General Manoj Pande, the Chief of Army Staff (COAS) has proceeded on a visit to the Bangladesh from 18 to 20 July 2022. This is the first foreign visit by General Manoj Pande since assumption as Army Chief. The Army Chief will commence his visit by paying tributes to the brave-hearts who made the supreme sacrifice during the Liberation War of 1971 by laying a wreath at the Shikha Anirban on 18 July 2022. During the day, the COAS will be carrying out multiple meetings with senior officials of the security establishment and exchange views on various defence related issues. He will also pay tributes to the Father of the Nation Bangabandhu Sheikh Mujibur Rahman Memorial Museum in Dhanmondi.

On the second day of his visit, the Army Chief will address the students and faculty of Defence Services Command & Staff College, Mirpur. He will thereafter visit and interact with the members of Bangladesh Institute of Peace Support and Operation Training (BIPSOT), a premier institute of Bangladesh which trains peacekeepers for employment in various UN Peace Operations. This will be followed by a visit to the Bangabandhu Military Museum at Mirpur. The visit of the COAS will further deepen the bilateral relationships between the two Armies and act as a catalyst for closer coordination and cooperation between the two countries on a host of strategic issues.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1842216>

Air Force Seminar on Indigenisation of Avionics in Pune

The Indian Air Force (IAF) is hosting a two-day Avionics Indigenisation Seminar, AVISEM-22, in Pune from Monday on the theme ‘Indigenisation of Avionics Aggregates Based on Modular Open System Architecture Framework’. Avionics refers to the development and use of electrical and electronic devices in aviation. “Taking forward the mandate of Atma Nirbharta, the objective of the seminar is to evolve a strategy for reducing the dependence on foreign Original Equipment Manufacturer (OEM) for supply and maintenance of avionic aggregates,” a press statement from the IAF said. The seminar intends to address this by holding ideation sessions to discuss the possibility of using commercially off-the-shelf products and technology, officials said.



Fighter jet Sukhoi-30 MKI at the Air Force Station, Pune.

“Eventually the seminar is envisaged to evolve a process that needs to be adopted for integration, certification and qualification of the modular level solutions as a replacement option for the OEM supplied avionic aggregates,” the statement added. The event is being steered by the Indigenisation Directorate of the Air Headquarters and will be conducted at the Base Repair Depot of the IAF in Pune. Officials said eminent scientists representing various laboratories of the Defence Research and Development Organisation (DRDO), prominent contributors from the industry, senior leadership of the IAF from Air Headquarters and the Maintenance Command, and representatives from all base repair depots of the IAF will participate in the event. Industry participants will showcase their capabilities in the niche domain of Modular System Architecture Framework for use by the IAF to undertake indigenous development.

<https://indianexpress.com/article/cities/pune/air-force-seminar-indigenisation-of-avionics-pune-8034494/>

Defence Ministry to Allow Private Companies to Develop Military Helicopters

In a major push to “Atmanirbhar Bharat” in military hardware sector, the Defence Ministry has decided to amend the Defence Acquisition Procedure (DAP) manual to allow private sector to collaborate with an Indian Defence PSUs with a majority stake and manufacture the required weapon system. According to South Block officials, this collaboration will be tested in the development and manufacture of Indian Multi-Role Helicopter (IMRH), which will ultimately replace all Russian built Mi-17 and Mi-8 helicopters in the Indian military’s present inventory.

The IMRH will have a 13 tons take-off weight and will perform with the Indian armed forces in air assault, air attack, anti-submarine, anti-ship, military transport and VVIP roles. It is understood that Indian private sector companies have already shown their eagerness to participate in the project with the Defence Ministry telling them to start manufacturing in the next seven years. The French Safran has already signed an MoU with Indian HAL on July 8, 2022, to form a new joint venture company to develop, produce and support the IMRH engine including the naval variant. According to officials, the private sector companies will also be allowed to export 25 per cent of their production to third countries and generate foreign exchange for the country.



Prototype of Indian Multi-Role Helicopter

The Indian Armed Forces has been told to purchase the developed IMRH which is stipulated to roll out in next seven years. The private sector companies have also sought an assurance from the Defence Ministry that the Indian armed forces should purchase the helicopter if the product is manufactured in the next five years by advancing timelines and saving money and man-hours. The decision to allow the private sector to acquire 51 per cent stake and form a joint venture with Indian PSUs was taken as the latter were not being able to deliver in required time leading to cost overruns. This delay was leaving the Modi government with no options but to

purchase the much-required machines via the tender or government-to-government route from other countries.

While the IMRH is expected to roll out in the coming five to seven years, the Indian Navy is expected to get its first anti-submarine warfare Sirkorsky MH 60R Seahawk helicopters delivered in India by the end of this year. Although the first two to three helicopters have already been handed over to the Indian Navy for training purposes by San Diego Naval Station in the US, the remaining deliveries of 21 helicopters will begin soon as per the USD 2.3 billion February 2020 deal signed by both the governments.

<https://www.hindustantimes.com/india-news/defence-ministry-to-allow-private-companies-to-develop-military-helicopters-101658025719093.html>



Sun, 17 Jul 2022

Defence Ministry to Allow Private Companies to Develop Military Helicopters

By Shishir Gupta

In a major push to “Atmanirbhar Bharat” in military hardware sector, the Defence Ministry has decided to amend the Defence Acquisition Procedure (DAP) manual to allow private sector to collaborate with an Indian Defence PSUs with a majority stake and manufacture the required weapon system. According to South Block officials, this collaboration will be tested in the development and manufacture of Indian Multi-Role Helicopter (IMRH), which will ultimately replace all Russian built Mi-17 and Mi-8 helicopters in the Indian military’s present inventory. The IMRH will have a 13 tons take-off weight and will perform with the Indian armed forces in air assault, air attack, anti-submarine, anti-ship, military transport and VVIP roles. It is understood that Indian private sector companies have already shown their eagerness to participate in the project with the Defence Ministry telling them to start manufacturing in the next seven years. The French Safran has already signed an MoU with Indian HAL on July 8, 2022, to form a new joint venture company to develop, produce and support the IMRH engine including the naval variant.

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<https://www.hindustantimes.com/india-news/defence-ministry-to-allow-private-companies-to-develop-military-helicopters-101658025719093.html>

ThePrint

Thu, 15 Jul 2022

Modi Govt. Needs to Learn from US, France. India's Defence Industry Needs a Push for Private

By Snehesh Alex Philip

In heartening news for the defence industry, India's military export touched a record high of Rs 13,000 crore for the financial year 2021-2022. The figure was eight times the amount of export India had recorded five years ago, Sanjay Jaju, additional secretary, Department of Defence Production, told journalists last week. India's defence sector is dominated by the state-run giants making everything under the sun—from rifles to tanks, helicopters and fighters to aircraft carriers and missiles. So it's naturally assumed that the public sector undertakings (PSUs) will eat up a big slice of defence exports. Unfortunately, that is not the case. In FY 2021-2022, defence PSUs contributed only about 30 per cent of the exports; the rest went to the nascent private players. This year's defence PSU share, however, has actually grown because until now, they only contributed to around 10 per cent of India's total exports. The growth is easily attributable to the sale of Brahmos supersonic cruise missiles to the Philippines, which was inked earlier this year for over Rs 2,700 crore.

The Narendra Modi government has set tough targets for defence PSUs, asking them to ensure that 25 per cent of their turnover comes from exports by 2022-23. This seems like a tall task. In 2020, the government set a target of Rs 35,000 crore (\$5 billion) export in aerospace, and defence goods and services in the next five years. This is part of the turnover of Rs 1.75 lakh crore (\$25 billion) in defence manufacturing by 2025 that the government is aiming to achieve.

Role of private sector

Last year, I said that India needs deal hunters abroad and intent alone cannot make us exporters. To begin with, talks of hand-holding the private sector for actual exports need to translate into action. While the Modi government has gone ahead and made licensing and clearance for defence simpler, what's missing is a real push. The big push can come only if the Modi government can pitch for them just like the Americans and the French when it comes to their

defence industry. Numerous niche companies in the private sector are doing amazing work and bagging foreign contracts on their own. The Modi government should actively start pushing for these companies. It should use the Line of Credit extended to various countries to push for the private sector as well.

If New Delhi is looking at countering China's forays into Africa, then it will have to come up with innovative ways and use the private sector to strike deals on a continent that is known to be very tricky when it comes to procurements. The push for the private sector has to run parallel to the Modi government's marketing of bigger weapons systems made by defence PSUs. The aim here should not be to earn profits but establish its foothold in countries even if it means a drastic reduction in the cost of equipment or a more flexible line of credit. At the end of the day, when defence equipment is being sold, it's not just about earning money but also a substantial strategic heft—something that the Chinese are already focusing on.

Indigenous systems and companies

India's defence procurement processes also need to be streamlined to ensure that decision-making processes are much faster than they are now. And this is where India's defence forces also need to focus. No doubt that the three Services are now more intent on indigenous systems because of the constant push by the government, but they need to be proactive as well. The fear of the 'system' is such that many private sectors are quite happy dealing with foreign clients than with Indian forces or defence PSUs. The forces need to be aware of what is happening in the domestic market.

