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नवभारत टाइम्स

मंगलवार, 25 अक्टूबर 2022

अब कुएं में जहर नहीं घोल पाएंगे दुश्मन

पुराने जमाने में जब जंग होती थी तो एक रियासत के लोग अपनी दुश्मन रियासत के गांव के कुओं में जहर घोल दिया करते थे ताकि उनके सैनिक वहां का पानी पीकर ही मर जाएं। मौजूदा दौर की जंग में सीधे तौर पर इस तरह कुएं में जहर नहीं घोला जाता, लेकिन अलग-अलग तरह से पानी दूषित जरूर हो जाता है। भारत की फौज इस तरह की किसी भी संभावना के लिए अभी से तैयारी कर रही है।

जहरीले पानी से निपटने के लिए क्या तैयारी है?

अगर केमिकल, बायोलॉजिकल, रेडियोलॉजिकल या फिर न्यूक्लियर अटैक होता है और इससे पानी जहरीला बनता है, तब भी फौज अपने सैनिकों को साफ पानी मुहैया करा पाएगी। डीआरडीओ की डिफेंस लैब जोधपुर ने सीबीआरएन (केमिकल, बायोलॉजिकल, रेडियोलॉजिकल, न्यूक्लियर) वॉटर प्यूरिफिकेशन सिस्टम बनाया है। यह दूषित पानी को साफ कर सकता है। लद्दाख में इस सिस्टम का एक प्रोटोटाइप मौजूद है और इसे भारतीय सेना इस्तेमाल कर रही है।

क्या न्यूक्लियर अटैक के वक्त भी पानी साफ रखा जा सकेगा?

डीआरडीओ के एक साइंटिस्ट ने कहा कि यह सिस्टम आर्मी और एयरफोर्स की जरूरत थी। अगर न्यूक्लियर अटैक होता है तो उस स्थिति में पानी को कैसे साफ करेंगे, इसका इंतजाम किया गया है। इस सिस्टम का पहला मॉडल मार्क-1 तैयार किया गया। वह सिर्फ डेजर्ट या प्लेन एरिया में काम कर सकता है। वह जीरो डिग्री से नीचे के तापमान पर काम नहीं करता है। मार्क-1 के कुल 10 सिस्टम पहले से भारतीय सेना के पास हैं ताकि वह हर हालात में अपने सैनिकों को साफ पानी दे सके।

बहुत ऊंचाई वाले इलाकों में आर्मी को कैसे मिलेगा साफ पानी?

लेकिन हाई एल्टीट्यूड के लिए अब तक ऐसा कोई सिस्टम नहीं था। ढाई साल पहले जब चीन के सैनिक ईस्टर्न लद्दाख में एलएसी पर आगे आए तो भारतीय सैनिकों ने उनसे वहां मुकाबला किया। उसके बाद से

ही भारतीय सैनिकों की बड़ी संख्या वहां तैनात है। वह हाई एल्टीट्यूड एरिया है जहां तापमान माइनस 20 डिग्री से भी नीचे चला जाता है। ऐसे में अगर दुश्मन पानी के सोर्स को दूषित करता है तो सैनिकों को कैसे साफ पानी मुहैया कराया जाएगा, यह एक चिंता थी। डीआरडीओ ने अब अपने सिस्टम का मार्क-2 मॉडल तैयार किया है।

कितना कारगर है डीआरडीओ का मार्क 2 मॉडल?

ह 55 डिग्री से लेकर माइनस 20 डिग्री तक किसी भी तापमान में काम कर सकता है और केमिकल, बायोलॉजिकल, रेडियोलॉजिकल या फिर न्यूक्लियर दूषित पानी को साफ कर पीने लायक बना सकता है। अगर पानी में न्यूक्लियर कंटामिनेशन (अशुद्धि) है तो इस सिस्टम से 1 घंटे में 2500 लीटर पानी को साफ किया जा सकता है। अगर पानी में न्यूक्लियर कंटामिनेशन नहीं है तो यह सिस्टम 1 घंटे में 6000 लीटर पानी को साफ कर सकता है। इसका ट्रायल ईस्टर्न लद्दाख में पैंगोंग लेक एरिया में भी किया गया, जो 14800 फुट की ऊंचाई पर है। आर्मी और एयरफोर्स ने मिलकर 54 ऐसे सिस्टम का ऑर्डर दिया है जिसे पूरा करने के लिए डीआरडीओ एक प्राइवेट कंपनी के साथ मिलकर काम कर रहा है। फौज को ऐसे 244 सिस्टम की जरूरत है।

<https://navbharattimes.indiatimes.com/navbharatgold/breaking-news-in-hindi/drdo-water-testing-kit-used-by-india-army-save-the-solders-from-poisonous-water/story/95080553.cms>

DefenceNews

Defence Strategic : National/International

TIMESNOW

Tue, 25 Oct 2022

Defence Minister to Visit Leh on October 28 to Take Stock of Situation at PP15 Area

Defence minister Rajnath Singh will be in Leh on Friday. Singh will be briefed on the situation along the line of actual control (LAC) in the wake of the recent withdrawal of the Chinese People's Liberation Army (PLA) from the PP15 area.

Singh is likely to be accompanied by the army chief General ManojPande. He is to be briefed on the situation in Ladakh by the Northern Army Commander, Lieutenant General UpendraDwivedi and the 14 Corps Commander Lieutenant General AnindyaSengupta. Singh could also see the

state of preparedness of soldiers for the winter months, particularly in terms of accommodation and warm clothing.

This is Singh's first visit after the PP15 problem was sorted out. But there are Chinese troops in Depsang and Chumar, but those problems are older and had happened before the intrusion in 2020. He will also inspect 75 (on the 75th year of independence) much needed infrastructure projects in the Ladakh area.

Before that Singh will be in Srinagar for briefings on the security situation in Jammu and Kashmir, particularly the 15 Corps area by Lieutenant General Dwivedi and the corps commander, Lieutenant General A.S. Aujwla.

He will also be present at a ceremony to mark the 75 years of the emergency airlift of Indian soldiers in 1947 to secure the Srinagar airport and ensure it did not fall into the hands of Pakistan soldiers and tribal fellow travellers. Also, the heroics of Major Somnath Sharma, who died fighting the Pakistanis and was awarded the ParamVirChakra will be remembered.

The Defence minister will be in Jammu and Kashmir during Infantry Day and commemorative programmes have been planned. He returns on Saturday afternoon.

<https://www.timesnownews.com/india/defence-minister-to-visit-leh-on-october-28-to-take-stock-of-situation-at-pp15-area-article-95079016>



Wed, 26 Oct 2022

Special Forces to Soon Get New Gear for Surveillance

The Indian Army has firmed up plans to boost the surveillance capabilities of its Special Forces (SF) battalions with 750 indigenous remotely piloted aerial vehicles (RPAVs), with new equipment to be bought through the fast track procedure under emergency procurement to meet critical operational requirements amid the lingering border standoff with China in the Ladakh sector, officials familiar with the development said on Tuesday. "Parachute (Special Forces) battalions are mandated to execute special missions behind enemy lines and, hence, should be equipped with state-of-the-art equipment. The current volatile situation along Northern Borders (with China) warrants expeditious procurement of operational equipment," the army said in a request for proposal (RFP) published on Tuesday.

