Feb
2021

समाचार पत्रों से चयित अंश
Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

खंड : 46 अंक : 30 11 फरवरी 2021

Vol.: 46 Issue : 30 11 February 2021

रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र
Defence Scientific Information & Documentation Centre
मेटकॉफ हाउस, दिल्ली - 110 054
Metcalfe House, Delhi - 110 054

CONTENTS

S. No.	TITLE	Page No.
	DRDO News	**1-9**
	DRDO Technology News	**1-9**
1.	Govt works to end China dependency on Li-ion batteries	1
2.	DRDO, ISRO to help develop alternatives like metal-ion to counter China dominated lithium battery industry	2
3.	Strategic tech: Becoming Atmanirbhar in batteries and chips is a national security imperative	3
4.	BrahMos, Tejas, artillery guns, grenades & more — India ready with defence export list	4
5.	Future fighters: Drone swarm, laser tech demo, AMCA nod likely this year	5
6.	DRDO's new next-gen close combat missile	7
7.	HAL, Wipro3D and CEMILAC collaborate to manufacture India's first metal 3D printed aircraft engine component	8
8.	Uttarakhand flash floods: DRDO team finishes first survey	9
	Defence News	**10-14**
	Defence Strategic National/International	**10-14**
9.	Theatre level operational readiness exercise (TROPEX 21) Indian Navy's largest war game	10
10.	Press release for signing of MoU between Indian Navy and IIT Delhi	11
11.	India exported military hardware worth Rs 34k cr in last 5 years: Govt data	12
12.	Indian Army leases 4 Heron Unmanned Aerial Vehicles from Israel as part of its emergency procurement	13
13.	Indian Army's firm stand forced China to disengage at LAC	14
	Science & Technology News	**15-21**
14.	ISRO plans new propulsion for deep space missions	15
15.	ISRO's first manned-mission Gaganyaan: Boeing responds to EoI for critical elements	16
16.	Placing cosmological constraints on quantum gravity phenomenology	18
17.	Silicon chip provides low cost solution to help machines see the world clearly	19
18.	First-ever observation of multi-photon Fano effect could lead to boost in quantum computing	20
	COVID-19 Research News	**21-21**
19.	New research shows exhaled respiratory droplets increase with onset of Covid-19, age and body mass index	21

DRDO News

DRDO Technology News

THE TIMES OF INDIA

Thu, 11 Feb 2021

Govt works to end China dependency on Li-ion batteries

By Dipak K Dash

New Delhi: In its bid to tide over India's complete dependence on lithium-ion batteries whose production is dominated by China, the road transport ministry is roping in agencies such as Defence Research Development Organisation (DRDO), Indian Space Research Organisation (ISRO) and IIT, Kanpur to carry out research on new technologies such as metal-ion and metal-air batteries.

Union road transport and highways minister Nitin Gadkari has called a hig- level meeting to prepare a road map for other options of high-quality batteries for vehicles other than lithium-ion for electric vehicles. Speaking at a webinar by the International Road Federation, the minister said the government needs to fix two issues road crashes and vehicular pollution.

According to a recent report by BloombergNEF on Global Lithium-Ion Battery Supply Chain Ranking, China leads the list of countries. It said China's success has come as a result of its large domestic battery demand, control over 80% of the world's raw material refining, 77% of the world's cell capacity and 60% of the world's component manufacturing. It has also projected that China will continue to occupy the top post while India's position would remain at number 16 in 2025.

The scientists, from Stanford University, have said that the rechargeable aluminium battery may replace existing storage devices, such as alkaline batteries, and lithium-ion batteries, which occasionally burst into flames. Officials said the studies have shown that the rechargeable aluminium batteries can get charged fast and they have a long life.

https://timesofindia.indiatimes.com/india/govt-works-to-end-china-dependency-on-li-ion-batteries/articleshow/80778206.cms

#SWARAJYA

Thu, 11 Feb 2021

DRDO, ISRO to help develop alternatives like metal-ion to counter China dominated lithium battery industry

In an effort to decrease the dependence on lithium ion batteries, an industry dominated by China, the Modi government is focusing on encouraging research on new technologies such as metal-ion and metal-air batteries, reports *The Times of India.*

Lithium Ion battery manufacturing (EV Reporter)

In this regard, the ministry of road transport plans to rope in agencies such as Defence Research Development Organization (DRDO), Indian Space Research Organisation (ISRO) and IIT, Kanpur to carry out research.

It is reported that the Union road transport and highways minister Nitin Gadkari has called a high level meeting to prepare a road map for other options of high quality batteries for vehicles other than lithium-ion technology.

Earlier in January, Minister Nitin Gadkari stressed the need to emerge as pioneers in developing leading battery and power-train technologies.

Noting that the challenge we presently face is the control on strategic reserves of Lithium, which is used to manufacture Lithium-ion rechargeable batteries for electric vehicles (EV), the Minister has called upon the EV sector to shift towards a completely indigenous battery technology in the coming years. This could be metal-air, metal-ion and other potential technologies in the research and development pipeline.

In November 2020, the Union Cabinet had approved the Production Linked Incentive (PLI) Scheme for 10 "key sectors", including telecom, electronics, solar PV and advanced chemistry cell (ACC) battery manufacturing.

The PLI scheme for the battery sector (ACC) is aimed at primarily incentivizing manufacturing of newer technology batteries, starting with Lithium ion. ACC batteries are rechargeable batteries that can be used in consumer electronics, electric vehicles and renewable energy.

The PLI scheme for the battery sector (ACC) received an impressive allocation of Rs 18,100 crores.

https://swarajyamag.com/insta/drdo-isro-to-help-develop-alternatives-like-metal-ion-to-counter-china-dominated-lithium-battery-industry

THE TIMES OF INDIA

Thu, 11 Feb 2021

Strategic tech: Becoming Atmanirbhar in batteries and chips is a national security imperative

In a welcome move with strategic implications, the Union road transport ministry is roping in agencies such as DRDO, Isro and IIT-Kanpur to carry out research in new battery technologies to reduce India's dependence on China for lithium-ion batteries. China is a world leader in this sector, controlling over 80% of the world's raw material refining, 77% of the world's cell capacity, and 60% of the world's component manufacturing. And it's on the strength of this lithium-ion battery manufacturing capacity that China is looking to dominate the global electric vehicle (EV) market.