One classic example is a small company called Tonbo Imaging, which is doing excellent work with the Indian forces. They discovered the company because of a joint exercise with NATO a decade ago. The US Army was using weapons that had Tonbo systems on them. "This came from an engineering centre in Bengaluru, they told the Indians. That's when the Army reached out to us. Five countries were buying our tech before India bought from us," Arvind Lakshmikumar, one of the founders of Tonbo Imaging, had told Mint in 2019. When the company initially began commercial operations around 2012, it focussed on the global market. Industry sources said that Lakshmikumar's prior work with the US' DARPA (Defense Advanced Research Projects Agency) helped him get recognition for products early in the US markets.

There are a few more companies like Tonbo Imaging that have been working with foreign countries and firms. And they're not even big ones like the Tatas or Mahindras. On 11 July, Defence Minister Rajnath Singh conferred the 'Raksha Niryat Ratna' award on state-run Bharat Electronics Limited and on Indo-MIM from the private sector for achieving the highest defence exports in recent years. It was surprising that many who attended the event had never heard of Indo-MIM before. There are many such companies in India that are waiting to be explored and fully utilised. And that is where the Indian forces should focus.

<https://theprint.in/opinion/brahmastra/modi-govt-needs-to-learn-from-us-france-indias-defence-industry-needs-a-push-for-private/1039686/>

Fri, 16 Jul 2022

The Race of Two Asian Giants! How India's Rise can Keep China's Growing Influence in Check

By M Saad

The clash of ideas and cultures has been going on for centuries between the East and the West. From the look of things in the years to come, it is quite possible for the East to outpace the West in many aspects. This would alter the course of history and geopolitics. The shift of centre of power has been in the waiting for quite some time. In the years to come, Asia is expected to regain its position as the foremost economic power that it had lost after the industrial revolution three centuries back. The unflinching shift of power scale towards China in the past decade or so is more of a threat for the West, which has tried every trick in the book to control the country's meteoric growth. One reason for this growing optimism among Asian countries is the abundance of natural resources in the region. According to an estimate, the Middle East, Russia and Central Asia combined account for almost 70 percent of global oil reserves and 65 percent natural gas reserves. Gas fields in Galkynysh, Turkmenistan are the second largest in the world. Countries that lie between the Mediterranean Sea and the Pacific including Russia, Ukraine, India, China, Pakistan and others account for more than half of the world's wheat production.

South East and East Asian countries such as Indonesia, Vietnam and others account for 85 percent of the world's rice production. When it comes to natural resources like silicon vital for production of semiconductors, almost three-quarters of global production is taking place in Russia and China. More so, South East Asian countries contribute a significant chunk to the global GDP. Countries including India, China, South Korea, Japan, Australia and New Zealand together have 30% of the global GDP, accounting for the total value of more than \$30 trillion.

The West is in decline and the talks on how and when it will come down like everything that goes up are taking place in drawing rooms across the Asian continent. A spate of incidents of gun violence in the US is a great example of the spiritual decline of American society. This century has been termed as "the Asian century" because development is taking place in the East at an astonishing pace and scale. Some reports suggest that by 2050 the per capita income in Asian countries would increase by sixfold in terms of purchasing power parity (PPP). These developments are being projected amid the declining influence of the US, which has been spearheading the West for the past many decades.

The withdrawal of American forces from Afghanistan whilst the country was being taken over by Taliban last year without a single shot fired from either side and the US action during the Ukraine war limited to aiding the country under Russian onslaught to defend itself has shown the

world that the war-weary US is in no mood to engage in another war. But President Joe Biden has recently proclaimed that in case Taiwan is attacked by China, who is an important US ally, his country would intervene. However, the past events — whether the US inaction in Afghanistan when the Taliban was taking over cities after cities or its role in the Russia-Ukraine war — has had an impact on the US strategic credibility in Europe and elsewhere. Beijing must perceive the new, weaker position of the US as its advantage in the Indo Pacific region, where it is directly or indirectly holding several ASEAN countries by their necks.

While China projects its aggressive efforts in the region — be it delivering crushing blows to pro-democracy protests in Hong Kong, its treatment of Taiwan as integral to the Chinese state, its hostilities along the LAC in Arunachal Pradesh or building of artificial Islands and defence infrastructure development in South China Sea — as the protection of its national interests rather than its attempt at global dominance. And it goes without saying that Beijing would do anything to keep the Western powers from interfering in its Asian adventures. Several countries have already dealt with the Xi Jinping regime’s aggressive policy of “bend the knee to Beijing or face dire consequences” . The continued dominance of China over the sea routes is also a great hindrance to the expansion of trade for several ASEAN countries, which are forbidden from taking trade routes through sea in the region.

The tensions between India and China have been rising ever since the PLA (People’s Liberation Army) entered the country’s East Ladakh territories in May 2020. In retaliation, the Indian government did restrict access of Chinese companies in Indian markets, banning close to 278 Chinese apps with a significantly huge user base but several companies with Chinese backing are still flourishing in the country. India recognises that the cost of full-fledged conflict with China would be too high. It might as well plunge the country into economic malaise, if it came to war.

Since 1993, India and China have been working to find peaceful solutions through mutual agreements to resolve border disputes, which have been a cause of rivalry and bitterness for the two neighbouring nations. After recent confrontations, India and China have now once again resorted to diplomacy to maintain the status quo and find peaceful solutions to territorial disputes. Considering India’s geographic location, China is not the enemy the country would want. India already has Pakistan on its north-western border with which a territorial dispute over a portion of land in the Kashmir region has been going on since 1947. China is a third party in this conflict as it claims some portion of the disputed land.

China’s dominance in East Asia

China’s journey in terms of economic growth has been remarkable in the past two decades. The nation with the world’s largest population has come a long way since the 1970s when it introduced a new, hybrid version of socialism that brought a large chunk of its population out of poverty. Today, China has become a powerful country that is shaping the future of several countries through investments. The Belt and Road initiative of China comes under Beijing’s signature foreign and economic policy that President Xi Jinping had termed as “the project of the

century” in 2017. China has been aiding infrastructure development in several Asian, African and South American countries. These strategic investments give China an edge in strengthening diplomatic ties and much-needed support in a fast-changing world. Yet several nations see the country’s aggressive approach to trade and its tactics as a threat.

The emergence of China as America’s rival in the domain of trade, defence and new-age technologies is shaping the course of today’s geopolitics. One can gauge the rise of the Chinese nation by its trade dominance and share in global exports. The country’s foreign trade accounts for 35% of its GDP and it is the world’s largest exporter of goods. The US, despite sharing a complicated relationship with China, had bilateral trade amounting to \$657.4 billion in 2021. The Chinese government holds a large chunk of US national debt with \$1060 billion in treasury holdings, which is almost 14% of the total US debt and second only to Japan’s share of 17%. This approach aids the export-oriented China in selling its products at cheap prices in the US market, which in turn also supports the value of the US dollar to remain stable. In the past two years, China’s economic recovery after the pandemic has been steady with manufacturing, investments and exports acting as the main drivers.

India’s Chance to Fly

The only answer to China’s growing dominance in the region is a strong, self-reliant India, which is now strengthening its position in the Indo-Pacific region. Japan may be far ahead of India in several departments but India has the advantage of its population and a large domestic market. The country’s exports last year at \$417 billion showed an upward trajectory but the rising imports of \$611.8 billion left a deficit of \$192.24 billion. The US-India bilateral trade has been showing a downward trend since 2019, when it stood at \$146.1 billion. The US trade with India dropped to 18% to \$122 billion in 2020. According to the United States Census Bureau, the trade between the two countries totaled an estimate of \$113.3 billion last year.

If one considers India’s vast national market and the way the Indian economy is faring despite trials and tribulations, the picture looks promising in terms of economic growth in the future. Currently, India ranks sixth in the list of countries with the highest total value of GDP. Although, Indian government’s dream of becoming a \$5 trillion economy by 2025 may remain distant, the growth will continue at a more or less similar pace if no ‘out of the box’ economic reforms are adopted to further boost the economy.

The nation whose founding fathers like Jawaharlal Nehru saw a stable future of the country in terms of agriculture alone has come a long way since 1991 when its economy moved towards liberalisation. The country is now opening new avenues for itself and exploring uncharted territories in terms of its plans for becoming the world’s biggest producer of renewable energy. The Indian growth story in the past two decades has been inspiring for several developing countries but now is the time for India to become an inspiration for developed countries. This will be a huge challenge for the second most populous country in the world, which is still struggling to contain mass poverty and unemployment. If truth be told India is like two sides of a

coin which are never similar — one side may be shining: India of ultra-rich and all-conquering business tycoons, but the other side shows a grim reality: poverty-stricken India of the deprived.

India's trade relations with developed countries are vital as the country has begun working on its future endeavours — the most fruitful of which can turn out to be clean energy production. The leaders in India understand the economical and political consequences of the growing Chinese influence and the geopolitical tensions that are arising due to its regional dominance. The Indian government has been looking at economic stability during these tough times. A few pending FTAs with the US, the European Union and the UK, can certainly change the game greatly.

