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अमरउजाला

Thu, 30 Sept 2021

आकाश प्राइम: स्वदेशी तकनीक बनाती है मिसाइल को अचूक, एलएसी जैसे ठंडे इलाकों पर भी नहीं बचेंगे दुश्मन के जेट्स

सार

आकाश प्राइम की सबसे खास बात यह है कि जहां इस परिवार की पिछली दो मिसाइलों में विदेश से मंगाए गए रेडियो फ्रीक्वेंसी सीकर (ऐसे सेंसर्स जो लक्ष्य तक आ-जा रहे सिग्नल को पहचान सकें) लगाए जाते थे, वहीं इसमें मेड इन इंडिया आरएफ सीकर लगाए गए हैं।

विस्तार

नई दिल्ली: जमीन से हवा में मार करने वाली (सर्फेस-टू-एयर) आकाश मिसाइलों के बेड़े में एक नई घातक मिसाइल का नाम जुड़ा है। इस नई मिसाइल का नाम आकाश 'प्राइम' दिया गया है। डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (डीआरडीओ) ने सोमवार को ही ओडिशा की चांदीपुर रेंज से इस मिसाइल का परीक्षण किया। मिसाइल के टेस्टिंग वीडियो में इसे हवा में तैर रहे एक मानवरहित लक्ष्य को अचूक निशाने से भेदते देखा गया। अब इस सफल टेस्टिंग के बाद कई रिपोर्ट्स में कहा जा रहा है कि आकाश प्राइम मिसाइल को चीन को ध्यान रखते हुए बनाया गया है। ऐसे में हम आपको बता रहे हैं कि आकाश प्राइम मिसाइल भारत की बाकी मिसाइलों से कैसे अलग है और इसमें क्या खासियत हैं, जो इसे बाकी मिसाइलों से अलग बनाती है...



सर्फेस-टू-एयर मिसाइल आकाश प्राइम का टेस्ट ओडिशा की चांदीपुर रेंज में किया गया। - फोटो : ANI

क्या हैं आकाश मिसाइल?

आकाश मिसाइल परिवार में अब तक कुल दो मिसाइलें थीं और आकाश प्राइम इस वर्ग की तीसरी अहम मिसाइल बन गई है। यह सभी जमीन से हवा में मार करने वाली मिसाइलें हैं। यानी इन्हें जमीन पर किसी भी वाहन या स्थायी जगह से दागा जा सकता है। ये मिसाइलें हवा में किसी भी तरह के एयरक्राफ्ट को नष्ट करने में सक्षम हैं।

आकाश मिसाइलों को विकसित करने का काम डीआरडीओ ने किया है और इनका उत्पादन भारत डायनेमिक्स लिमिटेड की ओर से किया जाता है। इसके सर्विलांस, रडार, कमांड सेंटर और लॉन्चर को बाने की जिम्मेदारी भारत इलेक्ट्रॉनिक्स (बीईएल), टाटा पावर स्ट्रैटिजिक इंजीनियरिंग डिवीजन और लार्सन एंड टूब्रो के पास है।

आकाश मिसाइलें भारत में बनीं हवा में मार करने वाली मिसाइल हैं। इसके पहले वर्जन मार्क-1 को रूस के 2के12 सब (एसए-6 गेनफुल) मिसाइल सिस्टम को सेवा से हटाने के लिए विकसित किया गया। मार्क-1 की पहली टेस्ट फ्लाइट 1990 में सफलतापूर्वक पूरी हुई थी। यह मिसाइल मैनुअल कंट्रोल पर आधारित थी। यानी लॉन्चिंग से लेकर निशाना लगाने तक ये मिसाइल इंसानी नियंत्रण पर निर्भर थी।

अगली मिसाइल आकाश-1एस रही। यह मिसाइल आकाश मार्क-1 के ही आधुनिक रूप के तौर पर विकसित हुई। दरअसल, सेना लंबे समय से ऐसी मिसाइल चाहती थी, जो खुद ही निशाने को ज्यादा सफाई से पहचान कर उन्हें तबाह कर दे। डीआरडीओ ने आकाश-1एस की टेस्टिंग 25 से 27 मई 2019 के बीच पूरी कर ली। इस मिसाइल की रेंज आसमान में तीस किलोमीटर तक है और यह एक बार में 60 किलोग्राम तक पेलोड ले जा सकती है। यह मिसाइल हवा में भी नियंत्रित की जा सकती है और खुद भी सेंसर्स के जरिए ड्रॉन्स से लेकर फाइटर जेट्स तक को निशाना बना सकती है।

आकाश प्राइम बाकी दोनों मिसाइलों से अलग कैसे?

जहां आकाश परिवार की बाकी दोनों मिसाइलें शॉर्ट रेंज मिसाइलें थीं। वहीं, आकाश प्राइम मीडियम रेंज मिसाइल है। आकाश मार्क-1 और आकाश-1एस दोनों में ही विदेश से मंगाए गए रेडियो फ्रीक्वेंसी सीकर (ऐसे सेंसर्स जो लक्ष्य तक आ-जा रहे सिग्नल को पहचान सकें) लगाए जाते थे। लेकिन आकाश प्राइम मिसाइल में मेड इन इंडिया आरएफ सीकर लगाए गए हैं। यह आरएफ सीकर विदेशी तकनीक से अलग भारत की जरूरतों को ध्यान में रखकर बनाए गए हैं।

क्या हैं आरएफ सीकर?

ये आरएफ सीकर रडार की तरह ही काम करते हैं, लेकिन रडार से से उलट यह खुद सिग्नल प्रेषित नहीं करते। इन्हीं रेडियो फ्रीक्वेंसी सीकर के जरिए मिसाइल खुद-ब-खुद ऐसे एयरक्राफ्ट्स को आसानी से ढूंढ लेती है, जो सुदूर स्थानों से रिमोट कंट्रोल के जरिए चलाए जा रहे हैं।

भारत ने जो आकाश प्राइम मिसाइल के लिए जो आरएफ सीकर तैयार किए हैं, वो मुख्य तौर पर कम तापमान में भी अचूक निशाने के साथ काम करने के लिहाज से बनाए गए हैं। इनका निर्माण डीआरडीओ की ही डीआर-एल लैब में हुआ है। ये आरएफ सीकर उन ऊंची ठंडी जगहों पर ज्यादा बेहतर तरीके से काम करेंगे, जहां सामान्य आरएफ सीकर टारगेट को ढूंढकर खत्म करने में नाकाम हो जाते हैं। यानी कि भारत की उत्तरी और पूर्वोत्तर की सीमा पर ये मिसाइलें काफी कारगर साबित होंगी। माना जा सकता है कि डीआरडीओ ने आकाश प्राइम की तकनीक को काफी हद तक चीन को ध्यान में रखते हुए तैयार किया है।

कम लागत वाली आधुनिक सुपरसॉनिक मिसाइल

आकाश परिवार की इस मिसाइल में सिर्फ लक्ष्य को भेदने की क्षमता ही बेहतर नहीं की गई है, बल्कि इसके ग्राउंड लॉन्चर को भी बेहतर नियंत्रण के लिए डिजाइन किया गया है। सबसे खास बात यह है कि आकाश इस वक्त दुनिया की सबसे सस्ती सुपरसॉनिक सर्फेस-टू-एयर मिसाइलों में से एक है। इसकी रेंज 27 किमी की है जो कि इस सुपरसॉनिक क्षमताओं के साथ इसे दुनिया की सबसे आधुनिक और सबसे कम लागत वाली मिसाइल बनाती है। आकाश प्राइम का सीधा मुकाबला अमेरिका की बनाई पेट्रियट मिसाइल सिस्टम से है, जो कि काफी महंगी हैं। भारत की इस मिसाइल की नई तरह की रडार से इसका निशाना भी पेट्रियट से बेहतर है।

आवाज की गति से 2.5 गुना तेज

भारत में इस वक्त ऐसी मिसाइलें तैयार की जा रही हैं, जो एक साथ कई लक्ष्यों को भेदने की क्षमता रखती हैं। यही खूबी आकाश प्राइम के लॉन्चिंग सिस्टम (कमांड गाइडेंस सिस्टम) में भी है। इसके चलते एक से अधिक लक्ष्यों को एक ही लॉन्च में खत्म करने की भी क्षमता है। आकाश प्राइम की सबसे बड़ी

खासियत यह है कि यह परमाणु क्षमता वाली मिसाइल है, जो कि 2.5 मैक (आवाज की गति से 2.5 गुना तेज- करीब 860 मीटर प्रति सेकंड की रफ्तार) है।