With the EV revolution knocking at our door, India must move quickly to ensure that its own EV industry isn't forced to dance to the tunes of Chinese suppliers. In fact, India has an opportunity here to leapfrog lithium-ion batteries – known to occasionally burst into flames – and invest in rechargeable aluminium batteries that charge faster and have a longer life. And if government identifies this as a priority strategic area and provides the right inputs – subsidies, land, power etc – India could emerge as an alternative hub for the global rechargeable battery supply chain.

Similarly, another strategic area that government would do well to hand hold is semiconductor manufacturing. Semiconductor chips are used in everything from smartphones to cars and military equipment. Annually, China consumes 50% of all semiconductors and has set the goal of becoming a global leader in all segments of the semiconductor industry by 2030. The recent global shortage of semiconductor chips – which has hit the automobile sector hard – shows how vital this industry is. But here too India has an opportunity to lay the foundation of a vibrant semiconductor industry by leveraging its huge market.

In fact, government in December had invited proposals from companies to set up semiconductor fabrication facilities in the country. But semiconductor manufacturing is a capital intensive process with a substantial gestation period. For example, Taiwan's TSMC – the world's largest contract chip manufacturer – is the product of the Taiwanese government's concerted efforts at semiconductor manufacturing since the 1970s. If Taiwan, a nation of 23 million people, can become a semiconductor powerhouse, India can certainly take advantage of its scale here. Identifying rechargeable batteries and semiconductors as strategic areas for Atmanirbhar Bharat is a good idea. Given that China today is our main strategic rival, we cannot have Beijing dominate us in these two sectors. It is a national security imperative.

https://timesofindia.indiatimes.com/blogs/toi-editorials/strategic-tech-becoming-atmanirbhar-in-batteries-and-chips-is-a-national-security-imperative/

ThePrint

Thu, 11 Feb 2021

BrahMos, Tejas, artillery guns, grenades & more — India ready with defence export list

India has listed 85 kinds of equipment and 47 sub-systems for export to Indian Ocean & African countries to help increase defence base to $25 billion by 2025

By Snehesh Alex Philip

New Delhi: India has come out with a list of 152 items that are available to friendly nations as part of its plan to expand its current $11 billion defence base to $25 billion by 2025, with a $5 billion export component.

The BrahMos missile at India Gate as part of Republic Day celebrations | Photo: ANI

The list, including 85 kinds of equipment and 47 sub-systems, has been curated to meet the needs of the countries in the Indian Ocean Region and Africa — some of the top items featured on it are the Brahmos supersonic cruise missiles, the Advanced Towed Artillery Gun System (ATAGS), Pinaka multi-barrel rocket launchers, and the Combat Management System.

The list, which was released by the Department of Defence Production during the Aero India air show last week, does not mention Arjun tanks and Astra air-to-air missiles, which were included in a separate list put out by the Defence Research and Development Organisation (DRDO).

The list also includes products from private sector manufacturers that haven't found an entry into the Indian armed forces.

Defence attaches posted in IOR and African countries were asked last year to prepare a set of requirements that could be met through Indian systems, and so far, the most interest has been the Light Combat Aircraft Tejas, helicopters and missile systems, according to defence sources.

Based on this interest, India can also look at different financing options, including extended Line of Credits, the sources said.

The defence attaches will promote Indian systems during interactions with their foreign counterparts, and also keep an eye out for possible tenders. This is besides the effort being put in by the Indian private sector.

Land systems

There are 30 land systems mentioned in the list. Chief among them are the Akash and BrahMos missiles and artillery guns.

India is offering the Akash Area Defence System for defending vulnerable areas/points against penetrating targets at low, medium and high altitude. The Akash missile has an effective range of 3-25 km, and can operate at altitude of 30 m to 18 km.

In the case of the BrahMos cruise missile, even as India works on extending its range, it is offering the 290 km-range missile for export. BrahMos is much sought after by countries like the Philippines and Vietnam.

Among artillery guns, the defence ministry has included the ATAGS and the in-service K-9 Vajra howitzer, apart from the 155mm/52 Caliber towed gun and Garuda 105 lightweight field gun — the latter two manufactured by private firm Bharat Forge.

The list also includes Ashok Leyland military vehicles, mine protected vehicles, combat helmets and vests manufactured by private firm MKU, multi-mode hand grenades and various kinds of ballistic protection.

Naval systems

On the naval front, India has offered to export anti-submarine warfare corvettes made by the state-run Garden Reach Shipbuilders & Engineers (GRSE), apart from various kinds of patrol and interceptor boats and Landing Craft Utility, which are used to transport troops and materiel from ship to shore and vice-versa.

Also on offer are lightweight and heavyweight torpedos, beside naval 30 mm guns, rocket launchers, coastal surveillance systems and communication and combat management systems for ships.

Air systems

While the LCA Tejas was already mentioned as being available for export, the DDP list adds the Light Combat Helicopter, which is yet to be ordered for the IAF and the Army. Both services are in the process of placing an order for 15 LCHs, but the numbers will eventually go up.

The list also includes several communication systems.

https://theprint.in/defence/brahmos-tejas-artillery-guns-grenades-more-india-ready-with-defence-export-list/601860/

THE TIMES OF INDIA

Thu, 11 Feb 2021

Future fighters: Drone swarm, laser tech demo, AMCA nod likely this year

By Chethan Kumar

Bengaluru: In line with the Centre's Atmanirbhar (self-reliant) initiative and the need for modernisation of the armed forces, India's premier defence research agency is confident of achieving milestones in three key projects this year.

The 5.5-generation twin fin, twin engine stealth aircraft — Advanced Medium Combat Aircraft (AMCA) — programme is expected to get formal approval in the early part of the second half this year. That the IAF also appears to be interested in the programme may finally see it get fast-tracked.

AMCA development has entered the crucial phase of a detailed data-generation process for making prototypes. The Centre gave the sanction for the design phase, with an allocation of more than Rs 400 crore, in December 2018 and if all goes as per plan, the first flight of AMCA is expected in 2025.

On when the prototype roll-out can be expected, Reddy said: "We'll be able to say six months later once we have the formal approval for the project, which is expected this year." According to DRDO, the multi-role aircraft with precision strike capabilities will be able to fight BVR (beyond visual range) and accommodate future missiles in its arsenal. Sources said it will be designed to operate in both unmanned and manned roles.

The aircraft will have multiple modern features: Stealth, pilot-vehicle interface, sensor data fusion, passive sensors, AESA Radar, electronic warfare suite, decision aids, network-centric warfare, low emission, 360° enhanced situation awareness, etc.