The US economic cooperation for Asian countries — especially for India — can further help keep China's rise in check. A stable and strong New Delhi can be the right answer to counter China or at least restrict its aspiration of territorial sovereignty beyond its borders. Those holding power in New Delhi are well aware of the aforementioned consequences of Chinese dominance. The country is working to create a more favourable environment for foreign investors, especially for those who are spurning China to set their moorings in India. China finds itself amid a web of problems in these tough times as the country battles a fresh outbreak of covid-19 infections with the most stringent lockdowns.

Far bigger problem for China is shattering the perception that is quickly gaining ground — all is not well in the country. This compelled state-run China Daily to recently do advertorials about progress in China in Indian newspapers. The Chinese Communist Party's propaganda has also appeared in reputed Indian publications in the past as paid advertisements. A worrying sign for China is the increasing number of investors exiting the Chinese market and seeking newer pastures. That's where India's chances to consolidate further lie. India has already outgrown several Asian countries and if it can leverage this advantage there will be no stopping for the nation which will have the largest workforce in the world by 2030. While the challenges that China will face in this decade —one of which an economist has called “baby bust” — are the aging population and the “credit bubble” that the nation has created with its increasing debt levels. China had been warned by the IMF of its dangerous debt levels in 2017.

As more and more American corporations continue to source raw material from India and considering the efforts from both sides to further strengthen economic ties, evidently the two countries are headed in the right direction. This is all a result of the germination of sentiment in the US to limit the growing dependence on China for its domestic needs. These are all signs of the shifting structure of the global economy and India's chance to fly above the Red Dragon in the years to come.

<https://www.financialexpress.com/defence/the-race-of-two-asian-giants-how-indias-rise-can-keep-chinas-growing-influence-in-check/2596112/?lite=1>



Mon, 18 Jul 2022

PM Modi to Address Naval Innovation and Indigenisation Organisation Seminar Today

As a part of the 'Azadi ka Amrit Mahotsav', Prime Minister Narendra Modi is all set to address the Naval Innovation and Indigenisation Organisation (NIIO) seminar 'Swavlamban' today on July 18. The seminar is scheduled at 4:30 pm at Dr Ambedkar International Centre in New Delhi. While highlighting the details of the seminar, the Prime Minister's Office informed that an important pillar of Aatmanirbhar Bharat is attaining self-reliance in the Defence sector. Additionally, during the seminar, Prime Minister will unveil 'SPRINT Challenges', which are aimed at giving a boost to the usage of the indigenous technology in the Indian Navy.

The NIIO, in conjunction with the Defence Innovation Organisation (DIO), aims at inducting at least 75 new indigenous technologies, products into the Indian Navy and this collaborative project is named SPRINT (Supporting Pole-Vaulting in R&D through iDEX, NIIO and TDAC). "The seminar aims to engage Indian industry and academia towards achieving self-reliance in the Defence sector," according to PMO release. The two-day seminar, scheduled to be held on July 18 and July 19, will provide a platform for leaders from industry, Academia, services and government to come together on a common platform to ideate and come up with recommendations for the Defence sector. Sessions dedicated to Innovation, Indigenisation, Armament and Aviation will be held. Additionally, the second day of the seminar will witness outreach to the Indian Ocean Region, in line with the government's vision of SAGAR (Security and Growth for All in the Region).

Meanwhile, in another development, Prime Minister Narendra Modi congratulated ace Indian shuttler PV Sindhu after she clinched the Singapore Open 2022 title on Sunday. Ace shuttler and Olympic medalist PV Sindhu clinched the Singapore Open 2022 title after defeating China's Wang Zhiyi in the final of the women's singles category. "I congratulate @Pvsindhu1 on winning her first ever Singapore Open title. She has yet again demonstrated her exceptional sporting talent and achieved success. It is a proud moment for the country and will also give inspiration to upcoming players," tweeted the Prime Minister.

<https://www.livemint.com/news/india/pm-modi-to-address-naval-innovation-and-indigenisation-organisation-seminar-today-details-here-11658105100919.html>

IAF Scrambles Fighter Jets in Response to Chinese Actions on LAC; IAF Chief on PLAAF Provocations Just Before Military Talks

Amid multiple provocative activities by the Chinese Air Force on the Line of Actual Control (LAC) ahead of the military talks, Air Chief Marshal VR Chaudhari today said whenever the People's Liberation Army Air Force (PLAAF) fighter jets come too close to the border, the Indian Air Force immediately responds by scrambling its combat aircraft to tackle the situation. The Indian Air Force chief's statement to ANI in an exclusive interview comes on a day when India and China are holding the 16th round of Corps Commander talks and the Chinese Air Force fighter jets provoked India on multiple occasions just before it. "Chinese aircraft activity is closely monitored by us. Whenever we see Chinese aircraft or remotely piloted aircraft coming too close to the LAC, we take appropriate measures by scrambling or putting our aircraft on higher alert. This has deterred them quite a lot," Chaudhari told ANI in an interview.

Asked why the Chinese Air Force was trying to provoke India just ahead of talks, he said, "I cannot point to any particular reason why they are doing it but we are monitoring it and we take immediate action by scrambling our fighter jets there." The IAF chief said that ever since the Galwan incident in June 2020, "we had started deploying our radars all along the LAC in eastern Ladakh sector. Gradually we have integrated all these radars with our Integrated Air Command and Control System so that we are able to monitor the air activity across the LAC." Chaudhari said the Air Force has also bolstered the surface-to-air-ground weapon capabilities along the northern borders and has also increased the number of mobile observation posts in that area.

"We get a lot of inputs from the army and other agencies deployed there. Chinese aircraft activity is closely monitored by us," he said. The first major incident of air violation took place in June last week when a J-11 fighter aircraft of the Chinese Air Force came very close to a friction point between the two militaries. In the last week also, the Chinese side has done multiple provocative activities along the LAC in the Eastern Ladakh sector where they are flying very close to the LAC violating the Confidence Building Measures as per which the two sides cannot fly within 10 km of the LAC. Indian Air Force has scrambled its MiG-29 and other aircraft deployed in the region to counter the threat posed by the Chinese aircraft to handle the possibility of any misadventure by the Chinese side.

<https://economictimes.indiatimes.com/news/defence/iaf-scrambles-fighter-jets-in-response-to-chinese-actions-on-lac-iaf-chief-on-plaaf-provocations-just-before-military-talks/articleshow/92935617.cms?from=mdr>

Sat, 16 Jul 2022

Indian Air Force gets 36 Rafale Fighter Jets! France Completes Delivery of Lethal Combat Aircraft

As the race for the fighter jets for the Indian Navy's fighter jets starts, France has announced that the order of 36 Rafale fighter jets for the Indian Air Force (IAF) has been completed. Despite the global lockdown due to COVID-19 pandemic, the France based Dassault Aviation has delivered all the combat aircraft ahead of time. Speaking on the sidelines of the French Day celebrations in New Delhi, French Envoy in New Delhi Emmanuel Lenain, said that 36 fighter jets have been delivered to New Delhi. Though technically all have been delivered to India, only 35 out of the 36 have arrived in India and the last one is still in France as all the 13 India Specific Enhancements (ISE) are being tested. This instrumented aircraft was the first one to be built for India and as has been reported in the Financial Express Online was designated RB008. In this RB stands for the then IAF Chief Air Chief Marshal RKS Bhadauria. He was the Deputy Chief of IAF, at the time he had played a major role in the contract negotiations when he was leading the team.

Fighter Jets

The IAF has no fighters originating from the US; there are French fighters in the IAF – Mirage 2000 and in recent months the Rafale from Dassault Aviation. The Inter-governmental agreement (IGA) for €7.87 billion for 36 multi-role fighter jets in fly-away condition was inked in 2016, following an announcement by Prime Minister Narendra Modi in 2015 April, during his visit to that country. While in February this year, IAF took the delivery of a batch of three Rafale from France taking the total to 35 combat aircraft arriving in India, upgrade of the existing aircraft here in India is underway. These are being upgraded with the 13 ISE configurations which have undergone tests and have been qualified and also certified to be fitted onboard the jets.

Operational Demonstration Report Awaited

Recently the Vice chief of the Indian Navy in response to a media question had said that the report of the operational demonstration of Rafale Marine (M) of Dassault Aviation and US based Boeing Company flew their F/A-18 Block III Super Hornet. Earlier this year, the French Rafale-M had come to India and demonstrated its compatibility and the F/A-18 Block III carried out a demonstration in May. The Vice chief of the Indian Navy had also stated the deal for 26 fighter jets for the Indian Navy's aircraft carriers will be done through government-to-government

route/Intergovernmental Agreement (IGA). This means that this deal will be done based on the talks between the governments of the companies involved.

American Aircraft in the Indian Fleets

So far, P-8I Patrol aircraft from Boeing Company are already in the Indian Navy and the delivery of the MH-60 ‘Romeo’ anti-submarine helicopters to US-based Sikorsky-Lockheed Martin is awaited. There are transport aircraft from Lockheed Martin and the Boeing Company being operated by the Indian Air Force (IAF). The IAF also inducted AH-64E Apache Longbow attack Helicopters and heavyweight CH-47F (I) Chinooks, both from the Boeing Company.