फाइटर जेट्स, ड्रोन्स या मिसाइल सभी इसकी जद में

यह मिसाइल आसमान में 18 किमी की ऊंचाई तक जा सकती है। इसलिए आकाश प्राइम बड़ी ऊंचाइयों पर उड़ रहे फाइटर जेट्स से लेकर ड्रोन्स, क्रूज मिसाइल, एयर-टू-सर्फेस मिसाइल और बैलिस्टिक मिसाइलों को भी आसानी से भेदने में सक्षम है। यह बेसिक आकाश मिसाइल के मुकाबले तकरीबन 10 गुना ज्यादा इलाके को स्कैन कर सकती है। यानी अगर इस मिसाइल ने किसी टारगेट पर लॉक-इन कर लिया, तो लक्ष्य को भेदने तक यह उसका पीछा कर सकती है।

<https://www.amarujala.com/india-news/drdo-conducts-tests-of-akash-prime-missile-know-its-comparison-with-other-missiles-of-akash-family-and-specialities?pageId=7>



Thu, 30 Sept 2021

Deciphering growth and development in the defence sector

The exponential growth is due to the support of the Indian Government and its policy makers who focused on enhancing the in-country domestic production of D&A articles/items under encouraging programs like self-reliant or Atamnirbhar Bharat

By Ajay Bedi

India is witnessing exciting developments in the defence and aerospace (D&A) industry. The industry which was mired with red-tapism, excessive controls etc., and majorly dependent on imports is eradicating all impediments enhancing its local defence production and taking slow and concerted steps to establish itself as a serious contender in the global arena. The exponential growth is due to the support of the Indian Government and its policy makers who focused on enhancing the in-country domestic production of D&A articles/items under encouraging programs like self-reliant or Atamnirbhar Bharat.



Some of the major steps which have provided the required impetus to this sector are: –

- Further consolidation of DDPMAS-2002 (design & development, production, modification, license production and indigenization of air systems and airborne stores in the Indian military airworthiness regulatory framework) with the latest DDPMAS version 1.0 in February 2021, made this document contemporary and exhaustive which promotes and prepare the Indian D&A industry for the global competition.
- Issuance of items list put under import embargo, which will be consolidated gradually to reduce import dependence.
- Approved budgetary funds worth Rs. 498.8 crore (US\$ 66.83 million) to Innovations for Defence Excellence (iDEX), a Defence Innovation Organisation (DIO) for the next five years, under Atamnirbhar Bharat.
- Defence corridor initiative at Uttar Pradesh and Tamilnadu which provides various incentives to foreign companies and developing a defence park in Kerala to manufacture defence equipment for forces, through Indian MSMEs participations.

- Advanced Towed Artillery Gun System (ATAGS) jointly developed by the Defence Research Development Organisation's (DRDO) Armament Research Development Establishment (ARDE) Pune, Defence Electronics Application Laboratory, Dehradun, and Centre for Artificial Intelligence and Robotics, Bengaluru, with the participation of corporates like Bharat Forge, TATA Power SED, Ashok Leyland, and Cummins.
- Increased the FDI limit up to 74% under the automatic route to motivate foreign original equipment manufacturers (OEMs) to invest in India and collaborate with the local industry.
- Issuance of two open general export licenses (OGELs, October -2019) for export of certain defence parts and components intra-company transfer of technology to select countries to give a boost to India's defence exports.
- Defence Acquisition Procedure (DAP-2020), focus on boosting domestic defence industry and Defence Production and Export Promotion Policy 2020'

The above-stated initiatives are targeting growth in D&A indigenous production with the export target in mind, which has opened new vistas for the Defence PSUs as well as the private and corporate industry associates involved in this robust industry. While discussing these new initiatives with the fellow members of the industry, it highlighted that we are focusing too much on the new procurement or inclined towards capital procurement, export enhancement etc., whereas we need to parallelly concentrate on sprucing up the maintenance and support activities in-country to work towards self-reliance, which itself is a daunting task. The in-country support mechanism with the strategic involvement of MSMEs will provide a foundation for the holistic growth of the Indian industry involved in this sector. Must encourage the MSMEs with incentivizing policies to foster tie-up with global vendors in this field, starting with small but critical components like communication, Surveillance, EWS etc. It will also boost the standards of testing and evaluation of an item or a gadget. The knowledge and know-how assimilated through this initiative would augment India's quest of becoming a prominent producer of the global market.

The D&A sector is stringently ruled by its quality standards and precision products. Global industrial production is subjected to global specifications. The most used identification criteria of 'standardized material items of supply are the North Atlantic Treaty Organization (NATO), National Stock Number (NSN) or NATO Item Identification Number (NIIN). Besides that, some of the industry standards in the Indian context are broadly described below:

Parameter for Facility/Company are as follows:

- Certification: AS 9100 rev D required for QMS system for aerospace machine and parts manufacturers
- Certification: NADCAP required for NADCAP accreditation is an industry managed accreditation based upon a consensus of the quality requirement for the Aerospace industry. Currently, NADCAP accreditation is given for the following Aero Structure Assembly Chemical Processing Coatings Composites Conventional Machining Elastomer Seals Electronics Fluid Distribution Systems Forgings Heat Treating Materials Testing Measurement & Inspection Non-Destructive Testing Non-Metallic Materials Manufacturing Non-Metallic Materials Testing Nonconventional Machining Sealants Surface Enhancement Welding
- Certification: CEMILAC required for Approval as Design House in case of design and development
- Certification: DGAQA / DGQA required for DGAQA registration shall be mandatory for all vendors/firms to supply aviation-related stores to service HQs through the respective central procurement agency. DGQA for all other central procurement requirements

Parameter for Product/Component are as follows:

- Certification: CEMILAC required for Type test is required for products developed under indigenization. These include systems, LRUs, raw material and consumables
- Certification: PMA / DGCA approval required for Producing replacement or modification parts for sale for installation on a type-certificated product by FAA or BASA signatory countries

Parameter for Marine is as follows:

- Marine class approval of manufacturer American Bureau of Shipping (ABS) Bureau Veritas Mode II Certificate Bureau Veritas China Classification Society (CCS) Class NK (Nippon Kaiji Kyokai) DNV-GL Indian Register of Shipping (IRS) Korean Register (KR) Lloyd's Register (Lloyd's), RINA Russian Maritime Various rules are followed for different equipment ranging from ISO to ASTM Standards required for both factory and process.

Note

1. The certification requirement may vary from OEM to OEMs
2. Some OEMs may only require a type approval certificate from any certifying body and some OEMs may require 'Class Approval' certificate.
3. Above listed certificate is the basic certificate that a supplier must have, however the OEMs requirement may differ for specific item/component or assembly.

The compliances, standards, certifications are the backbone of this industry, and these are constantly evolving in this high-tech industry. The evolutions and inventions are an important factor if you look at it commercially, the innovations get you ahead of your competition, which yields more revenue till the time some other invention captures the market in the same field, it's an ongoing process globally. One needs to be on top of this aspect, in this cutthroat sector. The people associated with this sector in India have raised some concerns about the quality parameters of the products locally produced; they feel that the prescribed norms and standards are either diluted or are circumvented while serving the industry under the Atamirbhar and Self-reliant Bharat schemes of the Government of India. This is a serious issue that compromises the effectiveness of an item and even affects its life cycle. This is witnessed across the sector, from end-users, DPSUs to the Private manufacturers.

The other related factor is the awareness of the end-user staff, at times it reflected that the designated executive or team is not well aligned with the required standards, hence they are being manipulated by the service providers. This lack of awareness needs to be plugged through constant training of field staff via seminars, designated courses, or awareness camps to be requested through the international integrator or OEMs. The GOI must ensure strictly that the quality of the indigenous products is meeting the global standards. That will help the Indian industry to prosper globally and would guarantee its sustainability in this fiercely competitive sector.

The unflinching quality and adherence to global parameters deliver promising results and would accelerate the growth and development of the Indian industry which desires to play a prominent role globally. We need to work diligently and consistently to become a reckoning force in this sector. The concerted efforts with integrity will help us in growing as a reliable, promising, and mature producer of the Defence and Aerospace components/items.

Let us contribute to the Indian government's new draft policy that sets a USD 25 billion defence production target, making USD 5 billion from exports, by 2025.

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

<https://www.financialexpress.com/defence/deciphering-growth-and-development-in-the-defence-sector/2340463/lite/>

Strong order book, favourable govt schemes to aid BEL's prospects

Favourable govt policies towards boosting indigenization of products through the Atmanirbhar Bharat initiative seemed to support the outlook on growth. BEL's order book is robust led by defence orders, totalling ₹55,800 crore

By Ujval Jauhari

Bharat Electronics Ltd (BEL) scaled fresh highs on the National Stock Exchange on Tuesday and is up by more than 70% year-to-date.

Favourable government policies towards boosting indigenization of products through the Atmanirbhar Bharat initiative seemed to support the outlook on growth. BEL's order book is robust led by defence orders, totalling ₹55,800 crore. The order book provides almost four years of revenue visibility.



BEL has seen a strong order inflow of ₹5,300 crore in FY22 year-to-date and expects the momentum to continue thereafter

The company has seen a strong order inflow of ₹5,300 crore in FY22 year-to-date and expects the momentum to continue thereafter. According to the management, order inflow run rates would be in the range of ₹15,000-17,000 crore in FY22.