Chief of air staff air chief marshal RKS Bhadauria also indicated during the recently concluded Aero India that the IAF is keen on AMCA. In fact, in the prevision edition of the show, when he was heading the training command, Bhadauria had said AMCA would be IAF's first choice for a fifth-gen fighter.

While DRDO's Aeronautical Development Agency (ADA) will be designing AMCA, the aircraft will be produced jointly with HAL and a private player with plans afoot for an SPV. There will also be involvement of other government-run agencies under MoD and DRDO.

A senior official from the AMCA project team in HAL said: "At the moment it will be only ADA and HAL. There are talks of a private player, but there's nothing final on it as yet." Another official added that the parts fabrication for AMCA will happen at the PSU's Nashik plant but prototype integration and other developments will happen in Bengaluru, along with CABS (centre for airborne systems).

Further, source said that the IAF, learning from the LCA programme, has decided to get involved right from the beginning so as to ensure the aircraft meets its requirements at every stage and that the project is not delayed.

Laser Weapons & Drone Swarm

Also, the defence research and development organisation (DRDO) is confident of demonstrating drone swarm technology and high power energy (laser) weapons pegged to give India an arsenal a la Star Wars. The TOI has earlier reported about India's plans for high-energy based weapons.

DRDO Chairman G Sateesh Reddy told TOI: "The anti-drone system today is completely laser based and we've demonstrated that. We're developing higher power lasers, naturally the range of kill gets enlarged and we can also engage some other kinds of targets too. We should be able to demonstrate this this year."

DRDO is looking at — no formal mechanism of working with the armed forces as on date — land, ships and air-borne laser weapons in the future. "There can be multiple applications, but the demonstration will be ground-based. These can become border-based weapons," Reddy said, adding that DRDO would also be able to demonstrate drone swarm technology without elaborating further.

While the armed forces are keen on both these technologies, they will take time to mature before DRDO can offer it for testing. This means it may take more than a decade at least for armed forces to actively consider it for induction.

https://timesofindia.indiatimes.com/india/future-fighters-drone-swarm-laser-tech-demo-amca-nod-likely-this-year/articleshow/80792497.cms?from=mdr

DEFENCE AVIATION POST
Your Connect To The World Of Defence And Aviation

Thu, 11 Feb 2021

DRDO's new next-gen close combat missile

With the emergence of futuristic Unmanned Combat Drone HAL/CATS Loyal Wingman, part of Combat Air Teaming System program that will fly alongside the Indian Air Force fighter aircraft in future – a whole lot of new indigenous weapons and missile for a variety of aircraft type was unveiled by DRDO.

Among the many new weapon systems displayed at Aero India 2021, DRDO's new Next-Gen Close Combat Missile – NG-CCM is a one such program that will eventually go a long way standardizing the diverse fleet of close combat missile operated by Indian Air Force for its various type of fighter jets. The new missile in its appearance looks heavily inspired from British MBDA ASRAAM missile procured for IAF's Jaguar fleet.

DRDO is progressing well towards many indigenous missiles for the armed forces and has successfully demonstrated the maiden test firing of many surface-to-air, air-to-air and air-to ground configuration missiles in past months, infusing a strong push to indigenous weapons in armed forces.

The efforts are on to develop an advanced imaging, heat and infrared-seeking short-range missile for upcoming aircraft being designed and developed within the country i.e Tejas MK-1A – deal for which was signed during the show, Tejas Mk-2 and AMCA of Indian Air Force and Twin-Engine Deck Based Fighter or TEDBF for Navy to name them.

As of now DRDO is yet to discuss the final specification of missiles with its users, it is most likely the missile will have effective range of 70-80 km with capabilities such as Lock-on-after-launch and Lock-on-before-launch with two-way encrypted data-link for secure and jam-proof communication.

While Astra and upcoming Astra Mk-2 will give IAF's fighter aircraft a long-range capability for BVR missions, NG-CCM will prove to be a perfect replacement for controversial Russian Vympel R-73 missiles currently armed with Su-30MKI and MiG-29 aircraft for close combat missions.

With the successful integration of Astra with Sukhoi-30MKI aircraft, IAF may consider standardizing an home-grown weapon system across its diverse fleet which would introduce various levels of economy as well as commonality and interoperability.

https://www.defenceaviationpost.com/2021/02/drdos-new-next-gen-close-combat-missile/

CXOtoday.com

Thu, 11 Feb 2021

HAL, Wipro3D and CEMILAC collaborate to manufacture India's first metal 3D printed aircraft engine component

Wipro 3D, the metal Additive Manufacturing (AM) business of Wipro Infrastructure Engineering (WIN), and Hindustan Aeronautics Ltd (HAL), Engine Division have collaborated for the development, manufacturing and air worthiness certification of acritical aero-engine component operating in the hot zone, using metal 3D printing.

The Nozzle Guide Vane (also called the Inner Ring), 3D printed in a high temperature resilient steel A286, has been awarded Airworthiness certification by Centre for Military Airworthiness and Certification (CEMILAC), the regulatory body of Defence Research and Development Organization (DRDO).

The Wipro3D manufactured components shall be installed in HAL manufactured helicopter engines.

Mr. Amitabh Bhatt, CEO, Bangalore Complex, HAL, said, "Additive Manufacturing is a disruptive technology and is going to play a big role in the manufacture of components used in the Aerospace and Defense Industry in the future. I would like to compliment Wipro 3D and HAL Engine Division for successfully developing a 3D component for use in the hot section of an aero engine. It is indeed a significant achievement towards "Atmanirbhar Bharat Policy of Government of India."

Mr B Krishnakumar, GM Engines, HAL said, "The long and unswerving efforts of Wipro 3D and HAL Engine Division have come to fruition with the certification of the inner ring. With the development process established and considering the benefits of 3D printing viz. zero tooling cost, reduced cycle times and cost competitiveness, 3D printing would definitely be considered by the Division as a manufacturing option for the spares required for ROH."