<https://www.financialexpress.com/defence/indian-air-force-gets-36-rafale-fighter-jets-france-completes-delivery-of-lethal-combat-aircraft/2596300/?lite=1>



Fri, 15 Jul 2022

Stage Set for the US to Waive off Sanction on India’s Purchase of Russian S-400 Air Defence System

It was primarily to punish Russia over the Crimean annexation in 2014 and its alleged role in the US elections in 2016. And it was first imposed on NATO-ally Turkey for its purchase of the Russia-S-400 system. Ahead of the India-China Corps Commander Talks on Sunday July 17, the US House of Representatives has passed a historic amendment on Thursday which will provide a waiver to India under the Countering America’s Adversaries Through Sanctions Act or CAATSA. The amendment was authored and introduced by Indian-American Congressman Ro Khanna. He received a majority of 330 to 99. In the next step it will now go to the Senate and then to the office of the US President Joe Biden before it is implemented.

Has the waiver been given?

No. “Not yet. It’s a long way off,” explained a senior officer. It is just an amendment which has been passed in the House of Representatives and it has “urged” the Biden administration to grant a waiver. This does not mean that it has been granted.

Who can grant the waiver?

Only the US President is the final authority to grant the CAATSA waiver. The amendment which has urged the Biden administration for a waiver under CAATSA is not a bill which has to be voted on and then signed into a law.

What is CAATSA?

This was signed during the tenure of President Donald Trump into a federal law in 2017. And it allows the US to punish countries which are doing significant transactions with countries including Iran, Russia, and North Korea.

Meaning of the amendment suggested

Once the amendment is made it will deepen US –India ties and in an effort to deter China, it will also urge the Biden administration to help give the waiver to India.

What did Representative Khanna say?

He said: “The US must stand with India in the face of escalating aggression from China. As Vice Chair of the India Caucus, I have been working to strengthen the partnership between our countries and ensure that India can defend itself along the Indian Chinese border.” “This amendment is of the utmost importance, and I am proud to see it pass the House on a bipartisan basis.” By suggesting the amendment he believes that a strong US-India US partnership is critical for advancing US interests in the Indo-Pacific. The partnership between the two countries needs to be further strengthened as the threats in the Indo-Pacific region increases and it will send an unequivocal signal that sovereignty and international law must be respected.

The way US looks at it: Growing Chinese Belligerence & India’s defence on Russian platforms

During discussions in the US House of Representatives it was recognized that issues related to China and dependence on Russian platforms needs to be taken into account and the Biden administration to take steps which will encourage India to move away from the Russian equipment and platforms. The CAATSA waiver will be important and beneficial to both the countries, believed the House of Representatives who have sought for a transition period to deter aggressors in light of the growing China and Russia partnership.

India & CAATSA & S-400

For India it has been a matter of concern since the time India and Russia had inked USD 4.5 billion deal to buy five units of S-400 Triumf ‘SA-21Growler’ which is a long-range surface-to-air missile (SAM) system, at the end of talks between Prime Minister Narendra Modi and Russian President Vladimir Putin. Under Section 231 of CAATSA, around 39 Russian entities are on the list, which invites sanctions. Major defence companies including: Russian Aircraft Corporation MiG, Rosoboronexport, Sukhoi Aviation, Almaz-Antey Air and Space Defence Corporation JSC – the company behind the S-400 system.

The idea behind CAATSA

It was primarily to punish Russia over the Crimean annexation in 2014 and its alleged role in the US elections in 2016. And it was first imposed on NATO-ally Turkey for its purchase of the Russia-S-400 system. Last year, a CAATSA sanction was imposed on China’s Equipment

Development Department (EDD) under the Ministry of Defence of China for the purchase of 10 SU-35 Russian fighter jets in 2017 and S-400 equipment in 2018. So far the US has not imposed it on India. This year there were reports that the Biden administration was to take a decision.

India-US Military Trade

The US-India Military trade as reported in the Financial Express Online has touched USD 20 billion and it is expected to go up once two major deals including the Predator Drones for the Indian Navy are inked soon. India is considered as a close and an important ally of the US in its efforts to control China's growing presence across the region and beyond. India is already part of the QUAD and West Asia QUAD.

<https://www.financialexpress.com/defence/stage-set-for-the-us-to-waive-off-sanction-on-indias-purchase-of-russian-s-400-air-defence-system/2595589/?lite=1>

BUSINESS INSIDER
INDIA

Fri, 15 Jul 2022

US Waives Sanctions, India can now Purchase S-400 Missile Defence System from Russia

The US House of Representatives has passed by voice vote a legislative amendment that approves waiver to India against the punitive CAATSA sanctions for its purchase of the S-400 missile defence system from Russia to help deter aggressors like China. The legislative amendment was passed on Thursday as part of an en bloc (all together as a single unit) amendment during floor consideration of the National Defence Authorisation Act (NDAA). Authored and introduced by Indian-American Congressman Ro Khanna, the amendment urges the Biden administration to use its authority to provide India with a Countering America's Adversaries Through Sanctions Act (CAATSA) waiver to help deter aggressors like China. CAATSA is a tough US law that authorises the US administration to impose sanctions on countries that purchase major defence hardware from Russia in response to Russia's annexation of Crimea in 2014 and its alleged meddling in the 2016 US presidential elections.

"The United States must stand with India in the face of escalating aggression from China. As Vice Chair of the India Caucus, I have been working to strengthen the partnership between our countries and ensure that India can defend itself along the Indian Chinese border," said Khanna, the US representative from California's 17th congressional district. "This amendment is of the utmost importance, and I am proud to see it pass the House on a bipartisan basis," he said. The law was brought in 2017 and provides for punitive actions by the US government against any country engaged in transactions with the Russian defence and intelligence sectors. In October 2018, India signed a USD 5 billion deal with Russia to buy five units of the S-400 air defence missile systems, despite a warning from the then-Trump administration that going ahead with the contract may invite US sanctions.

The S-400 is known as Russia's most advanced long-range surface-to-air missile defence system. The US has already imposed sanctions on Turkey under the CAATSA for the purchase of a batch of S-400 missile defence systems from Russia. Following the US sanctions on Turkey over the procurement of S-400 missile systems, there were apprehensions that Washington may impose similar punitive measures on India. The US has not yet made any decision on potential sanctions or waivers to India under CATSAA law for its purchase of the S-400 missile defence system from Russia, Secretary of State Antony Blinken said in April. The Ministry of External Affairs has said that India was pursuing an independent foreign policy and its defence acquisitions are guided by its national security interests. In his remarks on the House floor, Khanna said there is no relationship of greater significance to US strategic interests than the US-India partnership.

"My bipartisan NDAA amendment marks the most significant piece of legislation for US-India relations out of Congress since the US-India nuclear deal," Khanna, a Democrat, said. The legislation says that the United States-India Initiative on Critical and Emerging Technologies (ICET) is a welcome and essential step to developing closer partnerships between governments, academia, and industry in the two countries to address the latest advances in artificial intelligence, quantum computing, biotechnology, aerospace, and semiconductor manufacturing. Such collaborations between engineers and computer scientists are vital to help ensure that the United States and India, as well as other democracies around the world, foster innovation and facilitate technological advances which continue to far outpace Russian and Chinese technology, it said.

<https://www.businessinsider.in/international/news/us-waives-sanctions-india-can-now-purchase-s-400-missile-defence-system-from-russia/articleshow/92898311.cms>



Sat, 16 Jul 2022

IAF Chief Backs Co-Ordination Between Forces, Wary of Air Defence Command

The Indian Air Force (IAF) chief on Friday backed close coordination between all elements of the armed forces to counter a range of aerial threats, but said the creation of a separate air defence command “may prove counterproductive”. The remarks by Air Chief Marshal Vivek Ram Chaudhari, made while addressing a seminar organised by the think tank Centre for Joint Warfare Studies, assume significance against the backdrop of a move to create six theatre commands to integrate the capabilities of the three services, including an air defence command and a maritime theatre command in the first phase. Chaudhari argued that air defence operations are closely related to offensive aerial operations, and separating the two could affect the execution of any joint strategy.

At the same time, he emphasised the need to develop measures to protect national assets from a wide range of aerial threats such as miniature drones and precision weapons. While there is a need for close coordination between all elements within the same airspace to ensure aerospace

safety as well as effective air defence, creation of a [air defence] command may prove counterproductive because air defence operations are inextricably linked to counter air operations and all offensive [operations], as the success or failure of one will dictate the demands on the other,” he said while speaking on the theme “Air and missile defence.” “Air defence and offensive missions are interdependent and if executed in isolation, these would not only be disjointed but also ineffective in design or execution of the joint strategy,” he said.

The proposed air defence command will control air defence resources of the three services and be responsible for protecting vital assets from airborne threats. It will be headed by a three-star IAF officer, and will be based in Prayagraj. Creating the theatre commands will involve merging the 17 existing single-service commands spread across the country. IAF’s resistance to theaterisation has been articulated by its top leadership in the past. IAF has had concerns about the model for division of its air assets, the leadership of theatre commands and dilution of powers. The theaterisation drive slowed down after former chief of defence staff (CDS) Bipin Rawat’s death. Rawat, who was killed in the crash along with 13 others, was spearheading the theaterisation drive to best utilise the military’s resources for future wars. Last year, Rawat had asked three services to submit comprehensive reports on theaterisation and joint structures by April, but the timeline was not met.