Its order pipeline includes orders for Akash missile system, long-range surface-to-air missile systems, naval equipment and radar systems. BEL is also into project execution for the development of smart cities and manufacturing of electronic voting machines.

Analysts at Prabhudas Lilladher point out that with healthy execution capabilities, massive opportunity arising in all three defence segments, lean balance sheet, niche technology advantage and healthy market share, BEL is well placed to capitalize on upcoming opportunities.

Another factor that would help BEL drive order inflows and growth is the fact that it has 30 items in various advanced stages of development towards which it had expressed interest under the government's Make-II initiative or industry-funded projects.

With a strong order flow to continue from the defence segment, the company is actively exploring opportunities in the non-defence space. Bharat Electronics has already been manufacturing medical ventilators and is now exploring more opportunities in medical electronics.

It is also said to be looking to diversify into software services, space electronics and systems, and ammunition among others. The non-defence segment contributed 20% to total revenue in FY21 and analysts say the figure is expected to reach 25-30% in the next couple of years.

The services business, too, remains a focus area and rising annual maintenance contracts should help here. Besides its core defence business, BEL is exploring newer segments to grow its services revenue.



Robust improvement

As against 10-12% of defence services business revenue currently, it aims to ramp up the share of services revenues to 25% over the next five years, according to analysts at Motilal Oswal Financial Services Ltd.

With the planned expansions and diversifications, the capex intensity is also expected to increase. At ₹1,800 crore over the next three years, capex, however, can be sufficiently met by firm cash flows and a strong debt-free balance sheet.

Motilal Oswal analysts forecast a revenue growth of 11% and an Ebitda growth of 8% during FY21-24. Ebitda is earnings before interest, taxes, depreciation and amortization.

<https://www.livemint.com/market/mark-to-market/strong-order-book-favourable-govt-schemes-to-aid-bel-s-prospects-11632936720962.html>

COVID 19: DRDO's Contribution



Thu, 30 Sept 2021

हरियाणा में DRDO ने 200 मरीजों को एक साथ 5 लीटर/मिनट ऑक्सीजन आपूर्ति का प्लांट किया शुरू

By Vijay

बहादुरगढ़: हरियाणा के बहादुरगढ़ में रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने 1000 लीटर प्रति मिनट ऑक्सीजन का उत्पादन करने वाला प्लांट शुरू करा दिया है। इसके कारण अब बहादुरगढ़ सिविल अस्पताल में 200 से ज्यादा मरीजों को एक साथ 5 लीटर प्रति मिनट ऑक्सीजन की आपूर्ति की जा सकेगी। इस बारे में बहादुरगढ़ के सिविल अस्पताल के एक डॉक्टर ने बताया कि, बहादुरगढ़ में पीएसए ऑक्सीजन प्लांट में स्वदेशी फाइटर जेट एलसीए तेजस की ऑक्सीजन तकनीक का प्रयोग किया गया है। उन्होंने कहा कि, उक्त प्लांट को डीआरडीओ ने 24 घंटे में बिना किसी धूमधाम के शुरू करा दिया है।



1 मिनट में 1000 लीटर ऑक्सीजन का उत्पादन होगा

अधिकारियों के मुताबिक, टाटा कंपनी, कोयम्बटूर की ट्रायटेंड न्यूमैटिक प्रा.लि., इंडियन इंस्टीट्यूट ऑफ पेट्रोलियम (आईपीपी) को डीआरडीओ ने खास तकनीक सौंपी है। ये तीनों कंपनियां देशभर में 548 पीएसए ऑक्सीजन प्लांट स्थापित कर रही हैं। जिसमें 380 प्लांट टाटा, 120 प्लांट आईपीपी और 48 प्लांट ट्रायटेंड न्यूमैटिक प्रा.लि. तैयार कर रही है। वहीं, एम्स ऋषिकेश में स्थापित नए पीएसए प्लांट का निर्माण भी टाटा कंपनी ने किया है। बताया जा रहा है कि, पीएसए ऑक्सीजन प्लांट में हर मिनट एक हजार लीटर ऑक्सीजन का उत्पादन होगा।

हर मिनट 200 मरीजों को 5 लीटर ऑक्सीजन मिलेगी

बहादुरगढ़ के प्लांट में प्रेशर स्विंग एडजॉर्पेशन (पीएसए) मॉलिक्यूलर सीइव (जियोलाइट) तकनीक के प्रयोग से वातावरण में मौजूद तकनीक से ऑक्सीजन उत्पादन होगा। बताया जा रहा है कि, इस तकनीक के आने से प्लांट से एक समय पर 190 से 200 मरीजों को पांच लीटर प्रति मिनट ऑक्सीजन की आपूर्ति की व्यवस्था हो गई है। डीआरडीओ के अधिकारी के मुताबिक, इस तकनीक पर आधारित ऑक्सीजन प्लांट्स सबसे पहले लेह और उत्तर-पूर्व के राज्यों में लगाए थे।

फिलहाल, बहादुरगढ़ के सिविल अस्पताल की बात की जाए तो यहां 100-200 बेड के अस्पताल में 200 मरीजों को एक साथ ऑक्सीजन में जला-आपूर्ति क्षमता संतोषजनक स्थिति में होगी। इसलिए ऐसी ही व्यवस्था की गई है।

<https://hindi.oneindia.com/news/haryana/drdo-started-a-plant-of-5-liter-per-minute-oxygen-supply-to-200-patients-in-haryana-641308.html?story=2>

Defence News

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Wed, 29 Sept 2021 7:24PM

Defence Acquisition Council headed by Raksha Mantri approves proposals of value Rs.13,165 cr.

Key highlights:

- 87% procurement from domestic sources
- 25 ALH Mark III helicopters at a cost of Rs. 3,850 cr.
- Rocket ammunition of value Rs. 4,962 cr.

The Defence Acquisition Council (DAC) in its meeting of 29 September 2021 held under the Chairmanship of Raksha Mantri Shri Rajnath Singh accorded Acceptance of Necessity (AoN) for Capital Acquisitions proposals for modernization and operational needs of the Indian Armed Forces amounting to approx. Rs.13,165cr. Of the total amount approved, procurement worth Rs. 11,486cr. (87%) is from the domestic sources.

Key approvals include helicopters, guided munition and rocket ammunition. Looking into the need of the Indian Army for an Advanced Light Helicopters (ALH) Squadron, to improve its integral lift capability ensuring its operational preparedness, the DAC accorded approval of procurement of 25 ALH Mark III helicopters from M/s HAL under Buy Indian-IDDMM at an approx. cost of Rs.3,850 cr, in keeping with the continued thrust towards 'Aatmanirbhar Bharat' and 'Make in India'. Giving boost to Indigenous Design and Development of ammunitions, DAC accorded approval for procurement of Terminally Guided Munition (TGM) and HEPF/RHE Rocket Ammunition under Buy (Indian-IDDMM) category at an approx cost of Rs.4,962 cr. from domestic sources. Other proposals worth Rs. 4,353 cr. were also accorded AoN by the DAC.

In addition, the DAC also approved a few amendments to the DAP 2020 as a part of Business Process Re-engineering to ensure further ease of doing business for the industry as well as measures to enhance procurement efficiency and reducing timelines.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1759416>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 29 Sept 2021 7:24PM

रक्षा मंत्री की अध्यक्षता वाली रक्षा अधिग्रहण परिषद ने 13,165 करोड़ रुपये मूल्य के प्रस्तावों को मंजूरी दी

प्रमुख बातें:

- घरेलू स्रोतों से 87% खरीद
- 3,850 करोड़ की लागत से 25 एएलएच मार्क III हेलीकॉप्टर।
- 4,962 करोड़ रुपये मूल्य का रॉकेट गोला बारूद

रक्षा मंत्री श्री राजनाथ सिंह की अध्यक्षता में दिनांक 29 सितंबर 2021 को आयोजित रक्षा अधिग्रहण परिषद (डीएसी) की बैठक में भारतीय सशस्त्र बलों के आधुनिकीकरण और संचालन संबंधी जरूरतों के लिए 13,165 करोड़ रुपये के पूंजी अधिग्रहण प्रस्तावों के लिए स्वीकृति की आवश्यकता (एओएन) को मंजूरी दी गई। स्वीकृत कुल राशि में से 11,486 करोड़ रुपये की खरीद। (87%) घरेलू स्रोतों से है।