Mr AVPS Prasad, Chief Executive E, CEMILAC "The Inner Ring is unique example of collaboration between CEMILAC, DGAQA, HAL and Wipro3D. We have been able to create a unique framework for Airworthiness certification of Metal 3d printed components that should create the grounds for greater adaption of this technology in India"

Ajay Parikh, Vice President & Business Head, Wipro 3D, said The component, soon to enter series production, has been developed in India starting from arriving at the right material composition, developing 3D Printing process parameters, heat treatment cycles, post processing strategy, and testing & prove out methodology. This will be India's 3d printed metal component at the hot end of a jet engine to achieve Air Worthiness certification. The Inner Ring is not only a great showcase for Aatmanirbhar Bharat but also demonstrates what India can offer to the world."

https://www.cxotoday.com/press-release/hal-wipro3d-and-cemilac-collaborate-to-manufacture-indias-first-metal-3d-printed-aircraft-engine-component/

The Indian EXPRESS

Thu, 11 Feb 2021

Uttarakhand flash floods: DRDO team finishes first survey

A member of the Defence Geo-Informatics Research Establishment team said they haven't yet reached a conclusion to explain what triggered the flash flood

By Lalmani Verma

Joshimath: A six-member team of scientists, from Chandigarh-based Defence Geo-Informatics Research Establishment of Defence Research and Development Organisation (DRDO), has completed its first survey of Nanda Devi glacier and the downstream areas affected by the flash flood in Uttarakhand's Chamoli district.

Rescue ops on at the Tapovan and Rishi Ganga power project sites. (Express photo by Gajendra Yadav)

The team has sent images and other samples for examination to its Chandigarh laboratory, sources said.

The team of snow and avalanche experts had reached Joshimath on Monday, a day after the flash flood. Requesting anonymity, a team member said, "Several lateral glaciers exist around the Nanda Devi peak. We did an aerial survey near Nanda Devi glacier. A large black spot has been seen there, which may have developed because of dislocation of any part of the snow-covered mountain. We have collected images from helicopters. But so far, we not reached any conclusion to explain what triggered the flash flood on Sunday."

He added that the team has also conducted an aerial survey of the flood-affected areas of Raini village and Tapovan. He said images and samples collected have been sent for examination, and findings will be shared only after due deliberation with other experts.

The team left for Chandigarh Wednesday.

https://indianexpress.com/article/india/uttarakhand-flash-floods-six-member-scientist-team-finishes-first-survey-7183373/

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 Feb 2021 3:56PM

Theatre level operational readiness exercise (TROPEX 21) Indian Navy's largest war game

Indian Navy's largest war game – the biennial Theatre Level Operational Readiness Exercise (TROPEX 21) - which commenced in early January, is currently underway with participation of all operational units of Indian Navy including ships, submarines, aircraft as well as units of the Indian Army, Indian Air Force and Coast Guard. The exercise will culminate by third week of February.

The exercise is being conducted over a vast geographical expanse in the Indian Ocean Region including its adjunct waters and is aimed at testing combat readiness of the Navy in a complex multi-dimensional scenario set in the context of the current geo strategic environment. The Theatre Level exercise also aims to validate Navy's offensive-defence capabilities, safeguard national interests in the maritime domain and promote stability and peace in the Indian Ocean Region. Conduct of TROPEX is being overseen by Naval Headquarters with participation from all three Commands of the Indian Navy and the Tri-Services Command at Port Blair.

TROPEX is being progressed over distinct phases that also test the Navy's transition from peacetime to hostilities. In the first phase, the Indian Navy had conducted coastal defence exercise '*Sea Vigil'*along the entire coastline and Island territories of India on 12-13January 2021. This exercise aimed to validate the coastal defence setup of the country, which was entirely revamped after the 26/11 Terror attacks at Mumbai. The exercise witnessed large-scale participation from Indian Navy, Coast Guard, Marine Police of 13coastal States and Union Territories along with other stakeholders in the maritime domain. Valuable lessons emerging from the exercise are being incorporated in the existing procedures to further fine-tune the coastal defence architecture of the country.

Exercise Sea Vigil was followed by a large-scale Tri-Service joint amphibious exercise AMPHEX-21, which was conducted in the Andaman and Nicobar group of Islands from 21-25 January. The amphibious exercise was aimed at validating India's capabilities to safeguard the territorial integrity of its Island territories and enhance operational synergy and joint warfighting capabilities amongst the three Services.

The Weapon Workup Phase of TROPEX, which concluded recently, witnessed multiple 'on-target' ordnance deliveries including missiles, torpedoes and rockets from frontline warships, aircraft and submarines and demonstrated the lethal firepower of the Indian Navy and reaffirm the Navy's capability to carry out long range maritime strikes in the Indian Ocean Region, a capability that is central to meeting operational challenges and ensuring safe seas and secure coasts.

This large scale Theatre Level Exercise puts to test and validate Navy's Concept of Operations in various conflict scenarios, hone its warfighting skills, bolster its role towards maritime security in the wider Indian Ocean Region and is in keeping with the theme of being a 'Combat Ready, Credible and Cohesive force'.

https://pib.gov.in/PressReleasePage.aspx?PRID=1696774

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 Feb 2021 6:41PM

Press release for signing of MoU between Indian Navy and IIT Delhi

Furthering the relationship between Indian Navy and IIT Delhi on research in underwater domain of Naval Electronic Systems, a Memorandum of Understanding has been signed. The relationship dates back to 1970s and key technologies for Navy in the field of underwater electronics have been developed by the Centre for Applied Research in Electronics (CARE) at IIT Delhi since then. The research carried out at IIT Delhi has played an important role in the technological advances made by the Indian Navy. In line with Prime Minister Modi's vision of '*Atmanirbhar Bharat*', Indian Navy endeavours on development of major technology driven projects through IIT Delhi.

https://pib.gov.in/PressReleasePage.aspx?PRID=1696859

Business Standard

Thu, 11 Feb 2021

India exported military hardware worth Rs 34k cr in last 5 years: Govt data

India exported military hardware and equipment worth over Rs 34,000 crore in the last five years, according to details provided by the government in the Lok Sabha on Wednesday

New Delhi: India exported military hardware and equipment worth over Rs 34,000 crore in the last five years, according to details provided by the government in the Lok Sabha on Wednesday.

Replying to a question, Minister of State for Defence Shripad Naik said the total exports by both private and defence public sector undertakings were worth Rs 2059.18 crore in 2015-16 while the number came down to Rs 1521.91 crore in 2016-17.

Military air missiles. Photo: Shutterstock

However, the exports of military hardware went up to Rs 4682.36 crore in 2017-18 and further jumped to Rs 10745.77 crore in 2018-19. The amount for 2019-20 was 9115.55 crore while it was Rs 6288.26 crore in the current fiscal till January 31, according to Naik.