The government’s announcement in June regarding the new eligibility criteria for the CDS stoked hopes that it will soon name an officer to the senior-most military post in the land, and accelerate the theaterisation drive and enhance synergy in the armed forces. Chaudhari noted that dealing with air and missile defence as two separate entities will be “like creating additional silos within the air defence vertical” and made several other arguments regarding the IAF’s lead role in air defence. While the increasing demand of joint operations requires interoperability among multiple domains, budget constraints imply that technological choices based on reliable, future ready and open architecture systems, independent air defence systems in the field will have “very little relevance in tomorrow’s wars” unless they are a part of a larger integrated air defence system, he said. Any independent systems are “more likely to cause self-harm due to lack of common identification and communication protocols”, Chaudhari said.

“To prosecute the land, maritime or air strategy independently will almost certainly lead to failure because the enemy will fight a joint and integrated war. The enemy air and missile forces will be brought to bear on the fielded forces albeit from stand-off ranges and will adversely affect the progress of land or maritime battles. Therefore, control of air will remain paramount for success of any operation,” he added. An integrated air defence system comprises “defensive counter air, passive air defence and offensive counter air”, and IAF has the ability to monitor and identify all air elements through its integrated air command and control system (IACCS). “We are making all efforts to share IACCS-generated recognised air situation picture with all stakeholders down to the tactical level. Integration of our networks will surely enhance our ability to share information and augment our collective air defence capabilities,” he said.

With IACCS as the terrestrial network, airborne platforms will be fully networked with induction of software defined radios and work is underway to integrate the space segment to have a “truly networked integrated air defence system”, he said. “Hence, amalgamation of terrestrial, aerial and space domains into a common network will be a fundamental requirement of modern war fighting,” he said. “Towards this, we must look at operationally integrating the ballistic missile defence capability into the integrated air defence system. IAF’s existent technical expertise,

integrated radar network, established pan-India communication and congruence of airpower and space doctrines provide us a vital solution in deployment and operationalisation of a comprehensive defence mechanism against air and space threats,” Chaudhari added.

HT tried to reach out to defence minister Rajnath Singh’s office but was unable to get a response.

<https://www.hindustantimes.com/india-news/iaf-chief-backs-jointness-in-forces-but-wary-of-air-defence-command-101657909206411.html>



Mon, 18 Jul 2022

'India's Message to China is Strong': Defence Expert Amid India, China Talks

A senior military veteran has said that India's message to China is strong amid multiple provocative activities by the Chinese Air Force on the Line of Actual Control (LAC). India and China are holding the 16th round of Corps Commander talks and the Chinese Air Force fighter jets provoked India on multiple occasions just before it. Major General SB Asthana (Retd) in an interaction with news agency ANI said, "Chinese army has been strengthening their position in the areas they have occupied. From the fact that they have strengthened their position, it seems unlikely that they will go back. We can certainly expect some kind of disengagement. Other issues may take some more time," Further speaking on India giving a strong message to China, he said, "Both sides are giving strong messages. In this manner, the Chinese have flown aircraft where they are not supposed to be. And I think we should be talking of areas as no-fly zones, especially in areas where we are talking and where the recent incursion took place. So, therefore, under these circumstances, we are also quite ready in a manner that there is an array of radars. There is a very good surveillance system and air defence system. And the Chinese army if they try what they had been trying in the South China Sea and Taiwan, they will certainly be dealt with by the professional air force (India). So it's slightly different messaging."

Reacting to Air Chief Marshal VR Chaudhari on Indian Air Force responding to People's Liberation Army Air Force (PLAAF) fighter jets flying over borders, Asthana said, "Chinese have a strategy of incremental encroachment. Encroachment is not just limited to land but also to information, cyber, digital, and economic domains. So Air Force encroachment is also a part of it which they are carrying out in Taiwan. But here in India, you are meeting a professional Air Force. Perhaps a Taiwan-like strategy will not work here. Also, India has strengthened its grid and India's messaging is also strong." According to him, India's crackdown on some of the economic defaulters who have a connection with the Chinese is also a strong message to China. Meanwhile, India on Sunday strongly pressed for early disengagement of troops from all the remaining friction points in eastern Ladakh at the 16th round of high-level military talks with China, which took place after a gap of over four months.

In the discussions that lasted for around 12-and-a-half hours, the Indian delegation also insisted on the restoration of the status quo ante as of April 2020 -- before the start of the military standoff, people familiar with the development said. The talks began at 9:30 am at the Chushul

Moldo meeting point on the Indian side of the LAC in the region, and ended at around 10 pm, they said. There were some expectations of progress at the talks on completing the disengagement process at Patrolling Point-15 in the Hot Springs area. The Indian delegation at the talks was led by Lt-General Anindya Sengupta, the commander of the Leh-based 14 Corps, while the Chinese team was headed by South Xinjiang Military District Chief Major General Yang Lin.

<https://www.livemint.com/news/india/indias-message-to-china-is-strong-defence-expert-amid-india-china-talks-11658101481017.html>



Sat, 16 Jul 2022

Bid Date for Mega Submarine Building Project Extended Again, to Dec End

Defence Ministry has once again extended the deadline to submit responses to the Request For Proposal (RFP) in the over ₹40,000 crore deal for six advanced submarines under Project-75(I) to December end. At the same time, the Navy has approached the Ministry for relaxation of certain specifications which has made most submarine manufacturers non-compliant. “The earlier RFP deadline of June 30, which was already an extension, has been extended by another six months,” two defence sources independently confirmed. Project-75(I) envisages the indigenous construction of six modern conventional submarines with contemporary equipment, weapons and sensors including a Fuel-Cell based Air Independent Propulsion (AIP) system, advanced torpedoes, modern missiles and state-of-the-art countermeasure systems. The Navy currently has 16 conventional and one nuclear submarine in service. It includes eight Russian Kilo-class submarines, four German HDW submarines, four French Scorpene submarines and the indigenous nuclear ballistic missile submarine INS Arihant. The last two of the Scorpene class submarines are in various stages of trials and outfitting.

Separately, the Navy has drawn up plans to install Air Independent Propulsion (AIP) modules on all Scorpene submarines as they go for their refit beginning with INS Kalvari in the next couple of years to enhance their endurance. The development of an indigenous AIP module developed by the Defence Research and Development Organisation (DRDO) is in advanced stages. With delays in submarine induction, the SSKs - 209s (German HDWs) and EKMs (Russian Kilos) submarines are being put through the Medium Refit Life Certification (MRLC) process which will give them an additional life of 10 to 15 years.

<https://www.thehindu.com/news/national/bid-date-for-mega-submarine-building-project-extended-again-to-dec-end/article65647750.ece/amp/>

Sun, 17 Jul 2022

The Philippines Wants to Buy India's Advanced Light Helicopters

Months after the Philippines sealed a \$375 million deal to acquire three batteries of the BrahMos cruise missile, the country is now looking to buy a batch of advanced light helicopters from India. Aiming to crank up its combat capability and replace its ageing chopper fleet, Filipino officials have shown interest in procuring advanced light helicopters from India. In the face of the decades-long territorial dispute with China in the South China Sea and security challenges arising from it, the Southeast Asian nation has been focusing on modernising its military. Top officials in the security and defence establishment told news agency PTI that the two sides are holding talks on the proposed acquisition. The indigenously developed twin-engine, multi-role ALH helicopter is a new generation helicopter in the 5.5-ton weight class. The ALH is viewed as an effective platform for various military operations.

According to officials, the Philippines is also impressed by the performance of India's indigenously-developed Tejas Light Combat Aircraft. Sources said that the country might consider procuring the Tejas for its fighter aircraft fleet. The Philippines is India's key strategic partner in the Southeast Asian region. Security and bilateral defence relations between the two countries have risen in the last few years. The Philippines is also a member of the 10-nation Association of Southeast Asian Nations (ASEAN), an influential bloc with whom India's ties have witnessed a major expansion in the last decade. The Philippines concluded a \$375-million deal with India in January this year for the procurement of three batteries of the BrahMos cruise missile. In March, India and the Philippines inked a framework agreement providing for government-to-government deals for the supply of defence equipment and hardware.

India has been assisting countries with whom it has strong strategic ties and convergence of interests, supplying them with critical military hardware and platforms. Single-engine and highly-agile multi-role supersonic Tejas fighter aircraft has already emerged as the top choice for Malaysia over China's JF-17 jet, Russia's Mig-35 and Yak-130 and South Korea's FA-50. India has already placed an order with Hindustan Aeronautics Limited for 83 Tejas fighter aircraft for the Indian Air Force worth Rs 48,000 crore. At the same time, work is already underway to build a MK 2 version of the Tejas and on an ambitious \$5-billion project to develop a fifth-generation Advanced Medium Combat Aircraft. The defence ministry has set a five-year goal of a turnover of Rs 1.75 lakh crore in defence manufacturing, including an export target of Rs 35,000 crore worth of military hardware.