प्रमुख स्वीकृतियों में हेलीकॉप्टर, निर्देशित युद्ध सामग्री और रॉकेट एम्युनिशन शामिल हैं। एक उन्नत हल्के हेलीकॉप्टर (एएलएच) की स्क्वाड्रन के लिए भारतीय सेना की आवश्यकता को देखते हुए, इसकी अभियानगत तैयारियों को सुनिश्चित करने के लिए इसकी अभिन्न भार वहन क्षमता में सुधार करने के लिए, डीएसी ने 'आत्मनिर्भर भारत' और 'मेक इन इंडिया' पर निरंतर जोर देते हुए मेसर्स एचएएल से लगभग 3,850 करोड़ रुपये की लागत से 25 एएलएच मार्क III हेलीकॉप्टरों की खरीद के लिए बाय इंडियन आईडीडीएम के तहत मंजूरी दी। गोला-बारूद के स्वदेशी डिजाइन और स्वदेशी विकास को बढ़ावा देते हुए, डीएसी ने घरेलू स्रोतों से लगभग 4,962 करोड़ रुपये की लागत पर बाय (इंडियन-आईडीडीएम) श्रेणी के तहत टर्मिनल गाइडेड मुनिशन (टीजीएम) और एचईपीएफ/आरएचई रॉकेट गोला बारूद खरीद की मंजूरी दी। डीएसी द्वारा 4,353 करोड़ रुपये के अन्य प्रस्तावों को भी एओएन प्रदान किया गया।

इसके अलावा डीएसी ने उद्योग के लिए व्यापार में सुगमता सुनिश्चित करने के साथ-साथ खरीद दक्षता बढ़ाने और समय सीमा को कम करने के उपायों को सुनिश्चित करने के लिए बिजनेस प्रोसेस री-इंजीनियरिंग के अंतर्गत डीएपी 2020 में कुछ संशोधनों को भी मंजूरी दी।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1759528>



Signing of terms of reference for the conduct of Navy to Navy talks between the Indian Navy and the Australian Navy

Consequent to the signing of 'Joint Guidance for the India - Australia Navy to Navy Relationship' document by the Chiefs of the Indian Navy (*IN*) and the Royal Australian Navy (RAN) on 18 August 2021, the 'Terms of Reference for the Conduct of Navy-to-Navy Talks between the Indian Navy and the Royal Australian Navy' was signed on 29 Sep 2021. The signing ceremony was held virtually between Rear Admiral Jaswinder Singh, ACNS (FCI), *IN* and Rear Admiral Christopher Smith, DCNS, RAN.

The 'Joint Guidance' document sets forth the Navy to Navy (N2N) Talks as the '*Principal*' medium for the guiding the bilateral relationship. The bilateral defence relations between India and Australia have strengthened over the years. 'Comprehensive Strategic Partnership', Mutual Logistics Support Agreement, conduct of trilateral Maritime Security Workshop and RAN participation in Exercise MALABAR are significant milestones which underline the role played by both Navies in bolstering this relationship in recent times. The document would be pivotal in consolidating the shared commitment to promote peace, security, stability and prosperity in the Indo - Pacific region.

The inaugural Navy-to-Navy Talk with Australia was held in 2005. Since then, the two nations and Navies have continued to grow closer at all levels and with over a decade of bilateral talks, they remain more committed than ever to strengthen and deepen this important Navy to Navy relationship.

The document underpins the broad objective of deeper mutual understanding, trust and transparency, improved goodwill and understanding of each other's concerns and future directions, and provides detailed guidance for the conduct of *IN* - RAN N2N Talks. It also provides flexibility for implementation of separate agreements based on the specific outcomes of the Talks.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1759317>

Thu, 30 Sept 2021

CDS General Rawat meets US Maj Gen Brunson in Washington to discuss defence cooperation

India's CDS General Bipin Rawat, met with US Army Major Gen Xavier T Brunson, Commanding General, I Corps, on Sept 29 to discuss bilateral defence cooperation

By Aparna Shandilya

While visiting Joint Base Lewis-McChord, a military station in Washington, India's CDS (Chief of Defence Staff) General Bipin Rawat, met with US Army Major General Xavier T Brunson, Commanding General, I Corps, on September 29 to discuss bilateral defence cooperation.

The Indian Army took to Twitter and mentioned the meeting with the caption, "General Bipin Rawat #CDS is on a visit to #US. #CDS visited Joint Base Lewis-McChord #JBLM, #Washington and also discussed issues of bilateral defence cooperation with Major General Xavier T. Brunson, Commanding General, I Corps, #USArmy."



IMAGE: ADGPI/Twitter

India-US defence cooperation

India is essential to accomplish our common vision of a free and open Indo-Pacific. The Political-Military Affairs (PM) Bureau, in collaboration with interagency partners, promotes the United States-India defence trade relationship and larger security alliance,' according to a statement released by Bureau of Political-Military affairs, US.

It further read, "The United States named India as a Major Defense Partner in 2016. In accordance with this designation, India was elevated to Strategic Trade Authorization tier 1 status in 2018, granting India license-free access to a wide variety of military and dual-use technologies regulated by the Department of Commerce. With the Logistics Exchange Memorandum of Agreement (LEMOA), Communications, Compatibility and Security Agreement (COMCASA), and Industrial Security Agreement (ISA) currently in place, US-India defense trade collaboration is expanding."

CDS General Bipin Rawat had visited Russia last week

General Rawat met with Russian General Staff Army General Valery Gerasimov last week to discuss bilateral defence concerns. General Bipin Rawat was in Russia for a two-day visit. He attended a meeting of the Chiefs of General Staff of the Shanghai Cooperation Organisation (SCO) member states.

<https://www.republicworld.com/world-news/us-news/cds-general-rawat-meets-us-maj-gen-brunson-in-washington-to-discuss-defence-cooperation.html>

Navy talks to Coimbatore Industries on indigenous aviation equipment

Naval officers met representatives of the Coimbatore District Small Industries Association and other local industries on Monday

Kochi: Keen on ensuring self-reliance in naval aviation equipment through indigenisation of the same, the Indian Navy recently met with local industries from Coimbatore to discuss with them its requirements.

In the meeting held on September 27 at Indian Naval Station Agrani, Commodore Yogesh C Pandey, Commodore Superintendent Naval Aircraft Yard (Kochi), and five other naval officers met representatives of the Coimbatore District Small Industries Association (CODISSIA) and other local industries from the city to apprise them about the Navy's requirements, a defence release said.

The industry representatives were shown samples of more than 150 equipment for feasibility of "indigenisation and repairs", it said.

"The main focus of the interaction was towards identifying indigenisation and repair facilities for Line Replaceable Units (LRU), aircraft and ship's spares, tools and testers, ground support equipment and ground handling equipment.

"The interaction session elucidated good response from the industry and acted as a platform for the industry to understand Indigenisation requirements of Indian Navy," the release said.

<https://www.ndtv.com/india-news/navy-talks-to-coimbatore-industries-on-indigenous-aviation-equipment-2558292>



Industry representatives were shown samples of more than 150 equipment. File

Exported Rs 38,000 crore worth defence equipment in 7 years, says Rajnath Singh

Synopsis

Defence Minister Rajnath Singh urged private sector defence companies to invest in research and development, particularly in technologies relating to cyberspace.

India has exported defence equipment worth over ₹38,000 crore to friendly nations in the past seven years, with the defence manufacturing ecosystem expanding to include at least 10,000 small and medium enterprises, defence minister Rajnath Singh has said.

Lauding the private sector for playing a stellar role, the minister said Indian companies are capable of manufacturing cutting-edge hardware in a cost-effective manner.

There has been an increase in startups as well as research and development activities in the recent past, he said.

Speaking to a gathering of top manufacturers, the minister said that globally there is a trend for modernisation of defence equipment, given increasing security concerns and border disputes.

"India is capable of meeting these needs through a cost-effective and quality approach. By India, we mean public sector, private sector, academia, research and development. We believe in taking them all onboard," the minister said, addressing the annual conference of Society of Indian Defence Manufacturers (SIDM).

There has been an uptake in defence exports in the past few years, with Indian private sector manufacturers winning competitive procurement orders around the world.

Significant exports include simulators, bulletproof material, aerospace structures, small arms components as well as software.

Assuring the private sector of continued government support, the minister said that a part of the defence budget has been reserved for the Indian private industry and the proportion could also be increased in the coming years.

"We have opened up opportunities to build a Mega Defence Programme, including fighter aircraft, helicopters, tanks and submarines through a strategic partnership model that will help our private companies become global giants in the years to come," he said.

<https://economictimes.indiatimes.com/news/defence/exported-rs-38000-crore-worth-defence-equipment-in-7-years-says-rajnath-singh/articleshow/86624331.cms>



Defence minister Rajnath Singh

Thu, 30 Sept 2021

The nuclear submarine deal of the new troika

By Rajiv Nayan

On 15 September 2021, two members of the Quad—the United States (US) and Australia—along with the United Kingdom (UK) issued a joint statement to create a higher “trilateral security partnership called ‘AUKUS’” to meet the new challenges of the 21st century. The statement, in the very opening sentence, clearly mentioned that these challenges are emanating from the Indo-Pacific region.

The announcement made the world talk. A number of issues ranging from geo-politics to non-proliferation to containment of China have been circulating in discussions. Many wonder whether the much talked about Quad Plus has started materialising. Like the Quad, the AUKUS does not refer to China as a challenge but the common understanding is that the preparatory work of maritime democracies to contain China in the Indo-Pacific is being bolstered through it.