India and China have been locked in a border standoff for 29 months, and talks have led to disengagement at four friction points along the Line of Actual Control (LAC) in eastern Ladakh so far, with resolution of outstanding problems at two friction areas still elusive. Despite the disengagement goals achieved thus far, both armies remain heavily deployed in the Ladakh theatre. RPAV is a potent situational awareness system that provides day-night surveillance along with ability to scan the target area and obtain a processed 3D image to execute special missions, the document said. "RPAVs are a force multiplier in special operations that depend on surveillance, real-time intelligence and quick reaction," said former director general of military operations Lieutenant General Vinod Bhatia (retd).

The development comes at a time the army has sharpened its focus on acquiring a range of unmanned systems including different types of unmanned aerial vehicles, surveillance drones and armed drone swarms in the backdrop of drone technology proving to be a force multiplier in military operations and recent conflicts around the world. “This force multiplier (RPAVs) enables the Special Forces to execute pin point precision strikes during direct action tasks such as raids, and elimination of high value targets and command and control elements including enemy leadership. It is, therefore, imperative for SF battalions to be equipped with this niche technology,” the RFP said.

The delivery of the surveillance hardware (required to be up to 60% indigenous) is to be completed within 12 months of the signing of a contract, and the supplier will have to provide product support for at least 10 years. The RFP states the weight of the RPAV should not exceed two kg, must be operable by a single soldier, have endurance of at least 30 minutes and a range of five km. Also, the system’s launch time should be under 10 minutes, be capable of operating in temperatures ranging from -20 °C to 45 °C and have a shelf life of at least 10 years.

<https://www.hindustantimes.com/india-news/special-forces-to-soon-get-new-gear-for-surveillance-101666719763461.html>

The Tribune

Tue, 25 Oct 2022

Army to Procure 750 Hi-Tech Drones for Precision Strikes along LoC, LAC

The Indian Army’s special forces — the ones mandated to operate behind enemy lines — are looking for specialised drones that can provide 3D imagery of the terrain to launch operations. The Ministry of Defence on Tuesday came out with the request for proposal (RFP) for such UAVs which will be processed as per the fast-track procurement procedure under the “emergency procurement”. The RFP is part of the tendering process seeking commercial and technical bids from suppliers. Some 750 such drones are needed. “The current volatile situation along the northern borders warrants expeditious procurement of operational equipment,” the RFP document said. The Army is looking for UAVs that can provide round-the-clock surveillance with ability to scan the target area and provide a processed 3D scanned image of the target to execute special missions.

The MoD wants to keep out any Chinese parts and has asked the vendor to provide NATO stock number (NSN) for each item provided by a foreign maker. This equipment will be deployed for situational awareness and short-range surveillance that will enable the special forces to execute pin-point precision strikes during direct action tasks. The Army wants the UAV to be about 2 kg in weight and be operable by one person. The UAV needs to have an endurance of 30 minutes and be able to operate indoors and in GPS-denied areas.

<https://www.tribuneindia.com/news/nation/army-to-procure-750-hi-tech-drones-for-precision-strikes-along-loc-lac-444412>

Tue, 25 Oct 2022

DefExpo 2022: The Giant Stride of India's Military Might

By Abhinandan Sharma

Deep space technologies, cyber warfare, underwater swarm drones, unmanned fighter jets that can be controlled by mothership, use of artificial intelligence, space warfare, and the biggest-ever 1,600 drones swarming display. This is not a wish list of an international Sci-fi movie, but is the reality which was on the agenda and display of the recently conducted marquee military event 'DefExpo 2022'. Taking the technological leap to bolster the war-fighting edge, these state-of-art technologies have been finding their way into the arsenal of the Indian defence ecosystem.

India's technological progress powered by local defence manufacturers showcased country military prowess as Asia's largest defence exhibition saw the inking of over 345 Memorandum of Understandings (MoUs), 42 Major Announcements, 18 Transfer of Technology (ToT) agreements, and various product launches, which in total pegged around an envisaged investment worth Rs 1,50,000 crore.

During the Expo, the evening skies of Gandhinagar left thousands in awe by uniformed personnel's daredevil exercises, breathtaking combat free falls, daring displays by the elite Marine Commandos (Marcos) and Para Commandos, which left indelible impressions on the spectators

But the marquee event was not restricted to this, as focus areas also included aero-engines, advanced military materials & technology and a production line for semiconductors to facility domestic manufacturing of 'Semiconductors', which are used in combat jets, tanks, naval warships, submarines, missiles, night-vision devices, radars, displays for pilots, space applications and communication networks.

DefExpo 2022 showcased India's defence industry as a sunrise sector for investment on the global scale, as the event witnessed unparalleled participation of over 1,340 exhibitors, businesses, investors, start-ups, and delegates from several countries, with engagements spread over four venues. One of the brightest minds of the defence sector came together at over 20 seminars across three business days to brainstorm over wide ranging topics.

India's Race to Space

Gracing the inaugural ceremony of DefExpo, Prime Minister Narendra Modi laid the foundation stone of an imperative Air force station Deesa air base in Banaskantha, which is just 130km away from the Indo-Pak border and promises to strengthen the security architecture in the Western sector.

With an aim to harness India's power in space to not just benefit the people of the country, but to the entire globe, PM also launched 'DefSpace Mission' to provide the armed forces with innovative solutions for 75 items used in the space sector. The space programme aims to develop innovative solutions for the Defence Forces through industry & startups.

Notably, India's military use of space started in the 1990s when imagery was used from international satellites. In 2013, the Indian Space Research Organisation (ISRO) launched the GSAT-7 (known as Rukmini) to connect all Indian naval ships and planes. In December 2018, the ISRO launched the GSAT-7A satellite equipped with Ku-band transponders to interlink Indian Air Force combat aircraft, airborne early warning and control (AEW&C) platforms, unmanned aerial vehicles, ground radar stations, and major air bases. The Indian Army also uses 30 percent of GSAT-7A's capacity for communication until its own GSAT-7B is launched.

In November 2021, the 'GSAT-7C' satellite was approved to provide secure communication for the Air Force. Last year only, a satellite was also launched to track ships in the Indian Ocean Region, which provides a direct feed at a multi-agency centre headed by the Indian Navy.

"There are more than 60 developing countries with whom India is sharing its space science. Many African countries and many other small countries are benefiting from this, the Prime Minister mentioned.

The 'South Asia satellite' is an effective example of this. By next year, ten ASEAN countries will also get real-time access to India's satellite data. Even developed countries like Europe and America are using our satellite data, he added.

A mega domestic deal also made the headlines, when Indian Air Force and Hindustan Aeronautics Limited (HAL) inked aRs 6,800 crore contract for 70 HTT-40 trainer aircraft, which was unveiled by the PM on the 2nd day of the expo at the India Pavilion. The state-of-art aircraft has been indigenously designed and developed by HAL, is equipped with modern, cutting-edge systems and has been designed with pilot-friendly features.

The aircraft would be utilised for basic flight training, instrument flying, night flying, close formation flying, aerobatics, and basic flight training. In July 2022, HAL signed a contract worth over \$100 million for the supply and manufacture of 88 'TPE331-12B' engines/kits along with maintenance and support services to power its indigenously built Basic Trainer Aircraft (HTT-40).

