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DRDO News

DRDO Technology News

पंजाब कैसरी

Mon, 12 Sep 2022

लेजर आधारित हथियार प्रणालियों को अपना रहा है भारत, डीआरडीओ और सीएचईएसएस मिलकर कर रहे हैं काम

भारत के रक्षा क्षेत्र को दूसरे स्तर पर ले जाने के उद्देश्य से रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) सरकार द्वारा प्रदान की जाने वाली सुविधाओं का अधिकतम उपयोग कर रहा है। जैसे-जैसे दुनिया लेजर आधारित हथियार प्रणालियों की ओर बढ़ रही है, भारत डीआरडीओ के तहत सेंटर फॉर हाई एनर्जी सिस्टम्स एंड साइंसेज (सीएचईएसएस) जैसे संगठनों के साथ मिलकर काम कर रहा है। भारत में सीएचईएसएस इस तरह के लेजर आधारित विकसित हथियार प्रणालियों के लिए नोडल केंद्र है।

हैदराबाद में स्थित सीएचईएसएस और डीआरडीओ के तहत एक रक्षा प्रयोगशाला स्थापित की गई है। रिपोर्ट्स के मुताबिक सीएचईएसएस हाई एनर्जी लेजर सिस्टम पर रिसर्च और काम करता है। संगठन राष्ट्र की रक्षा प्रौद्योगिकी के आधुनिकीकरण के प्रयास में डायरेक्ट एनर्जी वेपन्स (डीईडब्ल्यू) के साथ प्रयोग कर रहा है। ये हथियार लेजर तकनीक का उपयोग करके शत्रुतापूर्ण लक्ष्यों को नष्ट करते हैं। कोई भी शत्रु वस्तु, चाहे वह ड्रोन हो, दुश्मन की नाव या मोर्टर जो उच्च-ऊर्जा वाले लेजर के संपर्क में आते हैं, इन हथियारों के माध्यम से नष्ट किए जा सकते हैं। आम आदमी के शब्दों में डीईडब्ल्यू उच्च-ऊर्जा बीम या लेजर पर ध्यान केंद्रित करके अस्थायी या स्थायी रूप से लक्ष्य को नष्ट या नुकसान पहुंचाने में सक्षम हैं। ऑल इंडिया रेडियो

की रिपोर्ट के अनुसार सीएचईएसएस द्वारा विकसित प्रणालियों के अनुप्रयोग में कर्मियों, मिसाइलों, ड्रोन, वाहनों और जमीन, हवा या पानी पर ऑप्टिकल उपकरणों जैसे लक्ष्यों को बेअसर करना शामिल है।

भारत की सुरक्षा चिंताओं को देखते हुए डीईडब्ल्यू एक आवश्यक भूमिका निभाएगा, खासकर ऐसे समय में जब हमारे पड़ोसी देश भी इस तरह के हथियारों का प्रयोग कर रहे हैं। डीईडब्ल्यू भविष्य के हथियार हैं। सीएचईएसएस इन हथियार प्रणालियों के हार्ड किल और सॉफ्ट किल दोनों भागों पर काम कर रहा है जो देश को खतरों से बेहतर तरीके से निपटने में सक्षम बनाएगा। रिपोर्ट में कहा गया है कि ये प्रणालियां भारत को अपने विरोधियों पर रणनीतिक और परिचालन श्रेष्ठता प्रदान करेंगी। सीएचईएसएस के एक वैज्ञानिक रविशंकर ने मीडिया को दिए एक बयान में कहा कि डीआरडीओ ने इन रक्षा प्रणालियों के बड़े पैमाने पर उत्पादन के लिए भारत इलेक्ट्रॉनिक्स लिमिटेड (बीईएल) के साथ गठजोड़ किया है क्योंकि यह केवल एक आर एंड डी संगठन है।

<https://www.punjabkesari.in/international/news/national-news-punjab-kesari-laser-drdo-chess-dew-1674044>

Defence News

Defence Strategic : National/International

THE ECONOMIC TIMES

Mon, 12 Sep 2022

Citing Russia-Ukraine War, Indian Army Chief General Manoj Pande Highlights Importance of Logistics in Conflicts

Indian Army Chief General Manoj Pande on Monday highlighted the importance of logistics in conflicts citing the Russia-Ukraine war as an example. Referring to the Russia-Ukraine war at Army Logistics Conference, he said, "While the war shows little signs of ebbing, there are important lessons for those concerned with national security. One such lesson that has emerged

clearly is that pace, intensity and reach of military operations ride on strength, agility and capacity of logistic support."

Army logistics, also known as military logistics, refers to the process of planning and confirming that the movement and maintenance of the armed forces are in due accordance with previous plans and procedures. It deals with procurement, maintenance, distribution and replacement of personnel and material. "Wars aren't fought between militaries alone; they remain a whole nation endeavour. Wars test national resilience and stretch the nation's resources and capacities. The ongoing conflict between Russia and Ukraine, which has already passed the half-yr mark is an apt example," said the Army Chief. It is a fact that logistics is as vital to military success as daily food is to daily work. Moreover, there are many examples which prove that battles, campaigns, and even wars have been won or lost primarily because of logistics, he said.

"Whilst military infrastructure will continue to meet the immediate and specific demands of armed forces, it is the civil-military fusion with the support of Indian industry that shall provide the bulwark for execution & sustenance of future operations," said Pande.

The Army Chief also said that the quick steps taken by the US, the UK, Russia and, most recently, China in implementing efficient joint military-civil structures underline the urgency of the issue. The war between Russia and Ukraine entered a new phase after Kyiv dealt a big blow to Moscow's grip on parts of the east with a fast-moving offensive that saw Ukrainian troops enter the strategic city of Iziom after six months of occupation.

The reason for it can be ascribed to logistical support. "Weapons, weapons, weapons have been on our agenda since spring. I am grateful to partners who have answered our call: Ukraine's battlefield successes are our shared ones. Three agenda items now are schedule, schedule, and schedule. Prompt supplies bring victory and peace closer," tweeted Dmytro Kuleba, Minister of Foreign Affairs of Ukraine.

Defence Minister Rajnath Singh too underscored the vital importance of logistics at the Army Logistics Conference. "Logistics is a significant component of the domestic and international economy. Today India is the 5th largest economy in the world and we are moving towards a 5 trillion economy. Logistics review and reforms needed today as per 21st century," said Singh.