<https://newsable.asianetnews.com/india-defence/after-brahmos-now-the-philippines-wants-india-s-advanced-light-helicopters-rf5fiq>

Sun, 17 Jul 2022

New Unmanned Combat Aircraft Designs Revealed by BAE Systems

British defence contractor BAE Systems has unveiled two new "agile and affordable" unmanned aircraft concepts to meet the demands of a "complex and rapidly evolving battlespace." The public debut of these designs follows recent and very open discussions on the part of the U.K. Royal Air Force, including additional details announced just earlier this week, about its new and evolving plans to integrate drones into future operations. The first of BAE's newly revealed designs is a relatively small drone capable of operating either individually or as part of a networked swarm, while the second is larger and more in line with various lower-tier unmanned combat air vehicle concepts that other companies have put forward in recent years. Both are intended to be highly modular, allowing them to be configured for various mission sets, including reconnaissance, strike, and electronic warfare, as well as have varying degrees of autonomy. The two new unmanned designs from BAE made their public debut at this year's Royal International Air Tattoo, or RIAT, a military air show held at the Royal Air Force's (RAF) base at Fairford in the United Kingdom. Though RIAT is an annual event, the planned shows in 2020 and 2021 were cancelled due to the COVID-19 pandemic.

"Autonomous systems play a key role in that connected, information-rich landscape. The development of agile and affordable new Unmanned Air System (UAS) concepts will provide critical enabling capability in these ever more contested environments," BAE Systems' website says. "UAS Concepts being developed within our Air sector offer the potential to enhance the operational effect of current and future crewed platforms, by augmenting the force mix through affordable combat power."

The two new drone designs are currently unnamed.

What is presently known simply as "Concept-1" is "a small, versatile UAS designed to augment existing forces in the Attack and ISR [intelligence, surveillance, and reconnaissance] roles of Air Power," according to a product card on BAE's website, reproduced below. It is intended to be "expendable, but recoverable for multiple sorties." The first concept's general design consists of a central fuselage with a bullet-like shape, two main wings with a very minor sweep, and twin vertical tails. It appears to be jet-powered, with an air intake positioned above the top rear portion of the fuselage. BAE Systems says this drone will be capable of flying for up to four hours at altitudes up to 30,000 feet and at speeds of up to 0.5 Mach. It should be able to carry payloads weighing up to 40 kilograms (88 pounds), which could include electro-optical or infrared sensor packages, electronic warfare jammers, or unspecified munitions.

Concept-1 is runway independent, being launched from a rail-type catapult and then using a parachute recovery system to 'land' after a mission. It will be able to operate singularly or as part of a networked swarm, and will have what BAE calls "goal based autonomy," the latter capability likely describing ability to carry out specific orders without further direct human interaction. From a logistical standpoint, Concept-1 is also intended to be rapidly deployable

utilizing a containerized storage system. "A medium-size UAS designed to substitute or augment existing forces in the Attack, ISR and Control of the Air Roles of Air Power," is how a separate product card, seen below, describes Concept-2. It is a more robust design that is still intended to be "attritable, but designed for 100+ sorties." A broad definition of attritable when it comes to unmanned aircraft involves designs where costs have been balanced against cost targets to produce platforms that can perform a variety of missions, while also not being so expensive and complex that commanders might be unwilling to employ them in higher-risk environments.

The Concept-2 design has a longer, more slender main fuselage compared to Concept-1, along with 'lambda'-like swept main wings and a splayed v-tail. This unmanned aircraft also looks to be jet powered with a very prominent top-mounted air intake and will take off and land like a traditional airplane. Outwardly at least, this concept has a number of similarities in broad strokes to other lower-endUCAV-like designs that other companies have been working on in recent years, including Lockheed Martin's recently unveiled Tactical Expendable-Combat Air Vehicle (TE-CAV) and Kratos' XQ-58A Valkyrie. An artist's conception of Lockheed Martin Skunk Work's recently unveiled TE-CAV unmanned aircraft. Lockheed Martin Skunk Works.

BAE Systems says the performance targets for the Concept-2 drone – which is shown in the rendering marked with the U.K. civil registration code G-UCAS and stencilling that reads "No Human Occupant" – include a five-hour endurance, the ability to fly up to an altitude of 40,000 feet, and reach a top speed of at least 0.75 Mach. With a maximum take-off weight of 3,500 kilograms (7,716 pounds), it should be able to carry various payloads, including electro-optical or infrared sensors and electronic warfare suites, and will also feature "goal based autonomy." The product card for Concept-2 specifically mentions a possible air-to-air combat loadout consisting of two high-speed Meteor air-to-air missiles or an air-to-ground one with 12 SPEAR-3 mini cruise missiles on four triple launch racks. It's unclear if the drone will be able to carry any of these munitions internally. Meteor and SPEAR-3 are both products of the European missile consortium MBDA, of which BAE Systems is a part.

BAE Systems says that Concept-2 will also be designed with an emphasis on rapid deployability, to include a containerized storage system. How mature either of these designs might be currently is unknown, but BAE Systems has mock-ups of both on display at RIAT. While BAE Systems does not appear to have said so yet specifically, it seems clear that the U.K. armed forces, specifically the RAF and the Royal Navy, are the main targeted customers for these concepts. Another product card on the company's website that discusses "Future Challenges" and "Technological Opportunities" related to these drone designs, shown below, includes art showing them operating together with examples of the now-in-development Tempest sixth-generation stealth fighter, F-35 Joint Strike Fighters, other drones and cruise missiles, as well as various other assets on the ground, at sea, and in space. BAE Systems is the lead contractor behind the Tempest project.

That there is significant RAF and RN interest in acquiring various advanced unmanned platforms, including so-called 'loyal wingman' type drones intended to work with manned platforms and types able to operate in swarms, is well established at this point. In the context of BAE's Concept-1 design, the RAF notably stood up a unit dedicated to experimenting with drone swarm concepts of operations, No. 216 Squadron, in 2020. In the past three years, 216 Squadron, as well as the RAF's Rapid Capabilities Office (RCO), have conducted 13 separate swarm experiments involving five different types of drones, Air Chief Marshall Sir Mike Wigston, the

RAF's Chief of the Air Staff, disclosed at the 2022 Global Air and Space Chiefs' Conference in London just this week, according to Defence News. In 2020, Italian defence contractor Leonardo offered details about one such event, which saw a swarm of drones configured to carry out electronic warfare jamming missions scramble mock enemy radars, as you can read more about here. "We are exploring new models of capability delivery and accelerated production 'when we need them' rather than 'in case we need them,' from the twin jet 3D-printed Pizookie, to commercially available large drones fitted with novel payloads, to large quadcopters," Wigston explained at the Global Air and Space Chiefs' Conferences week. No further details about the Pizookie drone appear to be readily available. British experiments have made it clear that drone swarms represent an "operationally useful and relevant capability," the RAF Chief of the Air Staff added.

In terms of work on designs like BAE's Concept-2, in June, the RAF did notably cancel a program, called Mosquito, which had been seeking to acquire flying prototypes of a broadly similar drone being developed by Spirit AeroSystems in Northern Ireland. Mosquito had been part of a larger RAF unmanned initiative known as the Lightweight Affordable Novel Combat Aircraft (LANCA) program. "Through Project Mosquito and other experimentation activities, the Royal Air Force has made substantial progress and gained significant value in understanding and harnessing a range of future uncrewed capabilities. This decision maximizes the learning accrued to date and enables a change of direction for the LANCA program," Air Commodore Jez Holmes, Head of the RAF's Rapid Capabilities Office, had said in a statement at the time of the cancellation. "The Rapid Capabilities Office will now quickly launch activities to aggressively pursue the RAF's unchanged firm commitment to integrate advanced uncrewed capabilities into the near-term force mix with more immediate beneficial value."

"The work has been challenging, but we have learned and gained a huge amount from our Mosquito program around digital design and novel manufacturing techniques. We've decided that our focus now should be on systems that can be operationalized much more quickly, and that is why we have drawn the Mosquito program to a close," Air Chief Marshall Wigston also said at the Global Air and Space Chiefs' Conference, according to Breaking Defence. "We are moving on fast and I'm delighted to announce that in the Autumn we'll unveil a series of targeted challenge areas that we want to drive forward at pace, with industry, our science and technology partners, and internationally too." "So look out for our Rapid Capabilities Office who will launch a series of industry competitions to accelerate scalable uncrewed systems, culminating in an operational 'fly-off' to get those systems on the frontline, delivering for the war-fighter faster and better," he continued. "A mix of swarming drones and uncrewed combat aircraft, as well as next-generation piloted aircraft like Tempest," is what the RAF is looking at now he added, describing exactly the two concepts BAE Systems has put forward today.

The Royal Navy is also looking into carrier-based drones of various types as part of Project Vixen. BAE's product cards say that both Concept-1 and Concept-2 could include maritime, as well as land-based variants. The U.K. armed forces and BAE Systems are hardly the only ones to be going down these paths. The unveiling of these two new drone concepts at RIAT comes just days after Lockheed Martin's Skunk Works advanced projects division outlines its own multi-tier distributed manned-unmanned teaming vision, which also includes an expandable swarming component along with more robustUCAV-like designs. You can read more about this here.

With all this in mind, there is a possibility perhaps that elements of the British military, as well as the U.S. military, are among the unnamed "customers" that Skunk Works has said it has already been working with regarding its new distributed teaming concept. Especially with the RAF pushing to move the LANCA program into the next phase, it is likely that continue to learn more about BAE Systems' two new drone concepts and the company's accompanying vision for how they might be employed operationally.