On domestic defence push, PM also announced 'Fourth Positive Indigenisation List' of 101 items, which will be procured from indigenous manufacturers as per provisions given in Defence Acquisition Procedure (DAP) 2020. The MoD had earlier promulgated 'First, Second and Third Positive Indigenisation Lists', comprising 310 items in the past 3 years.

The Start of Indian Defence Startup Ecosystem

The expansion of the defence sector is not limited to household names of the industry, it also throws up a wide variety of opportunities for start-ups and MSMEs. The Defence Ministry has already approved Rs 300 crore so far for more than 100 iDEX winners to develop products/technologies in over 50 technological areas to further support this growth.

Notably, the start-ups under the iDEX network have been working in the cutting edge technology including deep tech, AI, drones among others to equip the Armed Forces with innovative solutions for modern and futuristic warfare.

On 26 July 2022, iDEX (Innovations for Defence Excellence) achieved yet another milestone of signing its 100th contract. Within a short span of time, iDEX has emerged as a game changer in the Defence eco-system through its flagship programmes like Defence India Start-up Challenges (DISC), Prime and Open Challenges (OC).

The framework of iDEX was launched by Prime Minister Narendra Modi in 2018 with an aim of providing the platform of co-creation and co-development in the Defence sector, and to engage start-ups to contribute to the defence sector and develop defence and aerospace setup in the country.

The Technology Development Fund (TDF) scheme on the other hand, is executed by the Defence Research and Development Organisation (DRDO), which supports indigenous development of components, products, systems and technologies by Micro, Small & Medium Enterprises (MSMEs) and start-ups.

At the first-ever marquee event of the Ministry of Defence 'Invest for Defence', Defence Minister Rajnath Singh mentioned the government has reserved 68% of the defence capital acquisition for domestic procurement for the year 2022-23, which is approximately Rs 85,000 crores and 25% of this has been reserved for domestic private industry.

Further, the Defence Ministry has dedicated 1/4 of the Defence R&D budget to industry led R&D to encourage the participation of private firms in the defence sector. Sharing the government's future endeavours for the defence sector, Rajnath Singh asserted that the target is to increase defence production in India from USD 12 billion to USD 22 billion by 2025.

<https://newsonair.com/2022/10/25/defexpo-2022-the-giant-stride-of-indias-military-might/>



Tue, 25 Oct 2022

The Brave New World: Indigenisation of Materials for Defence

By Girish Linganna

Aerospace alloys are utilised in aircraft materials. Some applications need exceptional performance, tensile strength, or heat resistance, even at high manufacturing or processing costs. In this safety-focused profession, fatigue resistance is essential.

Material Science in Aircraft Engineering

Standards for materials and techniques establish its practice internationally. Most aerospace materials lack at least one of the following qualities: light, rigid, robust, damage-tolerant, and durable. Aerospace airframe and engine components may employ 0.05 percent of all materials. Aeronautical applications need less than 100 metal alloys, composites, polymers, and ceramics. India relies on China, Russia, the US, Brazil, Australia, and the Congo (DRC) for such military supplies. Military industries rely primarily on imports, while certain indigenous materials have replaced them. Dependence on imports limits the ability of Indian companies to export defensive equipment/platforms, limiting the country's defence industrial ecosystem.

During the recently concluded DefExpo, many Indian companies have announced partnerships with foreign OEMs. These partnerships focus on advanced materials for aerospace. India imports

\$2 billion in essentials annually, according to estimates. Domestic production of these minerals may reduce import prices and decouple important military assets from geopolitical uncertainty. Government of India (GoI) concerns and a drive for an indigenisation strategy highlight the need for self-sufficiency in high-tech military components. Steel, copper, aluminium, titanium, cupronickel, tungsten, composites, and ceramics are the primary metallic/non-metallic material groups used in aerospace and defence production. These elements are combined with other metals, including nickel, cobalt, vanadium, zinc, antimony, molybdenum, borates, chromium, germanium, and lithium, to create specialised alloys. These alloys are then machined into the necessary shapes and sizes after undergoing specific treatments such as forging and casting to make them lighter, stronger, and blast-resistant.

Aluminium alloys, titanium alloys, steels, and composites make up the primary categories of materials utilised in aeronautical constructions. In addition to these elements, nickel-based alloys are essential jet engine structural materials. Other materials have specialised uses for specific aircraft types, although they are only sometimes used in significant numbers. Examples include magnesium alloys, fibre-metal laminates, metal matrix composites, wood, ceramics for heat-insulating tiles for rockets and spacecraft, and radar-absorbing materials for stealth military aircraft. Many additional materials are also utilised in aircraft: copper for electrical wiring, semiconductors for electronic devices, and synthetic fabrics for seating and other furnishings. However, none of these materials is required to carry a structural load. Rarely does a single material have all the necessary qualities for an aircraft's construction and powerplant. Instead, mixtures of materials are used to provide the optimal balance of cost, performance, and security.

Setting the Standard

India's DOS (Directorate of Standardisation) standardises equipment. DDP, Ministry of Defence, controls DOS. (MoD). The Standardisation Committee creates DoS policies. The DoS works with the Indian Army, Navy, Air Force, Director General of Aeronautical Quality Assurance, Director General Quality Assurance (DGQA), Defence Research and Development Organisation (DRDO), Ordnance Factory Board (OFB), Defence Public Sector Undertakings (DPSUs), and Bureau of Indian Standards (BIS). DoS publishes five standardisation documents for components, assemblies, subassemblies, equipment, and other defence supplies. The Joint Services Rationalised List (JSRL), Joint Service Guide (JSG), and Approved Notification (AN) implement Indian norms.

MSSC standardised military material needs. They also harmonise worldwide and Indian material norms. India joined the NATO Codification System's highest body, the Allied Committee 135 (AC/135), via the Department of State (NCS). Due to this agreement, the Indian Navy uses naval standards to design and build surface and subsurface boats. To provide raw materials, businesses must have a QMS that meets aerospace and defence industry standards. AS 9100, ISO 9001, and ISO/IEC 17025 are required. Suppliers must also have their QMS authorised by the OEM to become approved raw material sources. Depending on the raw materials eventual use, India's Director General of Aeronautical Quality Assurance (DGAQA), Director General of Civil Aviation (DGCA), Director General of Quality Assurance (DGQA), Department of Space (DoS), and others may need to authorise suppliers. Material changes require platform recertification, especially for airborne systems.

A Glaring Gap in India

Mineral-rich India supplies most key mineral and ore classifications. India possesses 18 percent of the world's ilmenite reserves (titanium oxide minerals, which produce high-performance metal parts such as artificial human body parts, aircraft engine parts, sporting equipment, synthetic rutile, pigments, etc.) India produces about 200 million tonnes of iron ore and 13 percent of the world's bauxite output. However, India imports more essential metals and alloys. Most Indian defence businesses, DPSUs, and DRDO labs import raw materials. HAL, the largest DPSU, imported raw materials worth Rs 3,629.4 crore (\$ 500 million) in 2018-19. Six Indian defence businesses imported high alloy steel worth Rs 5250 crore in 2018-19. (\$700 million). India produces composite components from glass, carbon, and aramid fibres, but not Kevlar or aircraft-grade carbon fibre.