The AUKUS as a geo-political issue may have generated a gentle debate and discussions in the world, but the submarine part of the agreement is being considered a “bombshell” in many quarters. It invoked strong reactions not only from the Chinese establishment but also from Biden’s friends and allies. The non-proliferation community also joined the debate highlighting the departure from the long-standing American position.

The AUKUS pledged to facilitate the Australian acquisition of the nuclear-powered submarines. The 15 September statement noted: “Today, we embark on a trilateral effort of 18 months to seek an optimal pathway to deliver this capability. We will leverage expertise from the United States and the United Kingdom, building on the two countries’ submarine programmes to bring an Australian capability into service at the earliest achievable date.”¹

The joint statement, thus, makes it clear that it is not an immediate transfer of submarines, which Australia has been seeking for a number of years. For that purpose, it had a US\$ 66 billion agreement apparently escalated to US\$ 100 billion with France in the past. The acquisition of the submarines is supposed to boost “interoperability, commonality and mutual benefit” among the AUKUS countries. This would make the UK not merely a collaborator in development of nuclear-propelled submarines but also an active player in the Indo-Pacific security theatre.

As of now, Australia has very rudimentary capabilities in nuclear reactor business. It has built a 20 megawatt-thermal research reactor. For multiple reasons, it did not invest much in nuclear research and development or industry, though it has an impressive reserve of high-quality uranium. It seems that it is now serious about developing its nuclear industry, at least, to support the planned nuclear submarines’ acquisition.

In the coming weeks or months, more information may come out in the public domain about the nature of submarine transferred to or developed for Australia. The nuclear reactor which is going to be used in the submarine is also a matter of curiosity for the world. Moreover, the level of enrichment of uranium may further drive the discussion on it.

The reaction to the AUKUS nuclear-propelled submarine deal manifests multiple dimensions. The curious blend of geo-technology and geo-economics is synergised with geo-politics. All three are supporting and opposing each other simultaneously. It ranges from the breach of the commercial contract to the collaboration in the “prohibited technology” to implications for the non-proliferation regime.

Instantaneously, reactions in print, electronic and digital media highlight that the AUKUS will undermine the non-proliferation regime. Some express apprehensions that non-nuclear weapons states may compare the AUKUS to the India–US civil nuclear energy initiative, and may get “more ammunition in support of a narrative that the weapons states lack good faith in their commitments to disarmament”.²

Critics in the US and the Western countries look puzzled over the decision to sell/ transfer of naval reactor technology. The US has been resistant to the idea of transfer of technology to even its allies like France and Canada. Only the UK was an exception as a recipient but not as a seller. In the past, the UK was prevented from transacting naval nuclear fuel cycle relating nuclear attack submarines to Canada. Now, the US has made the UK team up in the AUKUS to deliver the nuclear-propelled submarine to Australia.

A section of the non-proliferation community is expressing reservations about the nuclear submarine transfer because of its proliferation potential. It is feared that such a transfer to the non-nuclear state may increase the possibility of diversion of fissile materials used in the submarine propulsion for nuclear explosive purposes.

Moreover, some opine that there is an increasing use of HEU (Highly Enriched Uranium) in nuclear reactor so that it becomes more “compact” in operation. The increasing use of HEU further raises the prospect of its misuse for nuclear weapons. Some academic activists have also been arguing for a long period that the existence of a huge amount of HEU in submarine reactors all over the world increases the danger of materials falling into wrong hands.³ This line of thinking maintains that the nuclear submarine deal will also dampen efforts towards converting HEU into LEU (Low Enriched Uranium), thereby increasing the possibility of nuclear terrorism.

As Australia had signed an agreement for 12 diesel propelled submarines with France, analysts assume as a requirement of 22 submarines by Australia, and then analyse the amount of HEU needed to run the submarines. One of the reports notes: “if Canberra wants to operate six to 12 nuclear submarines for about 30 years, it will need some three to six tons of HEU.”⁴ Since Australia does not have much capabilities in its nuclear establishment and considering the urgent security imperatives, the US and the UK will have to supply HEU.

One section of the non-proliferation community believes that after the US becomes a party to this deal, it will be difficult for it to check such a deal signed by another set of countries such as France and Russia with different recipients such as Brazil and China. It is anticipated that the AUKUS deal could be followed by an uncontrolled proliferation.

Most of these apprehensions and arguments fall in the grey area. Stretching the non-proliferation argument too far may harm the cause of non-proliferation itself. The bureaucratic approach to non-proliferation regime—blurring the distinction between a responsible country and irresponsible means a reckless proliferator—is risky. It allows the dangerous states to clandestinely operate and transact items, which may result in nuclear weapons. Australia has shown restraints, and as amply discussed, the nuclear submarine deal has nothing to do with nuclear weapons.

Even legally speaking, the Nuclear Non-Proliferation Treaty (NPT), the mainstay of the non-proliferation regime, does not prohibit development of nuclear submarines or transfer of nuclear materials used as propellant in the naval reactor/nuclear submarine. Moreover, the joint statement underlines Australia’s adherence to “the highest standards for safeguards, transparency, verification and accountancy measures to ensure the non-proliferation, safety, and security of nuclear material and technology”. It also indicates that Australia will continue to fulfil its obligations and will have an agreement with the International Atomic Energy Agency (IAEA).

In fact, Australia signed a safeguards agreement in 1974⁵ after ratifying the NPT in 1973, due to which it became famous for promoting the tools of non-proliferation. In 1987, it enacted the Nuclear Non-Proliferation (Safeguards) Act. It supplied uranium to several countries after signing the safeguards agreements. Later, it also became the first country to adopt additional protocol on 23 September 1997.⁶ The text of Additional Protocol was approved in the IAEA Board of Governors meeting on 15 May 1997.⁷

The continued engagement with the IAEA should remove apprehensions regarding the interpretation of the Article 14 of the Comprehensive Safeguards Agreement signed between Australia and the IAEA. The legal document signed between them explicitly gives direction to the Australian government what to do when nuclear materials are not under safeguards.

A section of the international community from time to time expresses scepticism of the information provided regarding fuel, its composition, and naval reactor designs, naval bases and military fuel cycle fabrication process.⁸ Australia's commitment to the safeguards norm has been continued. Australia has apparently demonstrated enough confidence in its suppliers and the IAEA on the need for balancing confidentiality and transparency.

The IAEA Director General Rafael Mariano Grossi informed that the AUKUS countries had informed the agency about the agreement.⁹ He also told that the three countries communicated their commitment to the non-proliferation regime by underlining Australia's "exemplary non-proliferation credentials". He also notified the willingness of the three countries to remain engaged with the "IAEA in the coming months". More significantly, he updated the international community by stating that "The IAEA will engage with them on this matter in line with its statutory mandate, and in accordance with their respective safeguards agreements with the Agency".¹⁰

The nuclear submarine business has overlooked some archaic alarms as far as the nuclear non-proliferation regime is concerned. In India, too, some reports record displeasure over the submarine deal on the grounds that India was denied similar deal in the past. Unlike Australia, India has an operational nuclear submarine programme and a very robust nuclear industry. True, India may still need some of the technologies or the submarine depending on its requirements, however, the deal heralds a new era. A country like India with established responsible credentials, may also get the benefits in the future.

(Views expressed are of the author and do not necessarily reflect the views of the Manohar Parrikar IDSA or of the Government of India.)

(Rajiv Nayan is Senior Research Associate at the Manohar Parrikar Institute for Defence Studies and Analyses, New Delhi)

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China unveils 'loyal wingman' armed drone concept

Zhuhai, China: China on Wednesday revealed a drone concept similar in mission - and appearance - to the US-made Kratos XQ-58A Valkyrie as countries race to invest in "loyal wingman" drones to help protect pricier crewed fighter jets.

The long-range FH-97 drone concept unveiled on Wednesday can carry different types of weapons, and has swarm and electronic warfare capabilities, said Wu Wei, a representative of China Aerospace Science Technology Corp's (CASTC) Feihong product line.

He did not provide specifics in his presentation at Airshow China in Zhuhai.

The United States, Britain, Australia, India and Russia are among the countries developing "loyal wingman" drones, which are cheaper and more expendable than crewed fighters.

CASTC did not provide technical details of the FH-97 concept, nor say whether it was planned for export, though many foreign observers watched the presentation.

The FH-97's appearance is nearly identical to the Kratos XQ-58A, which made its first flight in 2019. The XQ-58A has a maximum speed of Mach 0.85 and a range of about 2,200 nautical miles. Zhang Zhongyang, vice president of CASTC said the plan was to turn Feihong into an "international top-notch brand... and become a major player at the centre stage of the world arena."

China has exported military drones to countries including the United Arab Emirates, Pakistan and Serbia.

"The chief customer is certainly the PLA, but in recent years the Chinese are also aggressively marketing these systems for exports," said Collin Koh, a defence research fellow with Singapore's Rajaratnam School of International Studies.