<http://www.indiandefensenews.in/2022/07/new-unmanned-combat-aircraft-designs.html?m=1>



Sat, 16 Jul 2022

Indian, Brazilian Navy Discuss Mutual Cooperation, Special Focus on Submarine Maintenance

Giving a boost to mutual cooperation between the Brazilian and Indian navies with a special focus on submarine maintenance, a Brazilian delegation led by Vice Admiral Liberal Enio Zanelatto, Director of Industrial Production & Engineering, visited New Delhi on Friday. The delegation also called on Vice Admiral Sandeep Naithani, Chief of Materiel of the Indian Navy. The discussions included areas of mutual cooperation, with a special focus on submarine maintenance, as well as general maintenance philosophy, upgradation of weapons and sensors, and Indian Navy's indigenisation efforts for achieving self-reliance. Taking to Twitter, Indian Navy wrote, "Brazilian Navy delegation led by VAdm Liberal Enio Zanelatto, Director of Industrial Production & Engineering, visited New Delhi on 15 Jul 22. Extensive discussions b/n Brazilian & IndianNavy leadership incl call on VAdm Sandeep Naithani, Chief of Materiel Indian Navy."

Brazilian Navy delegation also called on Vice Admiral Ajendra Bahadur Singh, Flag Officer Commanding-in-Chief, Western Naval Command in Mumbai, on July 11. The two senior officers discussed various issues of common interest like defence, submarines technology, Make in India initiatives towards professional cooperation between the navies, and the outlook of the Indian Navy towards shared maritime interests with all likeminded navies/ nations. During the two-day visit to the Western Naval Command, the Brazilian delegation held extensive discussions with the Indian Navy counterparts with focus on maintenance of submarines. As part of the visit, the delegation also visited Mazagon Docks Shipbuilders Ltd and a Kalvari (Scorpene) class submarine of the Indian Navy. The Brazilian Navy also operates four Scorpene class submarines and is exploring options for collaboration towards maintenance of the diesel-electric attack submarines.

<http://www.indiandefensenews.in/2022/07/indian-brazilian-navy-discuss-mutual.html?m=1>

Mon, 18 Jul 2022

Boeing Looks to India for Super Hornet Success After European Setbacks: UK Media

Following the disappointment of missing out on European and North American fighter business with Finland, Switzerland and Canada, Boeing is confident the F/A-18E/F Super Hornet Block III will secure a production contract with the Indian Navy (IN) and beat competition from Dassault's Rafale M in the process. A procurement program for 26 carrier-based aircraft is currently on offer to industry but a total quantity could rise to 'just over 50', according to Steve Parker, Boeing VP fighters and bombers. India has not confirmed when a production award decision will be taken but in-country aircraft demonstrations of both the Super Hornet and Rafale-M have already taken place, with a chosen aircraft eventually set to be deployed from the IN's new Vikrant-class aircraft carrier. 'We took two [Super Hornet Block-III] aircraft over [to the Goa naval station] and ran them off the ski jump which replicates the Indian carrier,' Parker explained during a 15 July media press briefing during the Royal International Air Tattoo at RAF Fairford.

He added: 'We can launch with four Harpoons, so when you talk about closing kill chains or weapons effects we think we have a pretty good solution.' Parker also confirmed that other activities related to the Indian demonstration included speed testing and heavy-load aircraft configurations. 'We have the only two seat aircraft that can fly from the carrier, the competition doesn't and we can carry more weapons, [greater] payload and we can fit into the lifts on the Indian carrier,' he added. It was reported last month that other key issues facing decision-makers include aircraft unit costs, upgrades, lifecycle costs and commonality with the IN's current inventory. Parker did not go into specifics on how an industrial package for an IN Super Hornet acquisition would support domestic industry, but he did emphasise that Boeing has proven experience in contributing to the 'Make in India' manufacturing initiative through collaboration with Tata on fuselages for the AH-64E Apache Guardian attack helicopter.

Boeing also remains upbeat on hitting a 144-aircraft production target for the F-15EX fourth-generation fighter. Such plans continue to be uncertain with the UASF potentially moving out with an acquisition of just 80 units. 'They [USAF] made the decision to go with the F-15EX for everything that it brings; we're really just talking about budgets. We believe in the value proposition of what the aircraft provides and that's why I'm confident in how things will turn out,' said Parker. 'We are seeing interest from Israel [and] Saudi Arabia and Japan just moved out with the interceptor [F-15J upgrade].'

<http://www.indiandefensenews.in/2022/07/boeing-looks-to-india-for-super-hornet.html?m=1>

Ukraine Announces First Delivery of M270 Rocket Systems

Ukraine said Friday it had received its first delivery of a sophisticated rocket-launcher system, adding to a growing arsenal of Western-supplied long-range artillery Kyiv says is changing dynamics on the battlefield. The first MLRS M270 have arrived," Ukrainian Defence Minister Oleksiy Reznikov wrote on social media, without mentioning what country had dispatched them. "They will be good company for HIMARS on the battlefield," he added, referring to US precision rocket systems recently deployed in the conflict.

<https://economictimes.indiatimes.com/news/defence/ukraine-announces-first-delivery-of-m270-rocket-systems/articleshow/92907025.cms?from=mdr>

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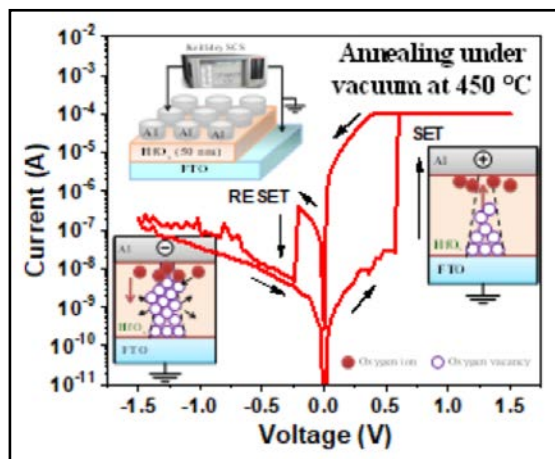
Ministry of Science & Technology

Fri, 15 Jul 2022 4:31 PM

New Memory Device with Excellent Switching Characteristics and Low-Power Requirements Developed

Scientists have developed a memory device with excellent switching characteristics and low-power requirements for data storage applications. Resistive memory devices with insulating film sandwiched between electrodes can address the needs of high-performance, and high-density memories with low power requirements for data storage. They are devices with resistive switching characteristics which refers to the physical phenomena in which a dielectric (electrical insulator that can be polarised by an applied electric current) suddenly changes its (two terminal) resistance under the action of a strong current. Though such devices have been studied intensively to meet the huge technological demands in terms of performance, several technical challenges still persist and pose major challenges to their commercialization. Extensive efforts are being made by scientists to design resistive switching-based memory devices that are non-volatile, reliable, and perform much better than the existing silicon-based flash memory technology.

Ms. Swathi S. P. and Dr. S. Angappane from the Centre for Nano and Soft Matter Sciences (CeNS), Bangalore, an autonomous institution of Department of Science and Technology, Govt. of India (DST), have developed a low-power memory device with excellent switching characteristics made from the chemical hafnium oxide, a replacement for silicon oxide, for data storage applications.



I-V characteristics of a Al/HfO_x/FTO device exhibiting the bipolar resistive switching behavior with low set/reset voltages and currents. Insets show the schematic of the device structure and the switching dynamics.

They have used hafnium oxide (HfO₂), an insulator which can be polarised on application of electric current as an insulating layer. They prepared with by a method called sputtering deposition method. It is a physical vapour deposition technique in which energetic ions are used to knock off the atoms or molecules from the desired 'target' material and deposit them onto a substrate. The HfO₂ film's resistive switching characteristics could further be enhanced by tuning the growth temperature and annealing conditions -- a heat treatment process that changes the physical and sometimes chemical properties of a material to increase ductility and reduce the hardness to make it more workable.

The team found that a higher concentration of oxygen vacancies (loss of oxygen from their respective positions in the crystal lattice) is created when these films are subjected to heat thermal treatment process called annealing. The oxygen vacancies play a vital role in creating conditions for low power operations. Besides, thermal treatment also influenced crystalline behaviour and density of defects of the hafnium oxide films, thereby affecting resistive switching parameters and device performance. Besides, the devices also exhibited good endurance, and high retention. Their research published in the *Journal of Alloys and Compounds* can contribute to the development of more efficient, viable, and reliable resistive memory devices in the future. The CeNS researchers are converting these resistive memory devices into miniature forms. The team is investigating brain-inspired functionalities in these memory devices and exploring the possibility of integrating the memory device with other potential sensors to bring out its multifunctional capabilities.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1841776>

NASA grounds Ingenuity Mars Helicopter temporarily

Currently, it is winter and dust season on Mars. This means that there is more dust in the air and less sunlight that can recharge the Ingenuity Mars Helicopter. Due to this, NASA teams have decided to give the helicopter a break for a few weeks so that its batteries can build their daily state of charge back up. Dust levels are expected to subside later in July and weather permitting, Ingenuity could be back in the air around the start of August. Ingenuity is a small solar-powered helicopter that landed on the surface of Mars on February 18, 2021. Having landed along with the Perseverance Rover, it completed the world's first powered extraterrestrial flight on April 19. On that day, it took off, hovered and landed for a flight duration of 39.1 seconds, creating history on the red planet.