Indigenous systems like the Light Combat Aircraft (LCA) Tejas Mk 1A, which has a 45 percent carbon composite airframe, rely heavily on imports. Light Combat Helicopters (LCH), Advanced Light Helicopter (ALH) Dhruv, Medium Weight Fighter (MWF) Tejas MK 2, and fifth-generation Advanced Medium Combat Aircraft (AMCA) will utilise carbon composite airframes (AMCA).

Challenges to Atmanirbharta in Material Science

Material grades have restricted purchase quantities. These orders are typically below a firm's lucrative minimum order quantity (MoQ). Order numbers are unsustainable because specific material grades have minimal or no dual-use potential. Thus, businesses cannot recuperate the expenditures of creating indigenous capabilities for these critical minerals compared to their commercial uses. Companies don't do R&D for some alloys and non-metallic materials since it's too expensive. The sector usually licences the technology, which has end-use restrictions and requires government engagement. The government has transferred technology from Defense Public Sector Undertakings and Defense Research and Development Organization (DRDO) institutions, including the Defence Metallurgical Research Laboratory (DMRL), to close the gap.

Any defence platform's designer specifies its materials. Thus, foreign platform material requirements are based on local norms, specifications, and material availability. After acquiring such a platform, during technology transfer from foreign OEMs, these design criteria are not changed to match Indian requirements and specifications since modifying those needs platform recertification. Platform requirements vary since Indian forces employ platforms from several nations. Due to this diversity of prevalent specifications and the need to recertify the platform if design standards change, Indian material manufacturers following Indian standards cannot substitute the imported raw material even if both materials have similar physical and chemical properties, creating a perpetual dependency on imported raw material.

For exotic material development, India requires better testing facilities. The lack of testing facilities raises research costs and slows material development, making the nation reliant on imports. Military material and alloy suppliers have another challenge: obtaining authorised sources. Most multinational OEMs have approved suppliers with long-term contracts for each programme. These OEM-associated vendors are vital to the supply chain. OEMs seldom swap suppliers since it's expensive. Thus, getting sourcing certification for numerous suppliers to increase volume and lower unit cost is difficult.

Course Correction: Power of Policy

Policy-level initiatives by the GoI and government entities and stakeholders are underway. The DAP 2020 proposal that emphasises domestic military material sources is the most important. DAP 2020 addresses some of the major issues highlighted above. • Service Headquarters (SHQ) analyses the material composition at the RFI stage for projects other than “Buy-Global” to see whether indigenous materials are feasible. If the material is not created locally, explore Transfer of Technology (ToT) under the “Buy and Make” area. • DPSU/PSU platform manufacturers, R&D facilities, and SHQ must conduct environmental scans to discover materials that may be created in the nation via the following channels for future needs.

Phased material development by platform manufacturers and R&D organisations using their resources or the Indian industry is encouraged. Inclusion of ToT for manufacturers and authentication of materials by production agencies in licenced manufacturing projects (PAs). Seeking and prioritising/promoting ToTs for military supplies in exchange for Indian industry offsets. Adopting ‘Make’ or Technology Development Fund (TDF) programmes for material development. In addition, DAP 2020 specifies a procedure and incentives for platform manufacturers to use indigenously created materials in procurement.

Systematic Overhaul to Foster Capability

Government and industry must collaborate on long-term domestic capability development. A think tank or nodal body should aggregate incentives from several ministries into a strategic material strategy with frequent milestone monitoring. Successive governments have provided incentives to help industries create vital military supplies. Demand side incentives like minimum order guarantees, exclusivity and long-term agreements with DPSUs should be guaranteed to promote indigenous military supplies. Public and private industries should discover defence materials employed in civilian applications. Carbon fibres are utilised for diving suits, thermal apparel, and military purposes. The more significant market for these components/subsystems will attract indigenous producers.

Technical and functional requirements in the military and aerospace industry require rationalisation and documentation of analogous standards to convert other global standards without recertification. The EDSIS (European Defence Standards Information System) may be implemented in India to provide a unified standardisation procedure. Certification standards should also follow internationally recognised norms of certifying materials rather than products. This will remove platform recertification and allow designers to pick from approved materials.

Manufacturers should find materials that can be reconfigured to satisfy military criteria without significant manufacturing line adjustments. After identifying and developing the technology, firms might set up a pilot production unit in their current manufacturing unit to obtain market exposure and certifications before establishing a dedicated unit. Monitor each DPSU and OFB facility’s import reliance on imported raw material. Each DPSU should have a self-reliance indicator that compares raw material imports to overall requirements. DDP should report this quarterly. This will foster healthy competition for DPSUs to minimise raw material imports.

<https://www.financialexpress.com/defence/the-brave-new-world-indigenisation-of-materials-for-defence/2736426/>

Tue, 25 Oct 2022

Malaysia Keen to Buy ‘Made-in-India’ BrahMos Missiles

Close on the heels of the Philippines closing a \$374 million BrahMos supersonic cruise missiles deal, Malaysia has evinced interest in the BrahMos NG (Next Generation) missiles. Sources confirmed to Financial Express Online on the sidelines of the recently concluded DefExpo 2022 in Gandhinagar, “Another ASEAN member country Malaysia has expressed its interest in the BrahMos NG. It is keen to buy the missile which has been made in India under Indo-Russian joint venture as it can be fitted in the Russian Sukhoi-30; the Royal Malaysian Air Force (RMAF) is flying.” Financial Express Online has reported that the BrahMos NG is not only lighter but is also compact and smaller and this next generation missile system can be fitted on different platforms.

Vietnam & BrahMos

According to sources, there is no deal with Vietnam. “As far as Vietnam is concerned in the region, no BrahMos missile or any other missile has been sold to that country,” the source mentioned above told Financial Express Online.

Indonesia & BrahMos

Talks with this country for the sale of the Indo-Russian BrahMos supersonic cruise missile are already at an advanced stage. In fact, this will also be discussed when Prime Minister Narendra Modi is in Indonesia for the Asean summit next month. During his meeting with the Indonesian leadership this would be one of the topics on the agenda of bilateral talks between the leaders of both countries. Since Indonesia already has Su-27 fighter jets in its fleet and Kilo class submarines, fitting the BrahMos supersonic missiles on board will not be difficult.

Other countries

Financial Express Online has reported earlier that several other countries from South America especially Brazil, from West Asian countries and South Africa have expressed their interests in the BrahMos-NG version of the missile system. Financial Express Online has reported earlier that these missiles will be made at facilities located in the UP Defence Corridor.

More about BrahMos-NG

This missile which is being produced in India weighs between 1.4-1.6 tonne. This missile can be integrated with the Russian Su-30 fighter jets and has a length of 6 metre. The missile has been jointly developed under an Indo-Russian joint venture – BrahMos Aerospace (BAPL) and after undergoing several tests in different configurations has been successfully inducted in the Indian armed forces. This next generation missile with a speed of up to 3.5 Mach has a range of 290 km and in comparison to the earlier version it has a lesser radar cross section. Also, according to sources, the BrahMos NG will have indigenous seeker with AESA radar.