He also stressed the Jointness between the three services. "The role of logistics in the defence sector is also very important. Jointness between the three services is a major dimension in the policy changes that have taken place in the Defence Ministry in the last three years," said the Defence Minister.

<https://economictimes.indiatimes.com/news/defence/citing-russia-ukraine-war-indian-army-chief-general-manoj-pande-highlights-importance-of-logistics-in-conflicts/printarticle/94149102.cms>

Tue, 13 Sep 2022

Conflict Tests National Resilience: Army Chief

Wars are not fought by militaries alone as it is a national endeavour and the conflict tests “national resilience,” Army Chief General Manoj Pande said here on Monday.

He also said logistics support to the frontline troops is a paramount importance in fighting as intensity and reach of military operations rides on strength, agility and capacity of this back up provided by fusion between military and civil infrastructure including Indian industry.

Underlining this crucial factor in modern warfare, he said, “Wars test national resilience and stretch the nation's resources and capacities. Ongoing conflict between Russia and Ukraine, which has already passed the half-year mark is an apt example,” he cautioned. Pande made these observations in the first Indian Army Logistics seminar, organised on the theme ‘Samanjasya Se Shakti.’

Addressing the seminar, Defence Minister Rajnath Singh said the government is committed to creating a robust, secure and self-reliant logistics system to effectively deal with future security challenges.

Giving this assurance, he also said the government is focussing on establishing common logistics nodes in the country in tune with the needs of the three services.

Through these nodes, the resources of one service will be seamlessly made available to the rest, he said. Elaborating upon the seamless logistics backup especially after the Russian military action in Ukraine, the Army Chief said the quick steps taken by the US, UK, Russia and most recently by China in implementing efficient joint military-civil structures underline the urgency attached to the issue. “While the war shows little signs of ebbing, there are important lessons for those concerned with national security. One such lesson that has emerged clearly is that pace, intensity and reach of military operations rides on strength, agility and capacity of logistic support,” he said.

Pande emphasised on bringing synergy in the efforts of the nation to make India a global powerhouse of defence logistics. He exuded confidence that the ongoing efforts will not only cater to the domestic needs, but also help the friendly foreign countries.

Rajnath said Information and Communication Technology (ICT) architecture is a major part of efficient logistics. He also called for civil-military fusion to further strengthen the logistics system and stay prepared to deal with future challenges. The minister emphasised that logistics in future wars will require jointness not only among the three services, but "also among different

bodies in the form of industrial back-up, research and development, material support, industry and manpower".

Rajnath spoke about the synergy needed between civil and military stakeholders, and asserted that presence of representatives from different sectors of the two sides showed the "commitment" to achieve the goal as India stood on the threshold of an 'Amrit Kaal'.

He also underlined that India has made rapid progress in the rail and other sectors in transportation. In the five years preceding 2014, doubling of tracks of 1,900 km of railway lines was done. And, in the last seven years doubling of line has been done for over 9,000 km of railway lines, he said. Rajnath termed jointness among the three services as one of the major policy changes made in Ministry of Defence in the last few years, which has benefited a number of sectors across the board, especially logistics.

<https://www.dailypioneer.com/2022/india/conflict-tests-national-resilience--army-chief.html>

THE ECONOMIC TIMES

Tue, 13 Sep 2022

Civil-military Fusion will Strengthen Logistics: Rajnath Singh

Calling for greater synergy and civil-military fusion for logistics, Defence Minister Rajnath Singh said future wars would require a joint approach with the industry and there needs to be a lot of research and development backing the armed forces.

He said the government is committed to creating a “robust, secure, speedy and Aatmanirbhar” logistics system that includes the Gati Shakti project to deal with future challenges.

“Future wars will require jointness not only among the three services, but also among different bodies in the form of industrial back-up, research and development, material support, industry and manpower,” the minister said while addressing an Indian Army Logistics seminar.

The minister called for formulating policies to enhance mutual trust between civil and military organisations and suggested that the best practices of different countries could be studied.

Chief of Army Staff General Manoj Pande said synergised efforts can make India a global powerhouse of defence logistics and ongoing efforts will not only cater to domestic needs but also assist friendly foreign countries.

<https://economictimes.indiatimes.com/news/defence/rapidly-moving-towards-jointness-of-three-services-says-rajnath-singh/printarticle/94146968.cms>

Business Standard

Mon, 12 Sep 2022

India is Rapidly Moving towards Combining the Armed Forces: Rajnath Singh

Defence Minister Rajnath Singh said on Monday that India is rapidly moving towards joining the three armed forces and efforts are on to have common logistic nodes so that the resources of one service can be made available to the other in a seamless manner.

"We are rapidly moving towards connectivity of all three services," Singh said, adding that "Our effort is to have common logistic nodes so that the resources of one service can be seamlessly made available to other services."

The Defence Minister spoke of the necessary synergy and fusion between civil and military stakeholders, and stressed that the presence of representatives from different sectors from both sides shows the "commitment" to achieving the goal that India envisions.

In the programme organised at Manekshaw Centre in Delhi Cantonment, he said that logistics is one of the sectors which has benefited the most from this collaboration.

Addressing the seminar on Army Logistics here, the Union Minister said that India has made rapid progress in the rail sector and more than 9,000 km of lines have been doubled in the last seven years. He said in the five years before 2014, the figure was only 1,900 kms.

https://www.business-standard.com/article/current-affairs/india-is-rapidly-moving-towards-combining-the-armed-forces-rajnath-singh-122091200594_1.html

तीनों सेनाओं के एकीकरण की ओर तेजी से बढ़ रहे कदम : राजनाथ

नया कदम ▶ रक्षा मंत्री ने कहा, साजो-सामान के लिए साझा मंजूरी व्यवस्था होगी

एक सेना का संसाधन अन्य को उपलब्ध कराया जाएगा

नई दिल्ली, प्रेस : रक्षा मंत्री राजनाथ सिंह ने कहा है कि देश तीनों सेनाओं का एकीकरण करने की दिशा में तेजी से आगे बढ़ रहा है। साजो-सामान के लिए साझा मंजूरी व्यवस्था कायम करने के प्रयास किए जा रहे हैं, ताकि एक सेना के संसाधनों को अन्य सेनाओं के लिए निर्बाध रूप से उपलब्ध कराया जा सके। सेनाओं के एकीकरण से सबसे अधिक फायदा साजो-सामान को लेकर होगा।

