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TECHNOLGY DEVELOPMENT FUND

DRDO'S TECHNOLOGY DEVELOPMENT FUND: FOSTERING INDIGENOUS EXCELLENCE

Technology Focus highlights on the technological achievements in the organization covering the products, processes and technologies.

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Spectrum of Industry Partners for TDF Project

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MESSAGE

As the technology rapidly evolves, the need for transformative solutions to address the challenges of today has never been greater. DRDO Technology Management is committed to foster a vibrant ecosystem by promoting fundamental and applied research, innovations and support indigenous development of technologies and cutting edge products.

In alignment with our nation's vision of **Atmanirbhar Bharat** (Self-Reliant India) & make in India initiatives, we believe that technology is the key to ensuring a sustainable and prosperous future for our country. Our efforts in technology management are focused on empowering Indian enterprises; Start-Ups, MSME, and research institutions to create home-grown solutions that are not only technologically advanced but also cater to our unique national requirements and help generations of indigenous IPs for exportable products.

Through our initiatives, we aim to bridge the gap between R&D and real world product by encouraging collaboration across industries, academia, R&D institutions and government. The mission of Technology Management is to enable the seamless translation of research into real-world technology based products and applications for self-reliance in defence technologies.

The vision of **Atmanirbhar Bharat** can only be achieved by "Whole of Nation" approach, creating world-class solutions from within, and for the world. At DRDO, we are proud to be a part of this transformative journey, through Technology Development Fund Scheme, contributing to a future where India becomes a global hub for technological excellence and innovation.

I am sanguine that you will all join us for this shared mission to drive indigenous R&D to take India to global stage.

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MESSAGE

As we continue to advance in the realm of technological innovation, it is crucial that we remain aligned with the vision of **Atmanirbhar Bharat**– a vision that empowers our nation to be self-sustaining, resilient, and globally competitive. In line with this vision, the Technology Development Fund (TDF) is committed, fostering research, and supporting the development of cutting-edge technologies that cater to India's unique needs and challenges.

In an era where technology is at the forefront of shaping the future, our role has never been more critical. Through TDF, we aim to accelerate the creation of solutions that are not only technologically advanced but also rooted in our country's strengths, ensuring long-term sustainability and global recognition. We believe that indigenous R&D will help our great nation to shape its own destiny.

By embracing the ethos of **Atmanirbhar Bharat**, we are not just building products, but empowering our industry, strengthening our economy, and contributing to the world.

I invite all of you to join us in this exciting journey as we continue to harness the power of defence and dual use technology development to realize a self-reliant India

Together, let's make India a global hub of innovation and technological excellence.

From the Desk of Editor-in-Chief

It is with great pride and excitement that I extend my warm greetings to all of you as we continue to strive for excellence in the field of scientific research and technological advancements. As part of the Defence Research and Development Organization (DRDO), the Defence Scientific Information and Documentation Centre (DESIDOC) has always been at the forefront of enabling strategic decision-making and promoting innovation in defence technologies.

In line with our nation's vision of Atmanirbhar Bharat (Self-reliant India), DESIDOC plays a crucial role in providing cutting-edge information, knowledge, and documentation that support the development of indigenously developed defence technologies. Our mission is to empower and equip our defence scientists, engineers, and policy makers with the right information to foster the creation of technologies that not only serve the defence sector but also contribute to India's overall technological self-sufficiency.

As we continue our journey toward a self-reliant India, it is essential that we invest in our human capital, nurture creativity, and embrace a spirit of innovation. At DESIDOC, we are committed to ensuring that the most advanced and relevant information is made available to all stakeholders to help achieve this goal. We are continuously enhancing our systems, improving our processes, and collaborating with our counterparts to deliver knowledge solutions that accelerate India's technological growth.

The future of India's defence capabilities lies in our collective commitment to innovation, self-reliance, and collaboration. Through initiatives such as Atmanirbhar Bharat, we are determined to build a future where India stands as a global leader in defence and technology.