In May this year, NASA published dramatic footage of the helicopter completing its record-breaking 25th flight, during which it covered a distance of 704 metres at a speed of 5.5 metres per second. This was the rotorcraft's longest and fastest flight to date. The flight happened on April 8 but was only released by the space agency on May 27.



An illustration of NASA's Ingenuity Helicopter on the Martian surface.

In May, before it released the video, NASA had also announced that it had momentarily lost contact with Ingenuity after the Mars helicopter entered a low-power state. It got back in contact a little later when it got adequate energy from its solar array to charge its six lithium-ion batteries. Further, in June, a preflight checkout of sensors and actuators had revealed that one of the helicopter's sensors, called an inclinometer, had stopped working. The non-working sensor consists of two accelerometers and its sole purpose is to measure gravity prior to spin-up and take-off to determine how Ingenuity is oriented relative to its direction. The inclinometer is not used during the flight itself but scientists were forced to find a new way to initialise the navigation algorithms prior to takeoff without it. But since Ingenuity has redundancies built into it, mission engineers were able to use data from other accelerometers to help it resume flying.

<https://indianexpress.com/article/technology/science/nasa-grounds-ingenuity-mars-helicopter-temporarily-8034899/lite/>



Sun, 17 Jul 2022

Stanford-Developed Millirobot Swims in Your Body and Delivers Medicine to Places That Need It

The tiny robots could bring health care closer to highly precise medicine delivery

You probably already know that medications aren't often designed to target specific pain areas if you've ever taken the same round tablet to try to cure everything from headaches to stomach cramps. While many illnesses have been treated with over-the-counter medications for many years, biomedical researchers have only lately started looking into methods to treat more complex medical problems like cancer or cardiovascular disease more effectively using targeted drug delivery. The millirobot is a potential development in this developing field of biomedicine. With their ability to crawl, spin, and swim into tight locations on their mission to explore inner workings or distribute medications, these fingertip-sized robots are set to become the future lifesavers in medicine.

Renee Zhao, a mechanical engineer who leads research in this field at Stanford University, is developing a number of millirobot designs simultaneously, including a magnetic crawling robot that was recently seen worming its way through a stomach on the cover of *Science Advances*. Her robots can self-select various locomotive states and navigate obstacles within the body because they are powered by magnetic fields, which allow for continuous motion and can be applied instantaneously to produce torque. Zhao's team has discovered a way to propel a robot across the body at distances ten times its length in a single jump simply by changing the magnetic field's direction and strength.

A key aspect of her research, the magnetic actuation also provides untethered control for non-invasive operation and separates the control unit from the device to allow for miniaturization. Zhao said their most recent robot, recently featured in the journal *Nature Communications*, is "the most robust and multifunctional untethered robot we have ever developed." This new "spinning-enabled wireless amphibious origami millirobot" is as multifunctional as its name implies. It's an elegantly conceived single unit that's able to speedily travel over an organ's slick, uneven surfaces and swim through body fluids, propelling itself wirelessly while transporting liquid medicines. Unlike pills swallowed or liquids injected, this robot withholds medicine until "it reaches the target, and then releases a high-concentration drug," said Zhao, who is an assistant professor of mechanical engineering. "That is how our robot achieves targeted drug delivery."

Reshaping drug delivery

What's groundbreaking about this particular amphibious robot, according to Zhao, is that it goes beyond the designs of most origami-based robots, which only utilize origami's foldability to control how a robot morphs and moves. On top of looking at how folding could enable the robot to perform certain actions – imagine an accordion fold that squeezes out medicine – Zhao's team

also considered how the dimensions of each fold's exact shape influenced the robot's rigid motion when it was not folded. As a result, the robot's unfolded form inherently lends itself to propulsion through the environment. Such broad-minded considerations allowed the researchers to get more use out of the materials without adding bulk – and in Zhao's world, the more functionality achieved from a single structure within the robot's design, the less invasive the medical procedure is.

Another unique aspect of the design of the robot is the combination of certain geometrical features. A longitudinal hole into the robot's center and lateral slits angled up the sides reduced water resistance and helped the robot swim better. "This design induces a negative pressure in the robot for fast swimming and meanwhile provides suction for cargo pickup and transportation," Zhao said. "We take full advantage of the geometric features of this small robot and explore that single structure for different applications and for different functions." Based on conversations with Stanford Department of Medicine experts, the Zhao Lab is considering how to improve upon current treatments and procedures by building new technologies. If this work goes Zhao's way, her robots won't just provide a handy way to effectively dispense medicine but could also be used to carry instruments or cameras into the body, changing how doctors examine patients. The team is also working on using ultrasound imaging to track where robots go, eliminating any need to cut open organs.

The smaller, simpler, the better

While we won't see millirobots like Zhao's in real health care settings until more is known about optimal design and imaging best practices, the lab's first-of-its-kind swimmer highlighted in *Nature Communications* is among their robots that are furthest along. It's currently in the trial stages that come before any live animal testing that proceeds human clinical trials. In the meantime, Zhao's team continues combining a variety of novel smart materials and structures into unique designs that ultimately form new biomedical devices. She also plans to continue scaling down her robots to further biomedical research at the microscale. As an engineer, Zhao strives to develop the simplest structures with the most functionality. Her amphibious robot exemplifies that mission, as it inspired her team to more fully consider geometric features not yet commonly prioritized by other origami robot researchers. "We started looking at how all these work in parallel," Zhao said. "This is a very unique point of this work, and it also has broad potential application in the biomedical field." The study was funded by the National Science Foundation and the American Heart Association.

Reference: "Spinning-enabled wireless amphibious origami millirobot" by Qiji Ze, Shuai Wu, Jize Dai, Sophie Leanza, Gentaro Ikeda, Phillip C. Yang, Gianluca Iaccarino and Ruike Renee Zhao, 14 June 2022, *Nature Communications*. [DOI: 10.1038/s41467-022-30802-w](https://doi.org/10.1038/s41467-022-30802-w)

<https://scitechdaily.com/stanford-developed-millirobot-swims-in-your-body-and-delivers-medicine-to-places-that-need-it/amp/>



Sun, 17 Jul 2022

Tiny Motors Take a Big Step Forward: First-Ever Solid-State Optical Nanomotor

Motors are ubiquitous in our everyday lives — from cars to washing machines, even if we rarely notice them. A futuristic scientific field is working on the development tiny motors that could power a network of nanomachines and replace some of the power sources we currently use in electronic devices. Researchers from the Cockrell School of Engineering at The University of Texas at Austin created the first ever solid-state optical nanomotor. All previous iterations of these light-driven motors reside in a solution of some sort, which limited their potential for the majority of real-world applications. This new research was published recently in the journal *ACS Nano*. “Life started in the water and eventually moved on land,” said Yuebing Zheng, an associate professor in the Walker Department of Mechanical Engineering. “We’ve made these micro nanomotors that have always lived in solution work on land, in a solid state.”

The scientists envision using these motors to power a wide variety of things. They could be useful for air quality measurement, as the spinning motion could pick up dust and other particles. They could propel drug delivery devices inside the human body. And they could also power tiny drones for surveillance and measurements, as well as other mini-vehicles. The tiny new motor is less than 100 nanometers wide (for reference, the thickness of a sheet of paper is about 100,000 nanometers), and it can rotate on a solid substrate under light illumination. It can convert light into mechanical energy for various solid-state micro-/nano-electro-mechanical systems as a fuel-free and gear-free engine. One of the biggest hurdles holding back implementation of these devices is Brownian Motion, which is avoided by bringing these nanomotors on land and out of water, so to speak. Brownian Motion happens when water molecules push these little motors off their spin. The smaller the motor, the stronger effect this motion has. Removing the solution from the equation side steps this problem entirely.

Nanomotors are part of a large and growing field of miniature power sources. They serve as a middle ground in scale between molecular machines at the smaller end and micro-engines at the larger end. The field is of immense interest, but at this point, researchers are still trying to figure out the fundamental science to make these tiny motors more viable through increased efficiency. The reason scientists are so enamored with creating these tiny motors is that they mimic some of the most important biological structures. In nature, these motors drive the division of cells and help them move. They combine to help organisms move. “Nanomotors help us to precisely control the nanoworld and make up new things we want for our real world,” said Jingang Li, a PhD graduate from Zheng’s group and the lead author of this study.

By taking these motors out of the solution and putting them onto chips, they have the potential to replace batteries in some instances, using only light to generate mechanical motion and power devices. This breakthrough arises from a novel design: a thin layer of phase change material on the substrate. The thin film can undergo a local and reversible change from the solid to a quasi-

liquid phase when exposed to light. This phase change can reduce the friction force of the nanomotors and drives the rotation. This was the team's first demonstration of the motors using nanoparticles. Going forward, the researchers will continue to improve their creation, working on enhancing performance, by making them more stable and controllable, which leads to converting light to mechanical energy at higher rates.

Reference: "Opto-Thermocapillary Nanomotors on Solid Substrates" by Jingang Li, Pavana Siddhartha Kollipara, Ya Liu, Kan Yao, Yaoran Liu and Yuebing Zheng, 20 May 2022, *ACS Nano*. DOI: [10.1021/acsnano.1c09800](https://doi.org/10.1021/acsnano.1c09800)

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