सोमवार को सैन्य साजो-सामान के बारे में एक सेमिनार को संबोधित करते हुए राजनाथ ने कहा, रेलवे के क्षेत्र में देश ने तेजी से प्रगति की है। गत सात वर्षों में 9,000 किलोमीटर से अधिक लाइनों को डबल ट्रैक किया गया। इसकी तुलना में 2014 से पहले के पांच वर्षों में सिर्फ 1,900 किमी रेल लाइन का दोहरीकरण किया गया था। सेमिनार के उद्घाटन समारोह में सेना प्रमुख जनरल मनोज पांडे, वायुसेना प्रमुख एयर चीफ



नई दिल्ली में सोमवार को सैन्य साजो-सामान पर सेमिनार के दौरान वायुसेना प्रमुख वीआर चौधरी, थलसेना अध्यक्ष मनोज पांडे और नौसेना प्रमुख आर. हरि कुमार के साथ राजनाथ सिंह। एएनआई

मार्शल वीआर चौधरी और नौसेना प्रमुख एडमिरल आर. हरि कुमार तथा नीति आयोग के सदस्य वीके सारस्वत समेत अन्य लोग शामिल हुए।

दिल्ली कैंट के मानेकशा सेंटर में आयोजित कार्यक्रम में राजनाथ ने नागरिक और सैन्य हितधारकों के बीच तालमेल पर जोर दिया। कहा कि भारत आज 'अमृत काल' की दहलीज पर खड़ा है। ऐसे में दोनों पक्षों के विभिन्न क्षेत्रों के

प्रतिनिधियों की उपस्थिति लक्ष्य को प्राप्त करने के लिए 'प्रतिबद्धता' दर्शाती है।

उन्होंने कहा, सरकार भविष्य की सुरक्षा चुनौतियों से प्रभावी ढंग से निपटने और देश को और अधिक ऊंचाइयों पर ले जाने के लिए एक मजबूत, सुरक्षित, तेज और आत्मनिर्भर सैन्य आपूर्ति प्रणाली बनाने के लिए प्रतिबद्ध है। उन्होंने सूचना और संचार प्रौद्योगिकी (आइसीटी) पर अपना दृष्टिकोण भी साझा किया। कहा

कि सभी सेनाओं ने अपना आइसीटी ढांचा विकसित किया है। हमारा प्रयास है कि तीनों सेनाओं के बीच अंतर-संचालन हो, ताकि हम अपने संसाधनों का सर्वोत्तम तरीके से उपयोग कर सकें।

रक्षा मंत्री ने कहा, भविष्य की लड़ाइयों के दौरान साजो-सामान आपूर्ति मामले में सिर्फ तीनों सेनाओं के एकीकरण की जरूरत नहीं होगी। औद्योगिक बैकअप, अनुसंधान और विकास, सामग्री सहायता, उद्योग और जनशक्ति के बीच भी सहयोग आवश्यक होगा।

सेना प्रमुख ने कहा, लड़ाई में साजो-सामान अब भी अहम : एएनआई के अनुसार, सेना प्रमुख जनरल मनोज पांडे ने सोमवार को रूस और यूक्रेन युद्ध का हवाला देकर कहा कि लड़ाई में साजो-सामान का महत्व अब भी बना हुआ है। उन्होंने कहा, राष्ट्रीय सुरक्षा के मामले में रूस-यूक्रेन संघर्ष से कई महत्वपूर्ण सबक मिले हैं। एक सबक यह भी है कि रफ्तार, मारक क्षमता और सेना की कार्यवाही साजो-सामान की आपूर्ति पर निर्भर है।

HT Hindustan Times

Army Prepared for any Eventuality in Eastern Sector, Says General Kalita

Eastern Army commander Lieutenant General RP Kalita said the army was fully prepared for any eventuality in the eastern theatre, focusing on further upgrading military capability along the border with China and infrastructure development, and monitoring Chinese People's Liberation Army (PLA) activity across the Line of Actual Control (LAC). "The border issue with China is being dealt with at all levels to ensure there is no friction. A robust mechanism is in place to

defuse any emerging situation or tension at the tactical level. We are focusing on operational capability development in all spheres,” Kalita said. His comments came on the sidelines of a function held at Kibithu in Arunachal Pradesh on September 10 when the army base there was renamed after India’s first chief of defence staff, the late General Bipin Rawat, in recognition of his service. The situation along LAC in the eastern sector is “reasonably calm and firmly under control,” Kalita said. “There have been reports of continued infrastructure development by the PLA and we are constantly monitoring the same.

Asked to comment on any visible impact of the ongoing standoff in Ladakh on the eastern sector, he said, the dynamics of Eastern and Northern Commands are totally different. “The terrain, size of area of operations, operational dynamics and objective of operations are all varied in a peculiar way. Till now, we have had cordial relations at the functional level of ground commander and there have been hardly any friction areas in the recent past in the east.” The situation has been stable in the eastern theatre, he said.

The army, which has focused on counter-insurgency operations in the North-east for decades, has carried out an overarching reorientation of its forces to sharpen its focus on LAC in the eastern sector, even as induction of new weapons and systems, capability building and a strong infrastructure push form the bedrock of its strategy to counter China.

“The deployment of the army for counter-insurgency duties is dictated by the security situation and the violence parameters. As the situation improves, the army is de-inducted and the Central Armed Police Forces/police take on the responsibility of ensuring peace and stability. In the North-east, with improvement in the situation, the army has got de-inducted and is geared for its primary role,” Kalita said. Infusion of latest technology is one of the army’s top priorities, and there has been substantial improvement in its surveillance capability with the induction of new platforms and systems, he said. “Now with better infrastructure close to LAC, we are in a better position to observe our areas of interest. It is an ongoing process and with improvement in connectivity and infrastructure, we will further enhance our reach and depth of surveillance,” he added. While the standoff is ongoing in eastern Ladakh, the eastern sector cannot be ignored, former Northern Army commander Lieutenant General DS Hooda (retd) had earlier said.

“Particularly in certain areas of Arunachal Pradesh, the road infrastructure is still inadequate. The push now being given to capability building and infrastructure will be a deterrent for any action by the PLA in this sector,” he said. Infantry battalions guarding LAC with China in Arunachal Pradesh are racing to equip themselves with new weapons and systems to sharpen their combat edge, with the capability upgrade encompassing light machine guns, assault rifles, rocket launchers, unmanned aerial vehicles, all-terrain vehicles and high-tech surveillance gear.