For the IAF

The BrahMos-NG which is in the process of being designed and developed is expected to be part of the Indian Air Force by 2025. These next generation missile systems could be fitted onboard the indigenous Light Combat Aircraft (LCA) as well as the Su-30 MKI. Since the Air Variant of the next generation missile system is still in the process of being developed and designed the company is looking at a 300 kms range and there is a possibility of tweaking this – plus or minus. “Countries including the United Arab Emirates and Saudi Arabia have expressed their interest in the BrahMos-NG air variant which is expected to have a 300 kms range which is still in the development stages,” sources told Financial Express Online. The company is already in the midst of looking at land targets and will move gradually to the sea target.

<https://www.financialexpress.com/defence/malaysia-keen-to-buy-made-in-india-brahmos-missiles/2742644/>



Wed, 26 Oct 2022

US Vows Full Military Defence of Allies Against North Korea

The United States will make full use of its military capabilities, “including nuclear, conventional and missile defence,” to defend its allies Japan and South Korea, US Deputy Secretary of State Wendy Sherman said Tuesday as she warned North Korea against escalating its provocations. Sherman said North Korea’s repeated firings of ballistic missiles and artillery in recent weeks were provocative military actions. North Korea has described them as practice runs for the use of tactical nuclear weapons. “This is deeply irresponsible, dangerous, and destabilising,” Sherman said in talks in Tokyo with South Korean First Vice Foreign Minister Cho Hyundong. The two officials met ahead of a three-way meeting with their Japanese counterpart on Wednesday.

It would be the second in-person meeting of the three officials since conservative South Korean President Yoon Suk Yeol took office in May, signalling an improvement in difficult ties between Japan and South Korea. A year ago, Japanese and South Korean vice ministers declined to participate in a joint news conference after three-way talks in Washington, leaving Sherman to make a solo media appearance. Sherman said North Korea needs to understand that the US commitment to the security of South Korea and Japan is “ironclad.” “And we will use the full range of US defence capabilities to defend our allies, including nuclear, conventional and missile defence capabilities,” she said.

Cho, during his talks with Sherman, raised concern that a new North Korean nuclear weapons policy adopted in September increases the possibility of its arbitrary use of nuclear weapons. “This is creating serious tension on the Korean Peninsula,” Cho said. Sherman met earlier Tuesday with Japanese Vice Foreign Minister Takeo Mori and reaffirmed the further strengthening of the Japan-US alliance and other shared goals, including the complete denuclearisation of North Korea and their joint response to China’s increasingly assertive actions in the region. Japanese Defense Minister Yasukazu Hamada recently said North Korea is believed to have achieved a miniaturisation of nuclear warheads while significantly advancing its missile

capabilities by diversifying its launch technologies, making interceptions more difficult. Japanese officials have also warned of a possible nuclear test by North Korea in the near future. The Japanese and South Korean officials met together later Tuesday and discussed ways to improve their countries' ties, which were badly strained over disagreements stemming from Japanese wartime actions, including abuse of Korean forced labourers and coercing girls and young women to work in brothels for Japanese soldiers.

<https://indianexpress.com/article/world/us-vows-full-military-defence-of-allies-against-north-korea-8230171/>



Tue, 25 Oct 2022

U.S. Considers HAWK Air Defence Equipment for Ukraine: U.S. Officials

“The United States is considering sending older HAWK air defence equipment from storage to Ukraine to help it defend against Russian drone and cruise missile attacks,” two U.S. officials told Reuters. The HAWK interceptor missiles would be an upgrade to the Stinger missile systems — a smaller, shorter range air defence system — that the United States has already sent to blunt Russia's invasion. The Biden administration would use the Presidential Drawdown Authority (PDA) to transfer the HAWK equipment which is based on Vietnam-era technology, but has been upgraded several times. The PDA allows the United States to transfer defence articles and services from stocks quickly without congressional approval in response to an emergency.

Reuters was unable to determine how many HAWK systems and missiles the United States has available to transfer. The White House declined to comment. The HAWK system is the predecessor to PATRIOT missile defence system made by Raytheon Technologies which remains off the table for Ukraine, U.S. officials have told *Reuters*. U.S. President Joe Biden pledged to Ukraine President Volodymyr Zelenskyy that Washington would provide Ukraine with advanced air systems after a devastating missile barrage from Russia earlier this month. NATO Secretary General Jens Stoltenberg has said that Spain intends to send four HAWK launchers.

The United States would likely initially send interceptor missiles for the HAWK system to Ukraine because it was unclear if enough U.S. launchers were in good repair, one U.S. official told *Reuters*. The U.S. systems have been in storage for decades. A PDA is being considered for later this week, U.S. officials have said. One U.S. official said it would likely be about half the size of the recent security assistance packages which have been around \$700 million. It was not immediately clear if HAWK interceptor missiles would be included, but U.S. officials have previously cautioned that size and composition of military aid packages can change rapidly. Since the February 24 Russian invasion of neighbouring Ukraine, which Moscow calls a "special military operation", the United States has sent around \$17.6 billion worth of security assistance to Kyiv.

<https://www.thehindu.com/news/international/us-considers-hawk-air-defence-equipment-for-ukraine-us-officials/article66052313.ece>

HAWK Air Defence Equipment

The United States is considering retrieving older HAWK air defence equipment from storage to send to Ukraine which is facing a heavy barrage of Russian drone-fired and cruise missiles, Reuters reported on Tuesday, quoting unnamed officials.

The report said it was unclear how many HAWK systems and missiles the United States had available to send to Ukraine. The White House declined to comment, it said.

HAWK after Stinger

The HAWK interceptor missiles would be an upgrade to the Stinger missile system, which is a smaller, shorter-range air defence system. The US sent the shoulder-fired anti-aircraft Stingers to Ukraine early on in the war, and then placed orders for more stocks of the missiles with Raytheon Technologies Corp. after they demonstrated great success in stopping Russian air assaults.

The US would likely initially send interceptor missiles for the HAWK system to Ukraine because it was unclear if enough US launchers — in storage for decades — were in good repair, a US official told Reuters.

NATO Secretary General Jens Stoltenberg has said that Spain intends to send four HAWK launchers, the report said.

PATRIOT predecessor

HAWK, short for ‘Homing All the Way Killer’, entered service with the US Army in 1959, during the Vietnam war. It underwent upgrades over the decades that followed, including a major one in 1971 that produced the so-called I-HAWK (or improved HAWK), with a kill probability of 85%.

The HAWK system was the predecessor to the PATRIOT missile defence system that Raytheon built in the 1990s. US forces largely stopped using HAWK from the early years of the new century. PATRIOT remains off the table for Ukraine, the Reuters report said, quoting US officials.

Presidential authority

The Biden administration would use the Presidential Drawdown Authority (PDA) to transfer the HAWK equipment, Reuters said. According to the US Department of State, PDA allows for the “speedy delivery of defence articles and services from Department of Defence stocks to foreign countries and international organisations to respond to unforeseen emergencies”.

Military assistance under PDA does not require Congressional approval, and could “begin arriving within days — or even hours — of approval”. A PDA is being considered for later this week, US officials have said, Reuters reported.