Naik said export authorisation has been granted for torpedo loading mechanism, night vision monocular and binocular, light weight torpedo and fire control systems, armoured protection vehicle, weapons locating radar and coastal surveillance radar among others.

To a separate question, he said FDI inflows of over Rs 4,191 crore have been reported by various companies operating in the defence and aerospace sector.

"Further, FDI inflows of over Rs 2871 crores have been reported in defence and aerospace sector after 2014," he said.

Responding to another query, Naik said a total of 124 Main Battle Tank (MBT) Arjun Mark-1 have been inducted into the Indian Army since 2008 and two armoured regiments are fully operational with these tanks.

"The DRDO has further developed upgraded MBT Arjun Mark-1A tank. This upgraded MBT Arjun Mark-1A tank has cleared validation trials in December, 2018," he added.

The minister said out of a total of 191 defence capital acquisition deals in the last three years, 118 contracts have been placed with the Indian industry.

"Further, 58 per cent of total expenditure on capital acquisition in the last three years has been made on indigenous procurement," he said.

(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)

https://www.business-standard.com/article/economy-policy/india-exported-military-hardware-worth-rs-34k-cr-in-last-5-years-govt-data-121021001767_1.html

TIMESNOWNEWS.COM

Thu, 11 Feb 2021

Indian Army leases 4 Heron Unmanned Aerial Vehicles from Israel as part of its emergency procurement

Tatra trucks, to major weapons systems including missiles, are also being bought, as also, tank transporters

By Srinjoy Chowdhury

The Indian Army has leased four Heron Unmanned Aerial Vehicles (UAV) from Israel as part of its emergency procurement programme. The Heron, with the Indian Army for some years, can be particularly effective in intelligence gathering as it is a long-endurance UAV and can be in the air for about 50 hours at a time.

The lease comes with the defence ministry changing the rules and allowing for the leasing of certain weapon systems. Similarly, the Navy has leased Predator drones from the United States.

The Herons apart, the Army has used its emergency powers to ensure that it has enough ammunition and spares for a two-week war, even if it is on two-fronts, high-level sources said. The emergency powers, given by the government in the wake of the situation in Ladakh, has allowed the army to get necessary spares and ammunition and also, strengthen its anti-tank weaponry and buy much needed anti-aircraft systems.

The Army has acquired the Igla and the Strela air defence systems from Russia. The former is shoulder-fired and the latter is man-portable. While neither is state-of-the-art, they are considered effective and efficient.

The Israeli Spike anti-tank missile system has also been purchased. The Spike is already with the Indian army, but more have been picked up.

While loitering munitions have been available for some years, they have never been part of the army's arsenal. Now, the Indian army, keeping in mind what has happened in the troubles between Azerbaijan and Armenia, acquired loitering munitions that can be "reused" after they are launched.

Tatra trucks, to major weapons systems including missiles, are also being bought, as also, tank transporters. Some of the weapon systems have come in. Others are on their way.

https://www.timesnownews.com/india/article/indian-army-leases-4-heron-unmanned-aerial-vehicles-from-israel-as-part-of-its-emergency-procurement/718568

THE NEW INDIAN EXPRESS

Thu, 11 Feb 2021

Indian Army's firm stand forced China to disengage at LAC

After the 1962 War, both India and China worked towards normalisation of relations, a process which took about three decades and more

By Maj Gen D A Chaturvedi (Retd)

The statement from China's Ministry of Defence that both armies have started to disengage from the North and South banks of Pangong Tso post the consensus reached in the ninth round of Corps Commanders talks is a welcome step, which needs to be verified and confirmed on the ground. Ideally, both sides should not only disengage but move back to their respective positions before the confrontation. After the 1962 War, both India and China worked towards normalisation of relations, a process which took about three decades and more.

India and China flags used for representational purpose only

To their credit, both sides managed the disputed and undemarcated borders without resorting to armed force till the 'Galway Incident', through various diplomatic and military mechanisms. It is in the interest of both the countries to manage their borders peacefully permitting and encouraging economic growth and well being unhindered by the spectre of war. China started its economic reforms in 1979 and today is the second-largest economy in the world poised to overtake the USA as the number one economy in this decade itself and India is not far behind as the fifth largest economy in the world, poised to grow at a healthy growth rate of seven to eight per cent.

India's strategic doyen, K Subramaniam had stated India's national strategy as keeping the borders secure against aggression thus permitting unhindered economic growth. To the credit of the Indian Army, it had foreseen the aggressive Chinese actions on the borders as early as almost eighteen years back and had started preparing for it meaningfully. Indian Army's resolute action as Doklam is a case in point and immediately after its resolution, the Chief of Defence Staff, General Bipin Rawat, then the Chief of Army Staff had stated in a meeting of senior military commanders that he expected a 'Doklam' like action in Ladakh in the next couple of years.

China sees itself as the number one superpower in a couple of decades, however, if twenty-first century has to be the Asian Century, both India and China can ill afford a war between the world's two largest armies; at best they can cooperate and collaborate to grow economically or at worst compete with each other economically while shunning war as an option. Both India and China as nations need to respect each other's sovereignty and work assiduously towards building mutual trust and respect. However, in the realm of realpolitik, the weak get rolled over and the best way to avoid war is to be militarily strong.

The development of the border infrastructure should continue apace while the Indian Armed Forces reorient themselves more towards the Northern and North Eastern borders. In the present confrontation, both sides need to disengage and go back to their respective pre-confrontation locations.

(Maj Gen (Retd) d a chaturvedi Former division commander &head of the Territorial Army)

https://www.newindianexpress.com/nation/2021/feb/11/indian-armys-firm-stand-forced-china-to-disengage-at-lac-2262494.html

THE TIMES OF INDIA

Thu, 11 Feb 2021

ISRO plans new propulsion for deep space missions

By Srinivas Laxman

Mumbai: Indian Space Research Organisation (ISRO) is exploring the possibility of developing a new propulsion technology to fuel spacecraft for its future deep space missions. On January 28, ISRO'S UR Rao Satellite Centre in Bengaluru issued an invitation for 'expression of interest' for "design and modelling; simulation and analysis; testing and qualification of 100W Radioisotope Thermoelectric Generator (RTEG) without radio isotope.'' Isro calls it alpha source thermoelectric propulsion technology.

RTEG will have less mass than solar cells of equivalent power and allow more compact spacecraft that can navigate easier in space. Many missions of NASA and Russia, Besides China's 2013 Chang'e 3 mission to the moon and its rover Yutu had used RTG.