Helipads, capable of operating multi-mission Chinook helicopters, are also coming up in remote pockets for faster deployment of soldiers and weaponry as part of an overarching infrastructure push, even as new satellite terminals along the border will provide high-capacity communications capability to plan operations, as earlier reported by HT.

<https://www.hindustantimes.com/india-news/army-prepared-for-any-eventuality-in-eastern-sector-says-general-kalita-101663007426697.html>

Foreign Companies Struggle to Meet Tech Specifications of Submarine Plan

The Indian Navy's plan to build six conventional submarines in India could get stalled with foreign technology partners finding it difficult to meet critical specifications for underwater endurance and stealth, besides having concerns on technology transfer.

The estimated '43,000-crore P75I project is already running several months behind time, with no firm response yet by foreign technology providers (both German, Korean companies) to request for proposals (RFP) floated by shortlisted Indian shipyards.

While Germany's ThyssenKrupp Marine Systems (TKMS) and South Korea's Daewoo Shipbuilding and Marine Engineering (DSME) have been in talks with Indian shipyards on the technical aspects of designing a new submarine for India, it is learnt that critical parameters required by the Navy may be difficult to incorporate. In a communication with Indian shipyards, the foreign companies are learnt to have requested for a toning down of technical requirements even when in the most critical requirement of underwater endurance.

The distinguishing feature of the new submarines is a sea-proven Air Independent Propulsion (AIP) system -- a critical component that will enable these boats to remain submerged for over two weeks, against the 2-3 days of underwater endurance of current submarines.

However, foreign technology partners are learnt to have asked for an easing in both underwater range and endurance. Similar concerns have been raised on the stealth rate required by the Navy, besides the dimension of the new submarine. In addition, foreign partners have also raised concerns on the transfer of technology required under the conditions of qualification. In one case, the bidding foreign partner has not yet obtained permissions from its government to share critical technology that took years to develop.

As reported by ET, objections had also been raised earlier over clauses in the draft contract which placed almost unlimited performance and delivery liability on the foreign technology partner. It is learnt that some of these clauses were modified in July after a top-level meeting in South Block. A dilution of technical requirements, however, could be a more complicated affair.

<https://economictimes.indiatimes.com/news/defence/foreign-companies-struggle-to-meet-tech-specifications-of-submarine-plan/articleshow/94161275.cms>



NewsOnAIR

Mon, 12 Sep 2022

Lok Sabha Speaker, MoS for Defence to Inaugurate National Defence MSME Conclave and Exhibition in Kota, Rajasthan Today

Lok Sabha Speaker Om Birla and Minister of State for Defence Ajay Bhatt will formally inaugurate the National Defence MSME Conclave and Exhibition in Kota, Rajasthan today. More than 50 companies, Startups and MSMEs working in defence sector are participating in the event. Senior officials of the Ministry of Defence, representatives of leading defence companies and defence experts are also participating in the program. An interactive session will be organized during the MSME Conclave. Many companies representative will participate In the session. Rajasthan's first Drone and Light Show will also be organized at Dashara Maidan kota in the evening. More than 250 drones will light up the sky by making different types of shapes. A live concert of pop band Euphoria will also be organized.

A large number of people are coming from Kota and the surrounding area for the defence exhibition. School children and coaching students are also visiting the exhibition.

<https://newsonair.com/2022/09/12/lok-sabha-speaker-mos-for-defence-to-inaugurate-national-defence-msme-conclave-and-exhibition-in-kota-rajasthan-today/>



FINANCIAL EXPRESS

Read to Lead

Mon, 12 Sep 2022

The Big Military Drift

By Lt Gen P R Shankar (R)

The contemporary Indian narrative is one of an emerging power whose economic strides are a beacon of light in the darkness of a global slowdown, inflation, and looming food insecurity. Tony Abbot, the ex-PM of Australia, calls India, the democratic superpower, the world needs.

The global head of Goldman Sachs calls this century an Indian Century. Heady stuff. Our Prime Minister draws widespread acclaim as an international statesman when he talks of India's rising role in global affairs. Our erudite External Affairs Minister with his sharp-witted interjections has put many doubting interlocutors in their place. India has overtaken its erstwhile colonial

master as the fifth largest economy and is on course to be the third largest by 2030. The world seems to be our oyster. Except that it is not. The main spoiler in this international oyster show is the Middle Kingdom. The 21st Century was to be a Chinese one. Where has India popped up from? Hence India has to be put in place. Irrespective of being in a perceptible all-round decline, China is sparing no effort to be the most modern and effective military power on earth. Consequently, it is aggressively leaning forward on the LAC and steadily closing Indian options.

PLA actions constantly threaten to force our hand to settle on a LAC on Chinese terms with a proviso of discussion on the future status of Arunachal Pradesh. Make no mistake. Xi Jinping will do everything in his power to destroy India if it comes in the way of his personal glory, the Middle Kingdom's primacy or the CCPs legacy. The PLA threat is now here and potent.

The '\$450 million spares for F16s' from the USA to Pakistan should also give us some distasteful food for thought. Our strategic partner is re-arming Pakistan to remind us of our relationship with Russia. If the USA can arm Pakistan when the necessity is to give it disaster assistance, we should be ready to continue to receive advice on trade management with China when we might actually need military cooperation.

Our quintessential partner Russia is so much into China that it will be a fool's paradise for us to rely on it for any purpose in case of any conflict with China. It is only the Indian Armed Forces which can stop the Chinese juggernaut. The only way forward is Atmanirbharta. Is all this rocket science? No. It is oft repeated plain common sense. The question then is...why have we sat back on our haunches? Why is India neglecting its military? Why is the government trying to catch up with Nehruvian times?

Neglecting the military? Am I talking sense or nonsense? We have just commissioned our indigenous aircraft carrier INS Vikrant and have placed orders for adequate Tejas', our own indigenous fighter aircraft. Surely, we are on the rise and on course! However, look behind this façade and there is another picture.

The planes to fly off the carrier's deck are yet to be locked in and they do not seem to be indigenous. The indigenous Tejas is not Atmanirbhar for engines. If the tap can be turned on for the F16 spares, it can be turned off for the Tejas engines also. Why are we in this state?