Following the waves of aerial attacks that targeted civilians and knocked out vital infrastructure in Ukraine earlier this month, President Joe Biden pledged to President Volodymyr Zelenskyy

that the US would provide his country with advanced air systems. Biden, who spoke by phone with Zelenskyy on October 10, assured him of continued US support against Russia's "senseless attacks" on civilian targets. "President Biden pledged to continue providing Ukraine with the support needed to defend itself, including advanced air defense systems," a White House statement on the phone call said.

The US has provided almost \$17 billion worth of security assistance to Ukraine since the launch of Russia's invasion on February 24.

<https://indianexpress.com/article/explained/explained-sci-tech/russia-ukraine-war-hawk-air-defence-equipment-8229957/>



Tue, 25 Oct 2022

What is a Dirty Bomb and why is Russia Talking about One Now?

In Russia's latest advocacy campaign over its invasion of Ukraine, Moscow has focused on accusations that Kyiv might be planning to use a so-called "dirty bomb" – a conventional explosive device laced with toxic nuclear material.

Kyiv and its Western allies say there is no truth at all to the accusation, and that the idea that Ukraine would poison its own territory is patently absurd. They say Moscow could be making the allegation to justify an escalation of its own.

Following is a look at dirty bombs and how they might be used in Ukraine, either as a real threat or as the basis of propaganda:

How much damage can they do?

Dirty bombs do not create city-flattening atomic explosion but are designed to spread toxic waste. Security experts have worried about them mostly as a form of terrorist weapon to be used on cities to cause havoc among civilians, rather than as a tactical device for use by warring parties in conflict. Experts say the immediate health impact would probably be limited, since most people in an affected area would be able to escape before experiencing lethal doses of radiation. But the economic damage could be massive from having to evacuate urban areas or even abandon whole cities. In testimony to the United States Senate during the Obama administration, physicist Henry Kelly, then president of the Federation of Scientists, outlined a wide range of hypothetical scenarios, depending on the amount and type of nuclear material used and how far it was spread. A bomb using radioactive caesium from a misplaced or stolen medical device might require the evacuation of an area of several city blocks, making it unsafe for decades. A piece of radioactive cobalt from a food irradiation plant could, if blasted apart in a bomb in New York, contaminate a 380 square mile (1,000 square km) area and potentially make the island of Manhattan uninhabitable, Kelly said.

What does Russia allege?

Moscow sent a letter detailing its allegations about Kyiv to the United Nations late on Monday, and diplomats said Russia planned to raise the issue at a closed meeting with the Security Council on Tuesday.

The head of Russia's nuclear, biological and chemical protection troops, Lieutenant General Igor Kirillov, told a media briefing Ukraine's aim for such an attack would be to blame Russia.

"The aim of the provocation would be to accuse Russia of using a weapon of mass destruction in the Ukrainian military theatre and by that means to launch a powerful anti-Russian campaign in the world, aimed at undermining trust in Moscow."

What is the response of Ukraine and the West?

Kyiv and its Western allies say Moscow's allegation that Ukraine would intentionally make some of its own territory uninhabitable is absurd, especially at a time when Ukrainian forces are recapturing territory on the battlefield.

In a joint statement, the United States, Britain and France called the Russian allegations "transparently false" and warned Moscow against using them as a "pretext" for escalation.

The Kremlin warned the West on Tuesday it was dangerous to dismiss Moscow's position.

Ukrainian President Volodymyr Zelenskyy suggested Moscow might be using the allegations as cover for plans for a similar attack of its own: "If Russia calls and says that Ukraine is allegedly preparing something, it means one thing: Russia has already prepared all this."

<https://indianexpress.com/article/explained/explained-global/what-is-a-dirty-bomb-and-why-is-russia-talking-about-one-now-8229688/>

THE ECONOMIC TIMES

Wed, 26 Oct 2022

Russia Digging in for 'Heaviest of Battles' In Kherson - Ukrainian Official

Russian forces are digging in for the "heaviest of battles" in the strategic southern region of Kherson, a senior Ukrainian official said, as the Kremlin prepares to defend the largest city under its control from Ukraine's counter-offensive. Russian forces in the region have been driven back in recent weeks and risk being trapped against the west bank of the Dnipro river, where the provincial capital of Kherson has been in Russian hands since the early days of the invasion of Ukraine eight months ago. Russian-installed authorities are evacuating residents to the east bank, but Oleksiy Arestovych, adviser to Ukrainian President Volodymyr Zelenskyy, said there was no sign that Russian forces were preparing to abandon the city. "With Kherson everything is clear. The Russians are replenishing, strengthening their grouping there," Arestovych said in an online video late on Tuesday. "It means that nobody is preparing to withdraw. On the contrary, the heaviest of battles is going to take place for Kherson."

Of the four provinces Russian President Vladimir Putin proclaimed to have annexed in September, Kherson is arguably the most strategically important. It controls both the only land route to the Crimea peninsula Russia seized in 2014 and the mouth of the Dnipro, the vast river

that bisects Ukraine. Yuri Sobolevsky, a member of the ousted pro-Ukrainian Kherson regional council, said the Russia-installed authorities were putting increasing pressure on Kherson residents to leave. "Search and filtration procedures are intensifying as are searches of cars and homes," he wrote on the Telegram messaging app.

In Mykolaiv region north and west of Kherson city, artillery duels raged throughout Tuesday, according to a post from the frontline on Rybar, a pro-Russian channel on Telegram. In Ishchenka district north of Kherson, Ukrainian forces tried to consolidate their positions, but were forced back to earlier lines, the post said. It said the Ukrainian military was preparing for an advance along the entire length of the frontline. A Reuters reporter in a remote hamlet near part of the Kherson frontline said residents hoped Russian forces would soon withdraw. "You fall asleep at night and you don't know if you will wake up," said Mikola Nizinet, 39, referring to Russian shelling. With no power or gas and little food or potable water in the area, many residents have fled, abandoning cattle to roam among expended munitions poking from the soil.

Dirty Bomb' Allegation

Russia told the U.N. Security Council on Tuesday that Ukraine is preparing to use a "dirty bomb", an assertion dismissed by Western and Ukrainian officials as a false pretext for intensifying the war. Russia's Deputy U.N. Ambassador Dmitry Polyanskiy said the evidence had been shared with Western counterparts. "I don't mind people saying that Russia is crying wolf if this doesn't happen because this is a terrible, terrible disaster that threatens potentially the whole of the Earth," he told reporters. President Zelenskiy said Russia's allegation suggested Moscow was planning to use a tactical nuclear weapon and would seek to blame Kyiv.

U.S. President Joe Biden said Russia would be "making an incredibly serious mistake" if it used a tactical nuclear weapon. Biden later spoke by phone with new British Prime Minister Rishi Sunak, and they agreed on the importance of supporting Ukraine, the White House said in a statement. In an apparent response to Moscow's allegation, the U.N. nuclear watchdog said it was preparing to send inspectors to two unidentified Ukrainian sites at Kyiv's request, both already subject to its inspections. Ukrainian Foreign Minister Dmytro Kuleba told reporters the inspectors would receive full access, and he called on Moscow to demonstrate the same transparency. Russia's state news agency RIA has identified what it said were the two sites involved - the Eastern Mineral Enrichment Plant in the central Dnipropetrovsk region and the Institute for Nuclear Research in Kyiv. Since Russian forces suffered major defeats in September, Putin has doubled down, calling up hundreds of thousands of reservists, announcing the annexation of occupied territory and repeatedly threatening to use nuclear weapons.