Former Isro chairman AS Kiran Kumar said RTEG is futuristic. "It will be useful for long duration missions where alternative energy is not available," he said. After another Mars mission, Isro could be eyeing Jupiter, Saturn, Neptune and Uranus.

According to the Isro document, "the development of RTEG is taken up as it is envisaged that it will be a part of Isro's deep space missions for power generation and thermal management." According to the document, the system should be capable of operating in vaccum conditions of deep space, dusty, carbon dioxide-rich and corrosive environments. Isro says the RTG's weight should be 20 kgs or less, with a life span of 20 years or more and survive indefinitely without damage when stored in the atmosphere at temperatures as high as 50 degrees Celsius. Emphasising on safety standards, the document says, "It should be safe for human handling in close vicinity under all conditions even with nuclear fuel concealed inside … the unit should be resilient to any pre-launch or post-launch explosion so as to not cause any nuclear contamination in the environment.

https://timesofindia.indiatimes.com/india/isro-plans-new-propulsion-for-deep-space-missions/articleshow/80801653.cms

FINANCIAL EXPRESS
Read to Lead

Thu, 11 Feb 2021

ISRO's first manned-mission Gaganyaan: Boeing responds to EoI for critical elements

India is planning to launch astronauts soon from here onboard a modified GSLV MK III launch vehicle. The launch vehicle shall place the Orbital module into space, and once positioned as per required orientation, the service part of the module shall be separated from the crew module

By Huma Siddiqui

India is planning to launch astronauts soon from here onboard a modified GSLV MK III launch vehicle. The launch vehicle shall place the Orbital module into space, and once positioned as per required orientation, the service part of the module shall be separated from the crew module.

How long will be the mission?

It will be a week long mission and at the end of flight completion, the crew module shall land back into ocean touch down with the assistance of the parachutes. The touch down is planned within Indian waters closer to a coastal region for ease of recovery.

In every space mission, the crew safety is paramount and ISRO's rigorous safety standards for human spaceflight have been formulated. The mission's operational role to put the space capsule in space is already a challenge which Indian Space Research Organisation (ISRO) has adequate past experience. But the robust safety standards for crew safety requires mature technology, which is not readily available within India since such technologies evolve with actual space flight experiences. Accordingly, ISRO has called out to the global suppliers to support in the design development and delivery of some of the critical items for the human spaceflight under the mission Gaganyaan.

Boeing India

The US based aerospace giant has already bagged huge chunks of Indian Air Force (IAF) deals. It has also bagged orders from the Indian Navy for the surveillance aircraft. Till date the company has delivered C-17 Globemaster III airlifters to the IAF; P-8I maritime surveillance and anti-submarine aircraft to the Indian Navy; AH-64E Apache helicopters & CH-47F (I) Chinook helicopters for the IAF.

Besides its huge presence in the Indian Armed forces, the US based company is now looking towards the Space Sector. It has recently responded to Expression of Interest (EoI) issued by Indian Space Research Organisation (ISRO) for certain critical requirements for the Human Space Flight Project `Gaganyaan'.

What has Boeing responded to?

In an exclusive interaction with Financial Express Online, Torbjorn Sjogren, VP, International Government & Defence, Boeing Global Services, said, "ISRO has sought information and involvement of the industry in some projects related to Human Space Flight Project. Boeing has responded to an EOI (Expression of Interest) on design and manufacture of a space capsule Simulator and is in dialogue on two other subjects – inner lining of space capsule and crew seat."

Has any contract between ISRO & Boeing been inked?

No.

According to Mr Torbjorn Sjogren, "While Boeing is excited to be engaged with ISRO on this prestigious space project, no contract has yet been signed."

Indo-US Space Cooperation

As reported earlier, last year, during the bilateral talks between Prime Minister Narendra Modi and the former US President Donald Trump, Space Cooperation was one of the areas where both

leaders looked for deeper cooperation. In a joint statement released then, it was decided that ISRO and NASA are planning to launch next year (2022) a joint mission with the world's first dual-frequency Synthetic Aperture Radar satellite.

ISRO & NASA are already working together in various fields of Space and these include Human Space Flight, Earth observation, Mars and planetary exploration, Helio-Physics, and Commercial Space cooperation.

Know more about Space Capsule Simulator, Inner Lining of Space Capsule and Crew Seat

Milind Kulshreshtha, C4I expert & Strategic Analyst talks in detail about these with Financial Express Online.

Space Capsule Simulator

"The Gaganyaan crew and Mission Control team require extensive training to prepare for the critical human spaceflight later. The Crew Training Simulator role is to familiarize the crew with panel buttons and other man-machine interfaces within the crew module. Most importantly the scenarios pertaining to contingencies (like abnormal system failures etc.) and alerts or alarms are also created for crew to take emergency actions and familiarize them with various safety drills," says the C4I expert.

According to him, "For any Space flight mission, the Space Crew Training simulator is one of the most critical elements for the complete mission, as it is not only for training of the astronauts but also to check the sequence of operations, including that by support personnel. Simulator caters for generation of abnormal behaviour of systems like malfunction, under-performances and mission abort like situations so that crew can take a timely and decisive action in an actual scenario. Many of these require individual actions and Team actions, and these too shall be practiced in the simulator under the guidance of the Instructor, whose panel shall run the Simulator Software module."

"The Instructor shall have the control to simulate the practice and test scenarios to train and test the crew members. This Instructor panel is positioned 10-20m away from the Crew Stations so as to oversee the complete exercise up close while giving the space for astronauts to operate independently. Most important criterion for any such simulator is the ability to capture the System Requirements accurately and follow an IEEE Standard on System Engineering approach as the Simulator shall be highly software intensive. Making a simulator of this nature is not an easy task."

Inner Lining

"The inner lining of the Capsule is supposed to endure the cold temperatures of the space and high temperatures of the reentry, while keeping the astronauts in a human comfortable protected environment. Another essential feature of the inner lining is to protect the humans in space from the harmful radiations. The inner lining is a complicated array of materials which is designed for keeping the astronauts safe throughout the flight duration," Milind Kulshreshtha, explains.

Crew Seat – what is so unique about it?