If I have to answer it in one word, it is 'Leadership'. Make no mistake; we have enough high caliber leaders Political, Bureaucratic and Military. However, are these brilliant people exhibiting leadership collectively to strengthen India militarily? That is the question. Prima facie my proposition might look askance to the extent of being negative. However, one must grasp the strands to weave the picture.

For a start, there is a lot of churn in the MOD- emphasis on 'Atmanirbharta', defence exports, ongoing reorganization of the erstwhile OFB, devolution of research to industry and academia, implementation of the import prohibited list and so on. These policies were welcome when

enunciated. However, they are on the verge of hollowness of inaction. There has been no one appointed as Secretary, Defense Production since long. The Defence Secretary is now wearing this additional hat. To expect him to be effective in this period of path breaking change is wishful thinking. He is not a superman. It is telling adversely on the system. The officer appointed as the advisor to the MOD has no experience in acquisition or procurement.

To expect him to step up to the task is also asking for too much. The largely non performing DRDO has been winged all of a sudden with the Secretary being changed mysteriously overnight. Add to all this, the post of the CDS has been left vacant since December. The NSA seems to be the 'go to' official in matters of the military. However, he has limitations of being only a human. My interaction with those who handle these affairs at the helm, middle and bottom indicates a rudderless drift. It is palpable. One might think that is being harsh. Let's take a look at some macro projects.

I have always opined that the Strategic Partnership model was an unwanted bureaucratic procedure. Now it is compounded by leadership issues. The submarine project under the Strategic Partnership has hit a major roadblock. The fact that we need an indigenous tank for high altitude came forth in 2020 in the Eastern Ladakh crisis. There was news that the high-altitude proven Vajra chassis was being converted into a tank. That was good news.

Suddenly one hears that the project is dumped after two years, and we are going in for a lighter variety which is available only with Russians! Is this the government concept of Atmanirbharta? Surprising? In fact, incredulous. Is there more than what meets the eye? In fact, even more curious is that ever since the Ukraine war commenced, the general 'Gyan' was to reduce dependance in Russia. This move seems to be increasing Russian Nirbharta. All said and done. The day when we will have indigenous submarines or tanks for high altitudes is only getting farther and not nearer.

Talking of Atmanirbharta, everyone was agog with praise, when two indigenous 155 mm guns – the Dhanush and ATAGS were under development. Dhanush recently entered service with fanfare. The feedback from the ground is that its firing is very accurate. Its teething problems can be overcome.

The major problem is with its production due to some self-erected roadblocks which are of erstwhile OFB heritage. If these cannot be surmounted with the new dispensation, then we are back to square one and the entire OFB re-organization is an exercise in futility. I cannot imagine for my life that the production of Dhanush is halted when there are completely indigenous solutions to its problems. On that I am clear. Is it external influence? Might be.

On the other hand, there is a lot of news about ATAGS when it has not yet passed its trials! It appears to be a competition between two indigenous contenders to edge out the other. This reminds me of the unseemly fight between Covaxin and Covishield in the national media when

the vaccines were being rolled out. Ultimately we needed both to kick the Wuhan Virus out of India.

Similarly, we need both the Dhanush and ATAGS to keep the Chinese at bay. We cannot do with one alone. Despite this being common knowledge, elements within the government itself seem to be killing one for the other. Vested interests? Possible. Lack of knowledge? Yes! lack of intent? That is most apparent. Lack of leadership? Definite.

I can go on with other cases. However, these major cases highlight the point I am making of the big drift. Just add to this mess. Our efforts at theatrisation have been undermined internally. Theatrisation, announced so proudly by our PM lies in tatters. The drift assumes dangerous proportions if one considers that the Indian Defence Industry is more interested in orders and is least interested in investing in R&D. If one combines this drift in capability building with the negatives of an un-modified Agnipath, the future is indeed bleak.

Let us not get fooled by the sweet words of Tony Abbot or the head of Goldman Sachs. We can neither be a Democratic Superpower nor can the 21st Century be an Indian one if our military is not capable enough. It takes sustained effort over long periods to build a strong military. If I put it simply. That effort is lacking. India is Aiming Without Arming. I hope my leadership is listening. India can not go off track. The Indian Military hierarchy needs to get its act together.

It is a measure of the strength of Indian Democracy as alluded by an ex Australian Prime Minister, that a commoner like me can question my leadership and supplicate for redress. I am sure I will get a positive response also. Try posing such a question to yourself-appointed 'leader for life' and you will find yourselves without minus some of our organs.

Then you will not be able to even mouth the expletives you have resorted to in your comments on my articles. That is the strength of Democracy. It has character. Anyway, none from the CCP mold will understand all this. That is why the 21st Century is turning slowly and steadily from a Chinese one to an Indian one.

<https://www.financialexpress.com/defence/the-big-military-drift/2664402>

The Tribune

Tue, 13 Sep 2022

Defence Export Mission

THE target of defence exports worth Rs 35,000 crore by 2025 is ambitious, given that the export of military equipment and technology worth Rs 13,000 crore during 2021-22 was a milestone for the Indian defence industry. What lends promise to coming close to achieving the goal is the increasing global interest in what India has to offer and the capability developments. The

BrahMos missile is being exported to the Philippines, opening doors for sales to various other Asian countries. A deal with Malaysia on the Tejas fighter jet is on the cards. The consistent progress in the indigenisation of weaponry is in line with the mission to become self-reliant, reduce dependence on imports and give more weightage to the export of military equipment to friendly countries.

The sway the leading arms manufacturing countries have over exports is clear from the figures. The US, Russia and France account for nearly 39 per cent, 19 per cent and 11 per cent of global sales, respectively. China has a share of 4.6 per cent. India is placed at the 23rd spot among the top 25 exporters of weapons and increasing its footprint can only be a gradual process. A reflection of that is visible in India's defence industry, which is participating in the global supply chain significantly. More than half of the exports are going to leading manufacturers in the US. The prime challenge is to establish itself as a provider of dependable goods at competitive prices and setting a sight on producing high-value items.

The commissioning of INS Vikrant, the first indigenous aircraft carrier built at a cost of Rs 23,000 crore, on September 2 was a defining moment in India's journey to emerging as a defence industrial and technological base. The launch of the Indian Navy's third Nilgiri-class guided-missile frigate, Taragiri, adds to the list of the state-of-the-art homegrown projects meant to strengthen the marine defence system. As it shoulders the huge responsibility, the defence industry, both private and public, needs all the assistance it requires.