China also used the country's biggest air show to display the weapons capability of one of its most advanced stealth attack drone projects, the GJ-11.

The Global Times reported that the GJ-11 on display at the show had its two weapons bays open for the first time. Inside each were four unidentified munitions that appeared to be precision air-to-ground glide bombs.

Bradley Perrett, a specialist on Asian aerospace and defence, said the GJ-11 was designed to slip undetected through radar coverage and attack heavily defended targets.

"In doing that, it would take the place of a much larger and more expensive fighter with a pilot," he said. "Development won't be easy, but when it's complete the type will present a new threat to Taiwan and potentially Japan."

Chinese companies have 27 drone exhibits at the Zhuhai show.

<https://timesofindia.indiatimes.com/world/china/china-unveils-loyal-wingman-armed-drone-concept/articleshow/86607882.cms>



A model of Feihong's FH-97 reconnaissance and attack drone is displayed at the China International Aviation and Aerospace Exhibition in Zhuhai, Guangdong province

Analysing North Korean missile test: What it means for the region

North Korean news media KCNA described the new missile as an important addition to the country's "strategic" weaponry, implying that the system is being developed to deliver nuclear weapons

New Delhi: North Korea test-fired a newly developed hypersonic missile earlier this week, state news media KCNA reported on Wednesday, joining a race headed by major military powers to deploy the advanced weapons system.

North Korean leader Kim Jong Un did not inspect the launch of Hwasong-8, according to a report from the hermit kingdom. The official Rodong Sinmun newspaper carried a picture of the weapon - with a set of guidance fins at the base of its nose cone - ascending into the morning sky.

"In the first test-launch, national defence scientists confirmed the navigational control and stability of the missile," the report said.



This photo provided by the North Korean government shows what North Korea claims to be a new hypersonic missile launched from Toyang-ri, on Tuesday.(AP Photo)

What are hypersonic missiles?

Hypersonic weapons are considered the next generation of arms that aim to rob adversaries of reaction time and traditional defeat mechanisms.

Unlike ballistic missiles that fly into outer space before returning on steep trajectories, hypersonic weapons fly towards targets at lower altitudes and can achieve more than five times the speed of sound - or about 6,200 km per hour.

The development of the weapons system increases North Korea's defence capabilities, KCNA said, describing the hypersonic missile as "strategic weapon".

How advanced is North Korea's missile?

The North's hypersonic missile is at an early stage of development judged by detected velocity and other data, and would take a "considerable period of time" until it could be deployed in combat, the South's Joint Chiefs of Staff said on Wednesday.

The official Korean Central News Agency said that the missile met key technical requirements, including launch stability and the maneuverability and flight characteristics of the "detached hypersonic gliding warhead".

What does this missile launch mean for North Korea?

The test could mean the North is entering an accelerating race to deploy the weapon now involving the United States, Russia and China.

KCNA described the new missile as an important addition to the country's "strategic" weaponry, implying that the system is being developed to deliver nuclear weapons.

However, experts say the missile test was likely a failure. "The North's HGV technology is not comparable to those of the US, Russia or China and for now seems to aim for short-range that can target South Korea or Japan," Chang Young-keun, a missile specialist at the Korea Aerospace University, told news agency Reuters.

Regional ramifications

Both Koreas are building up their weapons capabilities in what could become an arms race on the divided peninsula, with ramifications for neighbouring Japan, China and the wider region.

The nuclear-armed North, which invaded the South in 1950, is under multiple sets of international sanctions over its banned nuclear weapon and ballistic missile programmes, and earlier this month said it had tested a long-range cruise missile.

Developing the hypersonic missile was one of five "top priority" tasks in the five-year plan for strategic weapons, KCNA said.

<https://www.hindustantimes.com/world-news/analysing-north-korean-missile-test-what-it-means-for-the-region-101632900818202-amp.html>

Science & Technology News



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Ministry of Science & Technology

Wed, 29 Sept 2021 6:51PM

Large-scale reactor developed for cost-effective production of hydrogen using sunlight and water

A team of Scientists have, for the first time, developed a large-scale reactor which produces a substantial amount of hydrogen using sustainable sources like sunlight and water, which is a cost-effective and sustainable process.

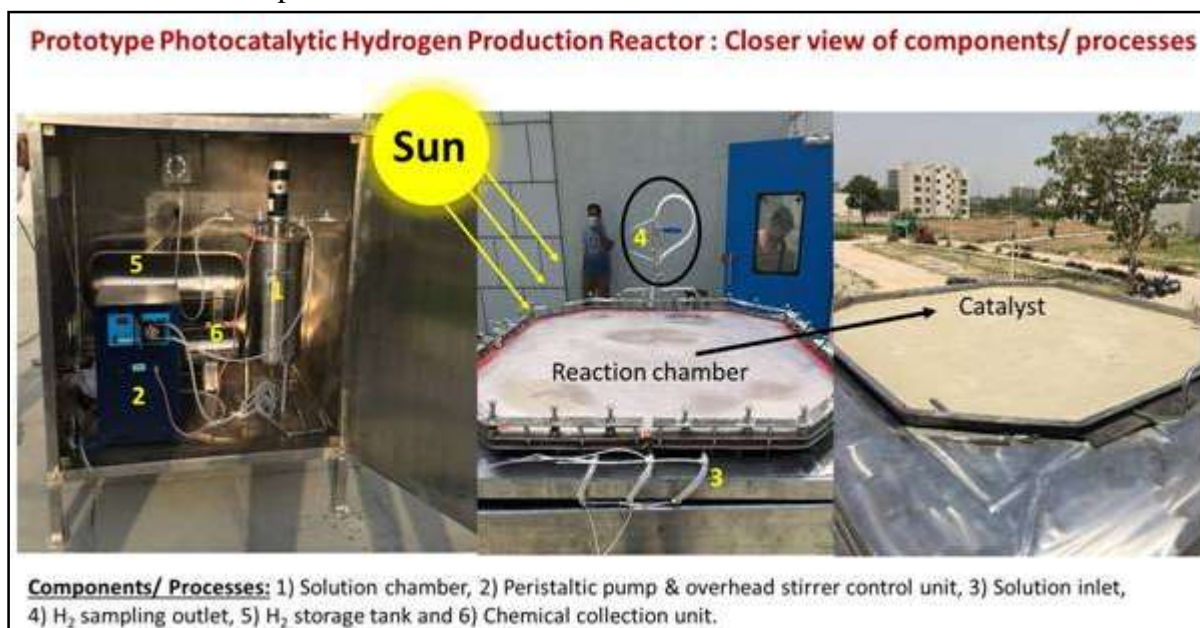


Figure 1. Natural sunlight-driven H₂ production using large-scale prototype reactor fabricated in INST Mohali.

India has set a target of 450 GW of renewable energy by 2030. To achieve this feat, in the current scenario, researchers all over the world are working towards renewable energy solutions which should be sustainable with a limited carbon footprint. One of the most economical ways to achieve this is to produce hydrogen at a large scale through photocatalytic water splitting. It is the long-term persistent solution for the growing renewable energy needs and a low-cost economic process which will benefit society in the longer term. Thus significant efforts from scientists towards achieving this goal are utmost necessary and urgent need-of-the-hour.

In this direction, Dr. Kamalakannan Kailasam and his team, including Prof. Ashok K Ganguli, Dr. Vivek Bagchi, Dr. Sanyasinaidu Boddu, Dr. Prakash P N & Dr. Menaka Jha from the Institute of Nano Science and Technology (INST), Mohali, an autonomous institute of the Department of Science & Technology (DST), Govt. of India have developed a prototype reactor which operates under natural sunlight to produce hydrogen at a larger scale (around 6.1 L in 8 hours). They have used an earth-abundant chemical called carbon nitrides as a catalyst for the purpose.

The process had been attempted many times by many researchers using complex metal oxide/nitride/sulphide based heterogeneous systems but was very difficult to reproduce in large quantities. The INST team employed the low-cost organic semiconductor in carbon nitrides which can be prepared using cheaper precursors like urea and melamine at ease in a kilogram scale. When the sunlight falls on this semiconductor, electrons, and holes are generated. The electrons reduced the protons to produce hydrogen, and holes are consumed by some chemical agents called sacrificial agents. If the holes are not consumed, then they will recombine with the electrons. This work is supported by the DST Nano Mission NATDP project, and the related article has been published in the 'Journal of Cleaner Production' recently, and the team is in the process of obtaining a patent for the technology.

The INST team has been working in this area of photocatalytic water splitting to generate hydrogen for quite some time now. "The energy crisis and ever-threatening climate crisis urged us to work on this promising way of hydrogen production through photocatalytic water splitting. The stability and chemical flexibility of having different organic groups in carbon nitrides triggered us to work on these cost-effective organic semiconductor materials for sustainable hydrogen production," added Dr. Kamalakannan.