<https://economictimes.indiatimes.com/news/defence/russia-digging-in-for-heaviest-of-battles-in-kherson-ukrainian-official/articleshow/95089672.cms?from=mdr>



Tue, 25 Oct 2022

NATO Deputy Secretary General Addresses Ethical Use of New Technology in Defence

NATO Deputy Secretary General Mircea Geoană emphasised how taking innovative, non-traditional approaches to problem solving is key to NATO's approach to current and emerging security challenges. Addressing over 1,000 experts from industry, academia, government and not-for-profit organisations at the NATO Edge conference in Mons, Belgium, Mr Geoană said, "We want the disruptors from all areas of life: public, private and academic. The people who think and act differently. In NATO, we're now in the business of uniting disruptors to shape a peaceful future. Because security is everyone's job." The Deputy Secretary General explained how NATO initiatives like the Defence Innovation Accelerator for the North Atlantic (DIANA) or the one billion Euro NATO Innovation Fund – which will both go live in 2023 – are already gearing up to further technological innovation, in order to develop "real-world solutions for today's real-world problems."

Titled 'Technology in Focus', the NATO Edge conference centres on four major topics: digital transformation, innovative partnerships, technological resilience, and agile acquisition. Hosted by the NATO Communications and Information Agency (NCI Agency), NATO Edge is the flagship event of 2022 for the most innovative technologies and ideas in support of the Alliance's digital transformation.

https://www.nato.int/cps/en/natohq/news_208582.htm

Science & Technology News



Wed, 26 Oct 2022

The Heaviness of Rockets, why it Matters in Space Flight

By Amitabh Sinha

The Indian Space Research Organisation (ISRO) crossed an important milestone with the successful launch of the LVM3 M2/OneWeb India-1 mission on Sunday. The LVM3 rocket carried almost 6 tonnes of payload into lower-earth orbit, the most that any ISRO mission has delivered into space till date. The success of the flight not only re-validated the viability of the LVM3 rocket, ISRO's most advanced launch vehicle, for keenly-awaited missions like the

Gaganyaan, but also affirmed the agency’s claim as a serious player in the heavy satellite launch market. Very few countries have the capability to launch satellites weighing more than 2 tonnes. Until recently, even ISRO used to take the services of Ariane rockets of Europe to launch its heavy satellites. The LVM3 rocket, which used to be called GSLV Mk-III earlier, is meant to end that dependence, and also become the vehicle for the more ambitious parts of India’s space programmes — manned missions, Moon landings and deep space explorations — in the near future.

India’s rockets

Rocket Name	Origin / Agency	Liftoff Mass (tonnes)	LEO Payload Capacity (tonnes)	GTO Payload Capacity (tonnes)
Ariane 5	Europe's Heaviest	780	20	10
Long March	China's Heaviest	850	—	14
Falcon Heavy	SpaceX, Most Powerful for Commercial Uses	1,420	64	27
Space Launch Vehicle	NASA's Latest, Meant for Deep Space Exploration	3,000	—	27 (to moon and beyond)

**Standard; Liftoff mass & payload capacity in tonnes*

India currently has three operational launch vehicles — the Polar Satellite Launch Vehicle or PSLV, of which there are multiple versions; the Geosynchronous Satellite Launch Vehicle or GSLV Mk-II; and the Launch Vehicle Mark-3 or LVM3.

The PSLV has been the most commonly used, having carried as many as 53 successful missions since 1993. Only two flights of PSLV have failed. The GSLV-MkII rocket has been used in 14 missions, of which four have ended in failures, most recently in August last year. The LVM3 has

flown five times, including the Chandrayaan 2 mission, and has never disappointed. In addition, ISRO has been working on a reusable launch vehicle (RLV). Unlike other rockets, the RLV would not end up in space as waste. Instead, it can be brought back and refurbished for use multiple times. India currently has three operational launch vehicles — the Polar Satellite Launch Vehicle or PSLV, of which there are multiple versions; the Geosynchronous Satellite Launch Vehicle or GSLV Mk-II; and the Launch Vehicle Mark-3 or LVM3.

Heavier rockets

LVM3 is the culmination of more than three decades of efforts to indigenously develop a rocket that can carry heavier payloads, or venture much deeper into space. These requirements not only result in a massive increase in the size of the rocket, but also necessitate a change in the engines and the kind of fuel being used.

Compared to vehicles that ply on land, or even on water, rockets are an extremely inefficient medium of transport. The passenger (or payload) comprises barely 2 to 4 per cent of the weight of the rocket. Between 80 and 90 per cent of the launch-time weight of any space mission is the fuel, or the propellant. This is because of the unique nature of a space journey, which involves overcoming the tremendous force of gravity.

The LVM3 rocket, for example, has a lift-off mass of 640 tonnes, and all it can carry to lower earth orbits (LEO) — about 200 km from the Earth’s surface — is a mere 8 tonnes. To the geostationary transfer orbits (GTO) that lie farther ahead — up to about 35,000 km from Earth — it can carry much less, only about 4 tonnes. However, the LVM3 is not particularly weak when compared to the rockets being used by other countries or space companies for similar jobs.

The Ariane 5 rockets, frequently used by ISRO earlier for its heavy payloads, has a lift-off mass of 780 tonnes, and can carry 20-tonne payloads to lower earth orbits and 10 tonnes to GTO.

The Falcon Heavy rockets from SpaceX, supposed to be the most powerful modern launch vehicles, weigh over 1,400 tonnes at launch time, and can carry payloads weighing only about 60 tonnes.

The constraints

The size of a launch vehicle is dictated by the destination in space it is headed towards, the kind of fuel — solid, liquid, cryogenic, mix — that is being used, and the size of the payload. The choice of any two of these variables places severe restrictions on the flexibility of the third, a predicament that is popularly referred to as the “tyranny of the rocket equation” in the space community.

Not surprisingly, most of a rocket’s energy is burnt in travelling to the lower earth orbit. This is because the force of gravity is the strongest here. The journey farther into space is much more smooth, and requires far less energy. In fact, it takes half as much energy for a rocket to travel to the Moon from the LEO (a journey of nearly 4 lakh km) compared to what it takes to travel to LEO from Earth (about 200 km). It is for this reason that it is often said that the giant leap for mankind was not setting foot on the Moon, but in reaching the LEO.

If a space mission is headed towards the Moon or Mars or any other celestial body, the gravity of the destination also enters the equation. More energy would be expended in reaching such a destination, compared to simply attaining a space orbit to deposit a satellite.

HEAVYLIFTERS



LVM3

INDIA'S HEAVIEST,
WILL ALSO BE USED
FOR GAGANYAAN

Liftoff Mass: 640

Payload Capacity:

LEO: 8

GTO: 4



PSLV

INDIA'S MOST
PROLIFIC

Liftoff Mass: 320*

Payload Capacity:

LEO: 1.75

GTO: 1.4



GSLV MK-II

MEANT FOR
HEAVIER
COMMUNICATION
SATELLITES

Liftoff Mass: 415

Payload Capacity:

LEO: 6

GTO: 2.25

The PSLV has been the most commonly used, having carried as many as 53 successful missions since 1993. Only two flights of PSLV have failed.