<https://www.tribuneindia.com/news/editorials/defence-export-mission-431040>

The Statesman

Tue, 13 Sep 2022

The Case for and Against a Third Aircraft Carrier

By Maj Gen Harsha Kakar (R)

The launching of INS Vikrant, India's second aircraft carrier, is truly a moment of pride for the nation. It took thirteen years to build and cost over Rs 20,000 crores. Aircraft and helicopters for it have yet to be procured. Its construction provided 15,000 personnel with direct and indirect employment. It also led to collaboration between 550 companies of which 100 were micro, small and medium. It has a 76% indigenous content, which is laudable. With its launch, India joins the elite group of nations which construct their own carriers. An aircraft carrier has a life span of forty-fifty years, during which it undergoes multiple upgrades and refurbishing. Vikrant's launch has opened doors to discussion on whether India needs a third carrier.

The navy has been insisting that India must possess a three-carrier navy as its security challenges have grown over the years. As PM Modi stated during the launch, 'earlier, security concerns in

the Indo-Pacific region and Indian Ocean have been ignored. Currently, this region is a major defence priority. Hence, we are working in every direction, from increasing the budget for the Navy to increasing its capability.’ As the Indian economy grows, so will its trade, most of which would be sea-bound, securing which is the navy’s responsibility.

Added are security challenges posed by the Chinese navy and its efforts at enhancing Pakistan’s naval capabilities. As the Chinese navy expands, its footprints in the Indian Ocean would increase. However, their force levels operating in the Indian Ocean would remain restricted. Its berthing of submarines earlier and military research ship recently in Hambantota in Sri Lanka, acquiring a naval base in Djibouti and possibly another in Gwadar would necessitate India possessing adequate naval power. India’s navy does need a blue water capability but does this only flow through aircraft carriers is the question.

The navy also contends that in case India possesses three aircraft carriers, at any one time, two would be available. INS Vikramaditya, India’s other aircraft carrier has been unavailable for the past two years, undergoing refurbishment.

Simultaneously, there is a counter view that the age of aircraft carriers has passed. Its cost of construction, maintenance and alternatives, including use of island territories as airbases, and submarines for sea denial are cheaper and more viable. The guns versus butter argument will never cease. Added is their vulnerability to long-range missiles such as the Chinese DF 21D and DF 26. Loss of an aircraft carrier in operations is degrading for the nation. Further, with India not possessing expeditionary designs, aircraft carriers are considered unnecessary by few experts.

Even amongst naval strategists there is a debate on whether India must invest in a third carrier or build additional submarines, whose strengths has reduced to 16 from the desired 24. Most submarines currently in service are also nearing retirement. India’s defence budget will always be limited, from which all three services will seek their shares.

Those opposing aircraft carriers claim that submarines can effectively provide a ‘sea denial strategy’ as against a ‘sea control strategy’ created by ‘Carrier Battle Groups (CBG).’ In their opinion sea denial is a better option for a country like India, which lacks financial resources. On the contrary, the official naval doctrine advocates CBG and sea control as it would enable degrading the enemy’s naval power. As the naval chief, Admiral Hari Kumar, mentioned, ‘It’s not about either carrier or submarine, but the right balance between ships, submarines and aircraft.’

The third aircraft carrier, which the navy desires, is expected to be of 65,000 to 70,000 tonnes as compared to INS Vikrant of 45,000 tonnes. It is estimated to cost approximately Rs 80,000 to 90,000 crores, including provision of aircraft and helicopters. Such an expenditure could impact other modernization plans, as additional budgetary allocations are unlikely to be forthcoming, despite recommendations of the 15th Finance Commission.

Shortfalls in funds has already impacted the navy. It has reduced its projections for a 200-warship navy by 2027 to a 175 one as also lowered its demands for helicopters and P 81 Maritime multi-mission aircraft. Before committing to additional expenditure for a third aircraft carrier there is a need for it to reassess its ability to manage its budget and continue with modernization of the rest of its fleet.

The army and air force, though officially silent on the navy's demand for a third aircraft carrier, have also been concerned about depleting budgets and the impact on their share in case the navy's case for a third carrier is accepted. The air force is more concerned as its squadron strengths are rapidly depleting. General Bipin Rawat, as the CDS, was firmly against a third carrier, pushing for sea denial employing submarines and developing India's island territories as air bases.

Air power strategists claim that employing air to air refuellers would enhance the range of fighter aircraft to support naval operations from shore-based airfields. The Su 30MKI is claimed to possess a 1500 Km range which could be expanded with air-to-air refuellers. IAFs fighter fleet is equipped with harpoon and Brahmos cruise missiles to support naval operations.

There is no doubt that aircraft carriers are projection of a nation's capabilities in peace time. However, in the operational context Indian aircraft carriers are unlikely to be employed beyond the Indian Ocean region, for which a two-carrier fleet is sufficient. To ensure availability, reducing down time in refurbishment is therefore of greater importance than creating a reserve.

The navy must also consider whether it possesses the necessary flotilla to operate three CBGs, in addition to its routine movements. If the intention of procuring a third is availability of two in case of refitting of one carrier, then it may well be a very costly war reserve. There is also a need to assess whether constructing operational airfields in Andaman and Nicobar would be a cheaper and more balanced option as compared to building a third aircraft carrier. An indepth assessment must be made before the decision is taken. Based on lessons learnt, the third aircraft carrier can be built in under 10 years, hence decision-making cannot be delayed.

<https://epaper.thestatesman.com/3580205/Kolkata-The-Statesman/13-TH-SEPTEMBER-2022#page/7/2>



Tue, 13 Sep 2022

India, France to Review Defence Ties

India and France will review the entire gamut of their bilateral defence and strategic ties during French Minister for Europe and Foreign Affairs Catherine Colonna's three-day visit here

beginning Tuesday. She will hold talks with External Affairs Minister S Jaishankar. It is her first bilateral visit to India as foreign minister.

As part of her official visit from September 13-15, Colonna will travel to Mumbai for engagements with industry leaders and site visits on Thursday, a statement issued by the Ministry of External Affairs said on Monday. During her stay in New Delhi, Colonna will hold talks with Jaishankar on September 14 "on bilateral, regional and international issues of mutual interest", the statement said. India and France have a long-standing strategic partnership, strengthened by regular high-level consultations and growing convergence in various areas.

The minister's visit will pave the way for further strengthening of the partnership across trade, defence, climate, migration and mobility, education and health sectors, the statement said.