The INST team started from the lab-scale process to the bulk scale of developing the photocatalyst and hydrogen production through a large prototype reactor. The reactor is about 1 metre square, and the photocatalyst was coated in the form of panels where water flow is maintained. Upon natural sunlight irradiation, hydrogen production occurs and is quantified through gas chromatography. The team is in the process of optimising the hydrogen production with effective sunlight hours in addition to the purity of the hydrogen, moisture traps, and gas separation membranes so as to hyphenate with the fuel cells.

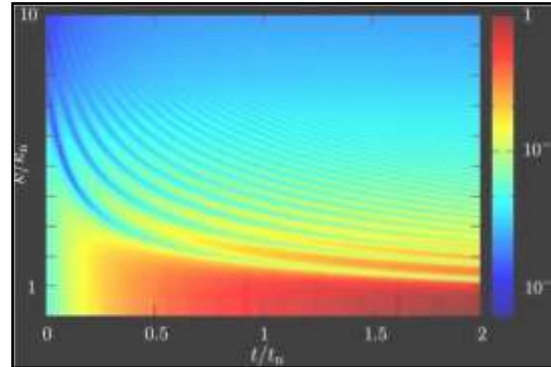
Hydrogen generated in this manner can be used in many forms like electricity generation through fuel cells in remote tribal areas, hydrogen stoves, and powering small gadgets, to mention a few. Eventually, they can power the transformers and e-vehicles, which are long-term research goals under progress.

Publication link: <https://doi.org/10.1016/j.jclepro.2021.127162>
<https://pib.gov.in/PressReleasePage.aspx?PRID=1759406>

Quantifying the effects of three-particle collisions in quantum gases

Quantum gases consisting of atoms are extremely suitable for observing quantum mechanical phenomena and making new types of quantum matter. In his Ph.D. research Mestrom was able to quantify the effects of three-particle collisions in those ultracold gases. With a new numerical method he was able to characterize and predict certain effects of these collisions. He defended his Ph.D. on September 27 at the department of Applied Physics.

A quantum gas can be created from an atomic gas by cooling the atoms to temperatures below one microkelvin. This is very close to absolute zero and corresponds to roughly -273 degrees Celsius. The density of these atomic quantum gases is extremely low, many thousands of times lower than the density of the air around us.



Credit: Eindhoven University of Technology

Interaction strength

In addition, they are very small with a typical diameter of a hair's breadth. The properties of these ultracold quantum gases depend on the interactions between the particles that collide with each other. Due to the extremely low density, collisions between two particles occur much more often than collisions between three or more particles. Nevertheless, three-particle collisions have a major impact on the stability of ultracold quantum gases.

Using the laws of quantum mechanics Mestrom could derive an interaction strength that can be used to quantify the effects of those three-particle collisions. He developed a numerical method that allowed him to calculate this interaction strength for different types of three-particle systems and study both elastic and inelastic collisions between three particles.

Gas into liquid

First, he investigated collisions between three identical particles. When the interaction between two particles is just strong enough to form a molecule without orbital angular momentum (a so-called s-wave molecule), three particles can form infinitely many types of molecules. Mestrom analyzed how the universal scaling of the size of these molecules—known as the Efimov effect—is influenced by the models describing the two-particle interactions.

In addition, the effect of elastic three-particle collisions on ultracold quantum gases is increased when the two-particle interaction strength is extremely low. Mestrom showed that the interaction strength between three atoms then behaves universally. Moreover, this interaction strength has a repulsive effect on the quantum gas. This repulsive force can even stabilize an unstable quantum gas into a quantum liquid.

Spin

Enhanced effects of elastic three-particle collisions also occur in ultracold gaseous mixtures. This happens, for example, when two non-identical particles can form a weakly bound molecule with a positive orbital angular momentum (a so-called p-wave molecule). The three-particle interaction strength then behaves universally.

Furthermore, quantum mechanical particles can have an intrinsic angular momentum. This is known as spin. One can create ultracold quantum gases in which the particles have the freedom to change their spin state. This change can occur via collisions with other particles.

In his thesis, Mestrom investigated the contribution of three-particle collisions to the spin dynamics. In this way he have determined the effect of three-particle collisions on the magnetic properties of atomic quantum gases. Moreover, he has predicted how this effect can be enhanced using electromagnetic radiation and magnetic fields.

Provided by [Eindhoven University of Technology](https://www.eindhovenuniversity.nl)

<https://phys.org/news/2021-09-quantifying-effects-three-particle-collisions-quantum.html>



Thu, 30 Sept 2021

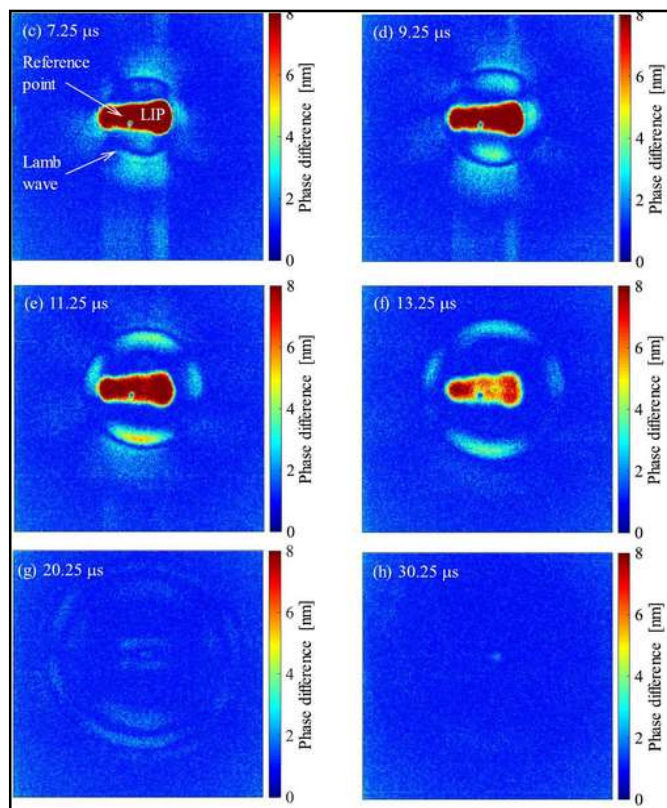
Making waves: A contactless way to detect damage in transparent materials

Transparent materials have become an essential component in a wide variety of technological applications, ranging from everyday electronics like tablets and smartphones to more sophisticated uses in solar panels, medicine, and optics. Just as for any other product to be mass-produced, quality control is important for these materials, and several techniques have been developed to detect microscopic scratches or imperfections.

One attractive approach to scanning for damages on materials is using "Lamb waves." Named after the British mathematician Sir Horace Lamb, these are elastic waves generated in solid plates following an appropriate mechanical excitation. Because the propagation of Lamb waves is affected by surface damage (such as scratches), they can be leveraged to ensure that the scanned material is free from imperfections. Unfortunately, the generation and subsequent measurement of Lamb waves on transparent materials are not straightforward.

While laser-based techniques exist for generating Lamb waves in a contactless manner, the laser parameters need to be carefully calibrated for each material to avoid causing damage. Moreover, existing approaches do not generate Lamb waves of sufficient amplitude; as such, repeated measurements have to be conducted and averaged to get reliable data, which is time-consuming. As for measuring the generated Lamb waves, no existing technique can quickly detect and use them to look for submillimeter-scale damage on transparent surfaces.

To address these issues, a research team led by Professor Naoki Hosoya from Shibaura Institute of Technology and Takashi Onuma from Photron Limited, Japan, developed a novel framework for the generation and detection of "S0 mode" (zero-order symmetrical mode) Lamb waves in transparent materials. Their approach is presented in a paper recently published online in the journal *Optics and Lasers in Engineering*.



Researchers from Japan used a high-speed polarization camera to capture Lamb waves on a transparent plate produced by shock waves from a laser-induced plasma, obtaining information on scratches and surface imperfections on the order of several dozen micrometers. Credit: Prof. Naoki Hosoya, SIT

First, the team had to find a convenient technique to generate Lamb waves without damaging the sample. To this end, they leveraged an approach that they had used successfully in other endeavors to generate mechanical oscillations in a contactless way: Laser-induced plasma (LIP) shock waves. To put it simply, LIP can be generated by focusing a beam of high-energy laser on a tiny volume of gas. The energy of the laser energizes the gas molecules and causes them to ionize, creating an unstable "plasma bubble" close to the material's surface. "The plasma bubble expands to its surroundings at super high speeds, generating a shock wave that is used as the excitation force to produce Lamb waves on the target structure," explains Prof. Hosoya.

Next, the researchers needed to measure the generated waves. They achieved this by using a high-speed polarization camera, which, as the name implies, can capture the polarization of the light traveling through the transparent sample. This polarization contains information directly related to the material's mechanical stress distribution, which in turn reflects the propagation of Lamb waves.