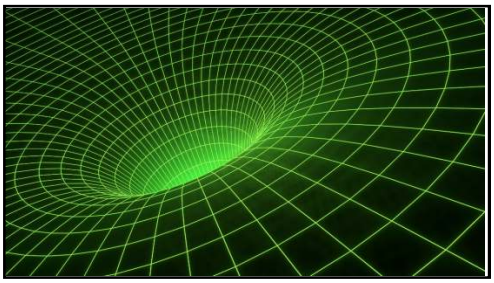
"A crew seat provides full body support and is specific for each crew on an individual basis. The seats are usually made as a composite shell and are reconfigurable so as to be reusable for subsequent flights too. The seats are tailor made as per the specific astronaut's height and weight so as to provide total body support in more complex circumstances like launch phase and landing. During the launch and reentry phases, the forces on a crew member is the largest and these forces require to be well distributed so as to avoid an injury to the human body," Milind Kulshreshtha, C4I expert & Strategic Analyst explains.

https://www.financialexpress.com/lifestyle/science/isros-first-manned-mission-gaganyaan-boeing-responds-to-eoi-for-critical-elements/2191793/

Thu, 11 Feb 2021

Placing cosmological constraints on quantum gravity phenomenology

A description of gravity compatible with the principles of quantum mechanics has long been a widely pursued goal in physics. Existing theories of this 'quantum gravity' often involve mathematical corrections to Heisenberg's Uncertainty Principle (HUP), which quantifies the inherent limits in the accuracy of any quantum measurement. These corrections arise when gravitational interactions are considered, leading to a 'Generalized Uncertainty Principle' (GUP). Two specific GUP models are often used: the first modifies the HUP with a linear correction, while the second introduces a quadratic one. Through new research published in *EPJ C*, Serena Giardino and Vincenzo Salzano at the University of Szczecin in Poland have used well-established cosmological observations to place tighter constraints on the quadratic model, while discrediting the linear model.



Credit: CC0 Public Domain

The GUP can influence the black hole evaporation process first described by Stephen Hawking, and may also lead to better understanding of the relationship between thermodynamics and gravity. Intriguingly, the GUP also places a lower limit on length scales that are possible to probe—below the so-called 'Planck length,' any concentration of energy would collapse under gravity to form a black hole. Previously, both the linear and quadratic GUP models were rigorously tested by comparing their predictions with data gathered in quantum experiments, placing stringent limits on their parameters.

In their study, Giardino and Salzano instead compared the predictions of GUP-influenced models of the universe with observations of cosmological phenomena, including supernovae and cosmic microwave background radiation. These comparisons were not widely made in the past, since the constraints they imposed on the GUP parameters were believed to be far weaker than those possible in quantum experiments. However, the researchers' analysis revealed that stricter bounds could be imposed on the quadratic model, comparable to those placed by some quantum experiments. In addition, they showed that the linear correction to the HUP generally could not account for the observed data. Ultimately, these results highlight the promising role of cosmological observations in constraining the phenomenology of quantum gravity.

More information: Serena Giardino et al, Cosmological constraints on GUP from modified Friedmann equations, *The European Physical Journal C* (2021). DOI: 10.1140/epjc/s10052-021-08914-2

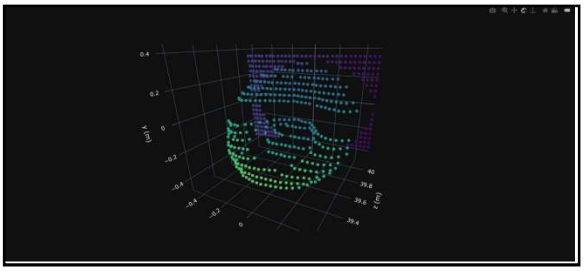
https://phys.org/news/2021-02-cosmological-constraints-quantum-gravity-phenomenology.html

PHYS.ORG

Thu, 11 Feb 2021

Silicon chip provides low cost solution to help machines see the world clearly

Researchers in Southampton and San Francisco have developed the first compact 3-D LiDAR imaging system that can match and exceed the performance and accuracy of most advanced, mechanical systems currently used.



Swivel chair and screen at 40 m -- picture taken using a 32x16 pixel sensor (2mmx2.5mm sensor size). Credit: Pointcloud Inc

3-D LiDAR can provide accurate imaging and mapping for many applications; it is the "eyes" for autonomous cars and is used in facial recognition software and by autonomous robots and drones. Accurate imaging is essential for machines to map and interact with the physical world but the size and costs of the technology currently needed has limited LIDAR's use in commercial applications.

Now a team of researchers from Pointcloud Inc in San Francisco and the University of Southampton's Optoelectronic Research Centre (ORC) have developed a new, integrated system, which uses silicon photonic components and CMOS electronic circuits in the same microchip. The prototype they have developed would be a low-cost solution and could pave the way to large volume production of low-cost, compact and high-performance 3-D imaging cameras for use in robotics, autonomous navigation systems, mapping of building sites to increase safety and in healthcare.

Graham Reed, Professor of Silicon Photonics within the ORC said, "LIDAR has been promising a lot but has not always delivered on its potential in recent years because, although experts have recognized that integrated versions can scale down costs, the necessary performance has not been there. Until now.

"The silicon photonics system we have developed provides much higher accuracy at distance compared to other chip-based LIDAR systems to date, and most mechanical versions, showing that the much sought-after integrated system for LIDAR is viable."

Remus Nicolaescu, CEO of Pointcloud Inc added, "The combination of high performance and low cost manufacturing, will accelerate existing applications in autonomy and augmented reality, as well as open new directions, such as industrial and consumer digital twin applications requiring high depth accuracy, or preventive healthcare through remote behavioral and vital signs monitoring requiring high velocity accuracy.

"The collaboration with the world class team at the ORC has been instrumental, and greatly accelerated the technology development."

The latest tests of the prototype, published in the journal *Nature*, show that it has an accuracy of 3.1 millimeters at a distance of 75 meters.

Amongst the problems faced by previous integrated systems are the difficulties in providing a dense array of pixels that can be easily addressed; this has restricted them to fewer than 20 pixels whereas this new system is the first large-scale 2-D coherent detector array consisting of 512 pixels. The research teams are now working to extend the pixels arrays and the beam steering technology to make the system even better suited to real-world applications and further improve performance.

More information: A universal 3D imaging sensor on a silicon photonics platform, *Nature* (2021). DOI: 10.1038/s41586-021-03259-y , www.nature.com/articles/s41586-021-03259-y

Journal information: *Nature*

https://phys.org/news/2021-02-silicon-chip-solution-machines-world.html

PHYS.ORG

Thu, 11 Feb 2021

First-ever observation of multi-photon Fano effect could lead to boost in quantum computing

In the first study of its kind, published by *Nature Communications*, an international team of researchers led by the University of Surrey has proven the existence of the fabled multi-photon Fano effect in an experiment.