She will also virtually participate in the discussion on the theme "France and India in the Indo-Pacific: An essential partnership in challenging times." The two countries are closely working on initiatives focused on the Indo-Pacific region.

A French Air and Space Force contingent, including three Rafale combat jets, recently made a technical stopover at IAF station at Sullur in Tamil Nadu during a long-distance deployment to the Indo-Pacific, reflecting the close defence ties between the two sides.

The French Air and Space Force was conducting a long-range mission in the Indo-Pacific, codenamed "Pégase 22". The first stage of the mission aimed to demonstrate France's capacity for long-distance air power projection by deploying an air force contingent from metropolitan France to the French territory of New Caledonia in the Pacific Ocean in less than 72 hours.

<https://www.dailypioneer.com/2022/india/india--france-to-review-defence-ties.html>

यूएनएससी की स्थायी सदस्यता का भारत प्रबल दावेदार : जयशंकर

सुरक्षा परिषद वर्तमान स्वरूप में 21वीं सदी की भू-राजनीतिक यथार्थ का प्रतिनिधित्व नहीं करती

विदेश मंत्री ने सऊदी गजट से बातचीत में यूएनएससी को बदलती वैश्विक परिस्थितियों के अनुकूल होने की दी सलाह

रियाद, प्रेस : विदेश मंत्री एस. जयशंकर ने कहा है कि भारत संयुक्त राष्ट्र सुरक्षा परिषद (यूएनएससी) का स्थायी सदस्य बनने का प्रबल दावेदार है। सुरक्षा परिषद को न सिर्फ अंतरराष्ट्रीय सुरक्षा कायम रखने के अपने उद्देश्यों की पूर्ति, बल्कि प्रासंगिक बने रहने के लिए भी बदलती वैश्विक परिस्थितियों के अनुकूल होना चाहिए।

बतौर विदेश मंत्री सऊदी अरब की अपनी पहली यात्रा के दौरान जयशंकर ने कहा कि भारत लंबे समय से सुरक्षा परिषद में सुधार के प्रयासों में सबसे आगे रहा है और उसका स्थायी सदस्य बनने का हकदार है। सुरक्षा परिषद वर्तमान स्वरूप में 21वीं सदी की भू-राजनीतिक यथार्थ का प्रतिनिधित्व नहीं करती। यही वजह है कि इसमें सुधार की आवश्यकता पर व्यापक वैश्विक सहमति है। यूएनएससी का विस्तार न सिर्फ भारत, बल्कि अन्य गैर-प्रतिनिधित्व वाले क्षेत्रों



सऊदी अरब के जेद्दा में सोमवार को एक बैठक में द्विपक्षीय वार्ता के दौरान विदेश मंत्री एस जयशंकर और सऊदी अरब के क्राउन प्रिंस मोहम्मद बिन सलमान। प्रेस

के भी पक्ष में है।

समाचार पत्र सऊदी गजट को दिए गए साक्षात्कार में जयशंकर ने कहा, 'भारत सबसे बड़े लोकतंत्र, पांचवीं सबसे बड़ी अर्थव्यवस्था, परमाणु शक्ति संपन्न, प्रौद्योगिकी हब व वैश्विक संपर्क की परंपरा वाले देश के रूप में सुरक्षा परिषद का स्थायी सदस्य बनने का मजबूत दावेदार है।' जेद्दा स्थित अंग्रेजी दैनिक से बातचीत में जयशंकर ने कहा कि आज की वैश्विक अर्थव्यवस्था में

सऊदी अरब की भूमिका काफी अहम है। इसका आधार सिर्फ उसका विकास नहीं है, बल्कि ऊर्जा बाजार में उसकी व्यापक पैठ भी है। उन्होंने कहा कि खाड़ी देश भारत के अहम आर्थिक साझेदार भी हैं। वित्तीय वर्ष 2021-22 में खाड़ी देशों के साथ भारत का कारोबार 42.86 डालर से ज्यादा रहा। जयशंकर दोनों देशों के बीच संबंधों को और मजबूत करने के तरीकों पर चर्चा के लिए शनिवार को तीन दिवसीय यात्रा पर सऊदी अरब पहुंचे थे।

THE TIMES OF INDIA

Tue, 13 Sep 2022

India, China Disengage Troops at PP-15 but final Verification Awaited

India and China on Monday ‘virtually’ completed the troop disengagement at Patrolling Point-15 in the Gogra-Hot Springs area of eastern Ladakh, which India hopes will set the stage for further negotiations on the more crucial face-offs at the strategically-located Depsang Plains and Demchok.

The phased mutual pullback of troops from the standoff site at PP-15 near the Kugrang Nallah, with dismantling of temporary structures erected in the area and the creation of a “no-patrol buffer zone”, was initially slated to be fully completed by Monday.

Sources, however, said there has been “a slight delay” in the overall disengagement process because the final physical verification is still to be carried out by the two sides. “It should be completed by Tuesday,” a source said.

The buffer zone at PP-15 will be the fourth one to be established in the over 28-month-long military confrontation with China in eastern Ladakh. The earlier ones, varying from 3-km to almost 10-km, came up at PP-14 (Galwan Valley), PP-17A (Gogra) and Pangong Tso-Kailash Range region after troop disengagements at those face-off sites.

A major concern is that the buffer zones have largely come up in what India claims to be its territory, putting a stop to patrolling by Indian troops in those areas. In the buffer zone on the north bank of Pangong Tso, for instance, Indian troops withdrew westwards to their permanent Dhan Singh Thapa post between ‘Finger-2’ and ‘Finger-3’ (mountainous spurs) in February last year.

Chinese troops withdrew from ‘Finger-4’ to its Sirijap positions east of ‘Finger-8’. In effect, Indian troops can no longer patrol an around 10-km stretch in ‘Finger’ area now, though Indian maps show the line of actual control runs north to south at ‘Finger-8’.

Moreover, China till now has flatly refused to de-escalate the major face-off at the Depsang Plains, where its troops have been actively blocking Indian patrols around 18-km inside what India considers its own territory since April-May 2020.

Echoing these concerns, ex-Army chief General VP Malik (retd) said there is “no need to make much” of the disengagement at PP-15 because it is just “a tiny step” after the encroachments by the PLA in April-May 2020. “Every disengagement takes longer and longer. Major friction

areas, Depsang and Demchok where five PPs are blocked, are yet to be resolved. China continues to maintain that LAC ‘was illegally crossed by India’,” he tweeted. The creation of buffer zones is also no guarantee that PLA will not transgress hereafter.