To put their strategy to the test, the team created microscopic scratches on a few flat, transparent polycarbonate plates and compared the propagation of Lamb waves on damaged and pristine samples. As expected, the scratches caused noticeable differences in the stress distribution of the plates as the waves propagated over the damaged areas, demonstrating the potential of this novel approach by detecting scratches measuring only several dozen micrometers.

While the findings are exciting, further studies are warranted to gain a more in-depth understanding of their strategy and its limits. Prof. Hosoya says, "The effects of the damage size or type, the camera lens magnification, and the properties of the transparent sample on the detectable defect size limit of our method needs to be verified as part of future works."

Hopefully, this ingenious non-contact, non-destructive damage detection scheme will help reduce the production costs of high-quality transparent materials.

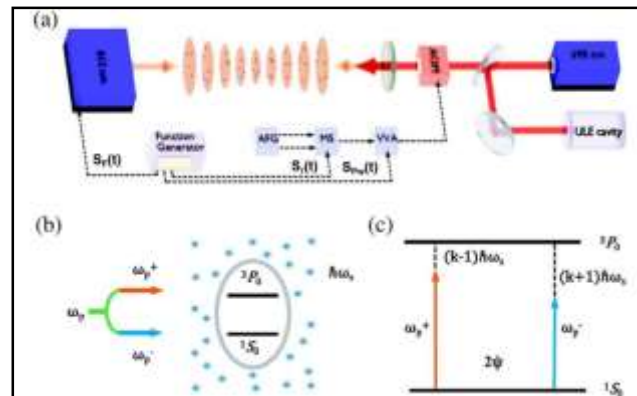
More information: Naoki Hosoya et al, Measurements of S0 mode Lamb waves using a high-speed polarization camera to detect damage in transparent materials during non-contact excitation based on a laser-induced plasma shock wave, *Optics and Lasers in Engineering* (2021). DOI: [10.1016/j.optlaseng.2021.106770](https://doi.org/10.1016/j.optlaseng.2021.106770)
<https://phys.org/news/2021-09-contactless-transparent-materials.html>

Researchers observe interference effect between Floquet quasi-particles using strontium optical lattice clock

By Zhang Nannan

Based on the strontium optical lattice clock platform, a research team led by Prof. Chang Hong from the National Time Service Center of the Chinese Academy of Sciences, together with Zhang Xuefeng from Chongqing University observed the interference effect between Floquet quasi-particles. Relevant results were published in *Physical Review Letters*.

According to Floquet Theory, when a quantum system is driven periodically, Floquet quasiparticle excitations occur. When two modes are driven simultaneously, the relative phase may lead to the interference effect between Floquet quasi-particles, and the application of the interference effect will be of great value for quantum precision measurement.



Schematic picture of experiment setup and interference. Credit: NTSC

"Benefiting from ultra-high frequency measurement precision, the strontium optical lattice clock developed by the National Time Service Center has the experimental conditions to observe the interference effect of Floquet quasi particles," said Prof. Chang.

The researchers trapped strontium atoms in a lattice. The two-level atom was surrounded by Floquet quasiparticles by modulating the lattice light frequency, which could assist the transition. When the coupling strength of the clock laser to the atoms was modulated, different number of Floquet particles could be selected to assist the transition.

There was a certain phase difference between the two transition processes, resulting in interference effect. The interference effect was observed by precise measurement of the clock transition spectrum of the Strontium atoms.

In the experiment, the Hamiltonian described the system corresponds to the Su-Schrieffer-Heeger (SSH) model of long-range interaction, so that the one-dimensional topological insulator with high topological number can be well simulated.

The time and frequency measurement based on optical lattice clock has become the most accurate basic physical quantity at present. The research of strontium optical lattice clock in China has always been in the status of "keeping pace" for a long time, far behind the technicalities led by other countries. The research team of the National Time Service Center broke the closed-loop of strontium optical lattice clock in 2017, and achieved the breakthrough of E-18 level of frequency stability in 2019.

More information: Xiao-Tong Lu et al, Doubly Modulated Optical Lattice Clock: Interference and Topology, *Physical Review Letters* (2021). DOI: [10.1103/PhysRevLett.127.033601](https://doi.org/10.1103/PhysRevLett.127.033601)

Journal information: [Physical Review Letters](https://phys.org/news/2021-09-effect-floquet-quasi-particles-strontium-optical.html)

<https://phys.org/news/2021-09-effect-floquet-quasi-particles-strontium-optical.html>

Covid can infect cells in pancreas that make insulin, research shows

Results of two studies may explain why some people develop diabetes after catching the virus

Covid-19 can infect insulin-producing cells in the pancreas and change their function, potentially explaining why some previously healthy people develop diabetes after catching the virus.

Doctors are increasingly concerned about the growing number of patients who have developed diabetes either while infected with coronavirus, or shortly after recovering from it.

Various theories have been put forward to explain this increase. One is that the virus infects pancreatic cells via the same ACE2 receptor found on the surface of lung cells, and interferes with their ability to produce insulin – a hormone that helps the body to regulate levels of glucose in the blood; alternatively, an over exuberant antibody response to the virus could accidentally damage pancreatic cells, or inflammation elsewhere in the body may be making tissues less responsive to insulin.

To investigate, Prof Shuibing Chen at Weill Cornell Medicine in New York screened various cells and organoids – lab-grown clusters of cells that mimic the function of organs – to identify which could be infected by Covid. The results suggested that lung, colon, heart, liver, and pancreatic organoids could all be infected, as could dopamine-producing brain cells.

Further experiments revealed that insulin-producing beta cells within the pancreas were also susceptible, and that once infected, these cells produced less insulin, as well as hormones usually manufactured by different pancreatic cells.

“We call it transdifferentiation,” said Chen, who presented the results at the annual meeting of the European Association for the Study of Diabetes on Wednesday. “They are basically changing their cellular fate, so instead of being hardcore beta cells which secrete a lot of insulin, they start to mix different hormones. It could provide further insight into the pathological mechanisms of Covid-19.”

Scientists have observed a similar phenomenon in some individuals with type 2 diabetes, although the disease is more strongly associated with the body’s tissues becoming less responsive to insulin.

It is not yet clear whether the changes triggered by Covid infection are long lasting. “However, we know that some patients who had very unstable blood glucose levels when they were in the intensive care unit and recovered from Covid-19, some of them also recovered [glucose control], suggesting that not all patients will be permanent,” Chen said.

Separate research by Prof Francesco Dotta at the University of Siena in Italy and colleagues confirmed that Covid attacks pancreatic cells by targeting the angiotensin-converting enzyme 2



A nurse conducting a diabetes test. Doctors are concerned about the number of patients who develop diabetes after catching coronavirus. Photograph: Peter Byrne/PA

(ACE2) protein on their surface, and that insulin-producing beta cells express particularly high levels of this protein.

They also demonstrated that ACE2 levels were increased under inflammatory conditions, which is important because people with existing type 2 diabetes may already have some inflammation within their pancreas. “This means that these insulin-producing beta cells could be even more susceptible to viral infection when inflamed,” Dotta said.

This could imply that people with existing diabetes or prediabetes are at greater risk of pancreatic dysfunction if they catch Covid-19 – something he now plans to investigate. “Diabetic patients in general are not more susceptible to Covid-19 infection in terms of frequency, but once they are infected they develop more severe complications and severe metabolic derangement,” said Dotta.

Prof Francesco Rubino, chair of metabolic surgery at King’s College London, said: “These studies seem to be consistent in supporting a biological rationale for the idea that Covid-19 could increase the risk of developing diabetes in people who are either predisposed to it, or even potentially completely from scratch.”

He is co-leading an international effort to establish a global database of Covid-19-linked diabetes cases, to better understand whether the infection can cause a new form of diabetes, or trigger a stress response that leads to type 1 or type 2 diabetes.

“Whether such changes are enough to permit this virus to cause diabetes is a question that these studies do not answer, but it gives us another reason to believe this is a possibility,” he said.

However, this may not be the only way in which the virus increases diabetes risk. “At least clinically, one of the things we’re seeing is that in some cases, patients who already had type 1 diabetes have started to express severe insulin resistance, which is a typical feature of type 2 diabetes,” Rubino said. This may imply a problem with how cells elsewhere in the body are responding to insulin after Covid-19 infection.

Dr Lucy Chambers, head of research communications at Diabetes UK, said: “People with diabetes have been disproportionately affected by Covid-19, and many people with the condition have tragically died as a result. Diabetes is a well-established risk factor for serious illness from Covid-19, and there is emerging evidence that Covid-19 may be triggering new cases of diabetes, but how these two conditions are biologically linked is not yet well understood.

“This research deepens our understanding of how diabetes and Covid 19 may interact biologically. This will help in the development of new, effective ways to treat people at risk of – or living with – diabetes who have Covid-19. Taking the Covid-19 vaccination, including a booster when offered, remains the best form of protection from the virus.”

<https://www.theguardian.com/society/2021/sep/29/covid-can-infect-cells-in-pancreas-that-make-insulin-research-shows>