Ionization is when electrons absorb photons to gain enough energy to escape the nucleus' electrical force. Einstein explained in his Nobel Prize-winning theory of the photoelectric effect that there is a threshold for the photon energy required to cause an escape. If a single photon's energy is not enough, there might be a convenient half-way step: ionization can occur with two photons starting from the lowest energy state.

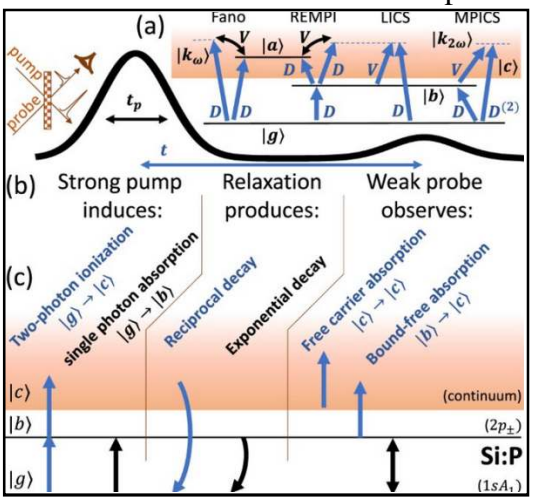


Fig. 1: Fano and related processes. Nature Communications (2021). DOI: 10.1038/s41467-020-20534-0

However, according to the counter-intuitive world of quantum theory, the existence of this half-way step is not necessary for an electron to break free. All the electron needs to do is gain enough power from multiple photons which can be achieved through "ghostly" so-called virtual states. This multi-photon absorption only happens in extremely intense conditions where there are enough photons available.

When there is a half-way step and enough photons around, both options are available for ionization. However, the wave-like nature of atoms presents another obstacle: interference. Altering photon energy can cause the two different waves to crash into one another, leading either to enhancement or to complete annihilation of their effect on the absorption event.

This Fano effect was theoretically predicted nearly 50 years ago and has remained elusive for decades because of the high intensity needed; manufacturing a stable laser that produced a large enough electrical field required to implement this effect to isolated atoms was not—and still is not—technically possible.

The team led by the University of Surrey overcame this complication by using impurity atoms where, due to the influence of the semiconductor host material, the electric field that determines the outer electron orbits is significantly reduced and, consequently, much less laser intensity is required to demonstrate the Fano effect. The team used ordinary computer chips that contain phosphorous atoms embedded in a silicon crystal.

The team then used powerful laser beams at the free-electron laser facility (FELIX) in Radboud University, Holland, to ionize phosphorus atoms. The outcome of ionization was estimated by the absorption of a weak beam of light. By sweeping the laser radiation photon's energy, the authors observed the Fano line shape's different skewness.

Dr. Konstantin Litvinenko, co-author and Research Fellow at the University of Surrey, said: "We believe we have taken a very important step towards the implementation of novel and promising applications of ultrafast readout of silicon-based quantum computers; selective isotope-specific ionization; and a variety of new atomic and molecular physics spectroscopies."

More information: K. L. Litvinenko et al. The multi-photon induced Fano effect, *Nature Communications* (2021). DOI: 10.1038/s41467-020-20534-0

Journal information: *Nature Communications*

https://phys.org/news/2021-02-first-ever-multi-photon-fano-effect-boost.html

CISION
PR Newswire

Thu, 11 Feb 2021

New research shows exhaled respiratory droplets increase with onset of Covid-19, age and body mass index

Harvard Inventor Co-Authors Study That Observes Commonalties Between "Super Spreading" Of COVID-19 And Exhalation Of Large Numbers Of Respiratory Droplets

Cambridge, Mass. and New Orleans, Feb. 10, 2021 /PRNewswire/ -- Harvard University, Tulane University and Massachusetts General Hospital today announced new research published, "Exhaled Aerosol Increases With COVID-19 Infection, Age And Obesity," in the Proceedings of the National Academy of Sciences (PNAS). Harvard's Dr. David Edwards, founder of Sensory Cloud, a health technology start-up spun out of Harvard University and maker of FEND, co-authored the article, which explores the causes of super emissions of exhaled aerosols and the role of key biological factors including age, BMI, and lung infection.

The study involved 194 healthy human volunteers ranging from ages 19 to 66 years old, and the experimental infection study examined eight nonhuman primates, infected by aerosol containing SARS-CoV-2. The findings show that while exhaled aerosol particles vary between the subjects, respiratory droplets did increase with the onset of COVID-19, heightened age and body mass index (BMI). These biological factors, age and heavier weight, are also associated with more severe COVID-19 symptoms.

The research also found from the 194 participants, that a strong minority 18% (35 people) of "super emitting" human subjects accounted for 80% of the exhaled particles of the group. This distribution mirrors the phenomenon of "super spreading", which is observed in outbreaks of airborne infectious disease, where 20% of infected individuals can be traced to 80% of infections.

"While we are working toward a widely disseminated COVID-19 vaccine, this research shows the value in daily cleansing of our upper airways to reduce the spread of respiratory droplets emitted," said Dr. David Edwards of Harvard University. He continues, "The role that airway hygiene plays in controlling the transmission and infection of COVID-19 and other respiratory infectious diseases including Tuberculosis and Influenza, is becoming clearer."

This new research, coupled with recently published peer-reviewed research on the effectiveness of airway hygiene to remove respiratory droplets with non-drug physiological salts, points to the potential value today of daily FEND airway hygiene for reducing the risk of exposure of respiratory droplets in the upper airways and surrounding air.

For more information on FEND, please visit www.hellofend.com.

About Sensory Cloud:

Sensory Cloud is a Cambridge-based technology startup company that designs solutions to problems of human wellbeing and healthcare through pioneering discoveries at the frontiers of olfaction and respiratory biology. Sensory Cloud is developing a proprietary line of consumer products based on its proprietary olfaction and calcium-salt platforms for human health and wellbeing. The Company launched its new hygienic product FEND (helloFEND.com) in October 2020. FEND was recently selected as a Time Magazine Best Invention of 2020.

https://www.prnewswire.com/news-releases/new-research-shows-exhaled-respiratory-droplets-increase-with-onset-of-covid-19-age-and-body-mass-index-301225960.html

© The news items are selected from 17 National Daily Newspapers subscribed at Defence Science Library,