<https://timesofindia.indiatimes.com/india/pp-15-pullback-complete-final-verification-awaited/articleshow/94162717.cms>

Science & Technology News



Tue, 13 Sep 2022

Scientists Develop Simple Technology to Produce Hydrogen Gas at Room Temperature

Scientists at the University of California Santa, Santa Cruz (UCSC) have developed a new method to efficiently generate hydrogen from water at ambient temperatures using aluminium and gallium. The research was published in the journal Applied Nano Materials in February and has a pending US patent application.

Aluminium is an excellent candidate material for this purpose because the highly reactive metal easily reacts with the oxygen molecules in water to release hydrogen gas. But the pure form of the metal is so reactive that it instantly reacts with air to create a coating of aluminium oxide on its surface, meaning it cannot react with water.

That is where gallium comes in. Gallium is liquid at slightly above room temperature and it removes the aluminium oxide coating that forms on the bare metal, allowing it to be in direct contact with the water and react with it. The reaction of aluminium and gallium with water to produce hydrogen gas is already common scientific knowledge but the new technology features innovations that bring it closer to practical applications.

According to the researchers, previous such studies mostly focused on using aluminium-rich composites. But they discovered that using a gallium-rich mixture led to an unexpectedly high rate of hydrogen production. “After the process, we could easily recover 95 per cent of Gallium that was used, without optimisation. The only other product that was formed was Alumina [Aluminium Oxide], which can be used for many other applications,” Scott Oliver, corresponding author of the research article, told indianexpress.com over email.

This is important because gallium is an expensive and rare mineral. Alumina has many applications including in spark plugs, abrasion-resistant tiles and cutting tools. Due to the new

proportion of the composite, not only was gallium removing the aluminium oxide coating, but it was also separating the aluminium into nanoparticles, which helped speed up the reaction. The researchers found that a 3:1 ratio of gallium and aluminium in the composite was the optimum ratio for the highest hydrogen production. Further, the composite is very easy to form. The researchers created it by manually mixing small amounts of aluminium into gallium.

While it remains to be seen whether this technology can be scaled up to produce hydrogen in commercial quantities, the researchers are optimistic. “It should be possible to scale up the technology to industrial levels of production. We were only limited by our apparatus to measure the hydrogen volume and the campus limits on hydrogen. Scale-up will require control of mixing the alloy but the reaction is spontaneous once the water is added,” added Oliver.

The worldwide push for electric vehicles has largely focused on battery electric vehicles (BEVs), which typically use lithium-ion batteries to store electricity that can be used to propel the vehicle using electric motors. An alternate technology involves the use of “hydrogen fuel cells” to generate electricity from hydrogen and use that to power the vehicle.

Hydrogen fuel cell vehicles present some advantages over BEVs—they can be refuelled with hydrogen as fast as a conventional vehicle can be refilled with fossil fuels. Also, they reduce dependence on minerals like lithium and cobalt, which are used to produce lithium-ion batteries.

But the use of hydrogen also comes with a major disadvantage. According to the US Department of Energy, a majority of the world’s hydrogen gas production comes from reforming fossil fuels like natural gas. And producing hydrogen using electricity from renewable sources is an energy-intensive process. New technologies like the one produced by the UCSC could remove this barrier to large-scale hydrogen fuel adoption.

<https://indianexpress.com/article/technology/science/scientists-develop-simple-technology-to-produce-hydrogen-gas-at-room-temperature-8147006/>

THE TIMES OF INDIA

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Hughes Ties Up with ISRO to Launch India's First High-Throughput Sat Broadband Service

Leading satellite internet provider Hughes Communications India (HCI) on Monday announced the commercial launch of India’s first high-throughput satellite (HTS) broadband service powered by Isro. The HCI, which is a subsidiary of US-based global broadband service major Hughes Network Systems, aims to deliver high-speed broadband across the country, including in the most remote areas beyond the reach of terrestrial networks, thus connecting enterprise and

government networks. The company had till now been providing limited broadband connectivity in some states and also to the Indian security forces along the China border, including in the Galwan region.

The Hughes HTS broadband service combines Ku-band capacity from Isro's Gsat-11 and Gsat-29 satellites with Hughes' JUPITER Platform ground technology to deliver high-speed broadband across India.

Speaking at the launch, Isro chairman S Somanath said, "With the new HTS capabilities powered by Isro satellites, we are confident that Hughes will continue to deliver excellent quality satellite broadband services and further enhance the connectivity experience that accelerates India's digital transformation. At Isro, we are committed to exploring and expanding the ways we can work with the private sector to help improve people's lives and bridge the digital divide."

Shivaji Chatterjee, senior vice-president of Hughes India, told TOI, "Though we have been providing limited broadband service for the last one year, it was specific and confined to J&K, Uttarakhand and Haryana as we took (service of) just one beam. This is because earlier the government's policy for shared infrastructure was not available. Now with recent regulatory changes, Isro's gateway opened and all regulatory approvals given, we have launched the national broadband service. Keeping in mind the strategic concerns of the government and its make-in-India drive, we went for the Indian satellites, not foreign ones, to cover the entire country." Chatterjee also informed TOI that HCI provides different kinds of (sat-based broadband) connectivity to the Indian Army and paramilitary forces like the BSF, SSB and ITBP patrolling the LAC and also to several border outposts. There are also specific services that we are providing to several Army battalions."

Partho Banerjee, president & MD of HCI, said the high-throughput satellite underscores the company's long-standing commitment to bridging the digital divide, delivering multi-megabit high-speed broadband at affordable rates. "This new service will address connectivity gaps and improve network performance and support high bandwidth requirements of government organisations, companies, cellular operators, mining and energy companies among other businesses," he said. HCI currently provides satellite broadband across more than 2 lakh business and government sites in India, supporting enterprises as well as as well as strategic central and state government projects. In use on over 75 satellites, the Hughes's JUPITER System is the de facto standard for both high-throughput and conventional satellite implementations worldwide. The service supports applications such as Wi-Fi hotspots for community internet access, managed SD-WAN solutions, backhaul to extend mobile network reach, and satellite internet for small businesses.

<https://timesofindia.indiatimes.com/india/hughes-ties-up-with-isro-to-launch-indias-first-high-throughput-sat-broadband-service/articleshowprint/94160281.cms>