The efficiency of the fuel being used is the other constraint on the flight of the rocket. Several chemicals are used as rocket fuels. They deliver different thrusts. Most modern-day rockets use multiple sets of fuels to power the different stages of the flight to optimise the results. The LVM3, for example, has solid fuels in the boosters which provide additional thrust during liftoff, a liquid stage, and a cryogenic stage.

Engineering ingenuity

With dreams of setting up a permanent station on the Moon, and taking human beings to Mars and beyond, rockets would need to carry more and more stuff to space. But the capacity of rockets is severely limited.

There are two kinds of engineering innovations that can be employed to fulfill the objectives of future missions. The rockets can make multiple trips, carrying components of larger structures that can be assembled in space. This is how the International Space Station and other similar facilities were built.

The other is the possibility of the use of resources available in situ on the Moon and Mars. In fact, all future missions to the Moon are attuned to exploring this possibility.

<https://indianexpress.com/article/explained/explained-sci-tech/isro-oneweb-mission-satellite-rockets-8229773>



Tue, 25 Oct 2022

Explained: Why ISRO Launched LVM3 at 12:07am & Why Only 36 Satellites on Biggest Rocket?

For those who observe very closely, no two rocket launches (months apart or years apart) take place at the exact same time. Each lift-off has its own specific, unique timing, down to the minute. Some happen at dusk, some at dawn, some during the midnight hour etc. For example, the recent launch of the LVM3, India's largest rocket carrying 36 satellites from UK-based company OneWeb, took place at 00:07hrs IST on October 23. There is an entire branch of space science known as 'Orbital Mechanics' that is used to determine what is known as a 'Launch window', a period of time within which a certain launch must happen. Launch windows depend on a plethora of factors - place of launch, type of orbit intended, final destination, whether it is headed for another planet, number of satellites being carried, the time of the year, the position of the relevant heavenly bodies and also minimal risk of space debris.

In the case of OneWeb Launch, 14 which was carried out from India's Satish Dhawan Space Centre, Sriharikota, the launch was originally scheduled for Friday, 22nd October night. However, due to some factors, the launch was carried out on Sunday 00:07am IST. OneWeb Officials told WION that they had determined the time of launch, in close coordination with ISRO, as the former were the paying customers for the launch. Interestingly, launch day 23rd October also happened to be the birthday of the Chairman of OneWeb, but that was just an extremely rare coincidence, with no relevance to the launch. It must be noted that the Indian LVM3 rocket can carry anywhere between eight to 10 tons of payload to Low Earth orbit. However, OneWeb only put 36 satellites (weighing 6 tons in total) on board the rocket. Queried about why the company did not make full use of the payload capacity and derive maximum value out of the launch, Massimiliano Ladovaz, CTO, OneWeb told WION that it was a limitation posed by the satellite dispenser that they used.

Ladovaz explained to WION that the satellite dispenser was originally meant for only 36 satellites and was supposed to fly on a Soyuz rocket. Owing to circumstances, when OneWeb decided to launch their satellites on ISRO's LVM3, they knew that they had to go with 36 satellites on the existing dispenser or spend precious time for getting a new dispenser. "We would have liked to and could have done more (launched more satellites on this LVM3 rocket), however getting a new dispenser to accommodate more satellites would have taken more time"

he elaborated. With Low Earth orbit getting increasingly populated with constellations of communication satellites from various firms, astronomers have raised concerns. The issues are primarily to do with light getting reflected from the satellites' solar panels, satellite trails appearing in astronomical images and adversely affected the field of view of astronomers.

When queried about what OneWeb was doing to mitigate this issue, Ladovaz told WION that the company was working with astronomers to measure the exact impact and prepare to reduce it. He also said that the OneWeb satellites were placed in an orbit that was too high to be visible. However, he did acknowledge that they could be seen in some conditions by astronomers. He added that the company was working on reducing this adverse impact by darkening some reflective surfaces of their Next-gen constellation of satellites.

<https://www.wionews.com/science/explained-why-isro-launched-lvm3-at-1207am-why-only-36-satellites-on-biggest-rocket-528247>



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A Reinforcement Learning-Based Four-Legged Robotic Goalkeeper

Researchers at the Hybrid Robotics Group at UC Berkeley, Simon Fraser University and Georgia Institute of Technology have recently created a reinforcement learning model that allows a quadrupedal robot to efficiently play soccer in the role of goalkeeper. The model introduced in a paper pre-published on arXiv, improves the robot's skills over time, through a trial-and-error process. "By letting quadrupeds play soccer, we can push the limits of the artificial intelligence of athletic legged robots," Xiaoyu Huang, Zhongyu Li, Yanzhen Xiang, Yiming Ni, Yufeng Chi, Yunhao Li, Lizhi Yang, Xue Bin Peng, and KoushilSreenath, the researchers who carried out the study, told TechXplore. "Goalkeeping is an interesting but challenging task that requires the robot to react to the fast-moving ball, sometimes flying in the air, and intercept it using dynamic maneuvers in a very short amount of time (usually within one second). By solving this, we can thus also gain insight about how to create intelligent and dynamic legged robots."

The key objective of the recent work by Huang and his colleagues was to create a four-legged robot goalkeeper that can perfect its skills as it plays, just as a human goalkeeper would. To do this, the researchers developed a reinforcement learning model that trains the robot via a trial-and-error process, rather than through a fixed, human-engineered strategy. "The robot first learns different locomotion control policies to preform distinct skills, such as sidestep, dive, and jump, while tracking randomized trajectories for the robot's toes," the researchers explained. "Based on these control policies, the robot then learns a high-level planning policy to select an optimal skill and motion to intercept the ball after examining the detected ball position and robot's states."

The researchers trained their reinforcement learning model in a series of soccer-game simulations. Subsequently, they deployed the policies it learned on the Mini Cheetah, a real quadrupedal robot developed at the Massachusetts Institute of Technology (MIT) and tested its performance in the real world. The reinforcement learning framework created by Huang and his

colleagues was found to greatly improve the abilities of the Mini Cheetah robot as a soccer goalkeeper. In the team's real-world tests, the robot was able to save 87.5% of 40 random shots. "I think that the coolest aspect of our work is that, using our proposed method, the quadrupedal robot Mini Cheetah is able to perform very dynamic and agile locomotion skills, such as jumping and diving, as well as fast and precise manipulation skills, such as pushing the ball away using its swinging legs in a very short amount of time," the researchers said. "This actually pushes the boundaries of legged locomotion, showing that the leg can also be a manipulator, just like it can be for humans."

In the future, the reinforcement learning model created by this team of researchers could be used to improve the performance of robots designed to participate in RoboCup and other robotic soccer competitions. In addition, their model could be used to improve the agility and physical abilities of quadruped robots designed to tackle entirely different tasks, such as search & rescue missions. "We hope that we can enable quadrupedal robots to compete with human soccer players in the near future," the researchers added. "The robots need to perform larger variety of dynamic and agile motions and attain more intelligence in the soccer game."

<https://techxplore.com/news/2022-10-learning-based-four-legged-robotic-goalkeeper.html>

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