Let us work together to bring this vision to life, ensuring that we continue to push the boundaries of innovation, strengthen our defence sector, and contribute to India's growing stature on the global stage.

Kiran Chauhan
Director, DESIDOC

DRDO'S TECHNOLOGY DEVELOPMENT FUND: FOSTERING INDIGENOUS EXCELLENCE

Defence Production Policy (DPP) promulgated in 2011 by the Ministry of Defence (MoD) considers self-reliance in defence manufacturing as a vital strategic and an economic imperative emphasis on utilising the emerging dynamism of the Indian industry by leveraging domestic capabilities for the growth of the Indian defence industry. In pursuance of this policy, the Government of India announced the setting up of a 'Technology Development Fund (TDF)' in the Union Budget 2014-15, which aims at funding the development of defence and dual use technologies that are currently not available with the Indian defence industry or have not been developed so far. The highlights of TDF scheme are:

- The funding is through provision of grants-in-aid to Indian public and private sector industry especially MSMEs and Startups that work in collaboration with academic and research institutions to carry out innovation, research and development.
- The focus of TDF scheme is funding development of technologies that form the kernel of components/ assemblies, which in turn are used to develop defence equipment/systems/sub-systems/platforms.
- The scheme is executed by decision-making committees under the overall guidance and oversight of Hon'ble RM. Empowered Committee (EC) is the policy decision-making committee for TDF scheme and Technical Committee is the functional and operational committee of TDF scheme. The execution of development of technology is through PMMG who ensures proper selection, monitoring of industries and provide technical guidence leading to successful development of technology..

The TDF scheme, covers the following nature of products and technologies as:

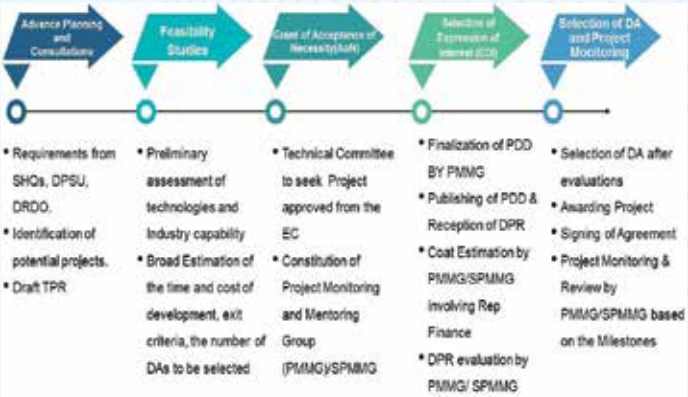
- Significant up-gradation/improvements/further developments in the existing products/process/ application/upgrades, in terms of reduced material consumption, improved functioning, improved quality, reduced energy consumption resulting in overall cost reduction and functional improvements.
- Technology readiness level up-gradation from TRL3 onwards to realisation of products as per the Services requirements.
- Development of futuristic technologies/innovative products for defence applications special focus on deeptech technology development.
- Import substitution of components whose technologies does not exist with Indian industries and where there is a clear need from the User.
- The scheme is normally limited to development of technologies or prototype having potential use of defence/national security/dual use. However if need be the technology is developed beyond TRL Level 7 to ensure early readiness for adoption.
- The financial criteria for inclusion of projects under the TDF scheme are the cost of technology, development does not exceed Rs. 50 crore. Projects with cost above Rs. 50 crore may be taken up after approval from RM.
- Typical, time line of the project under TDF scheme does not exceed a period of four years.

TDF Scheme Procedure Flow

The TDF process outlines the key stages involved in the development of defence technologies. It begins with advanced planning, where strategic goals and objectives are set, followed by feasibility studies to assess the technical and financial viability

of proposed projects. The process continues with the Grant of Acceptance of Necessity (AoN), which formalizes the project's importance, and proceeds to the Selection of Expression of Interest (EOI), where potential partners are identified. Selection of Design and Development Agencies (DA) ensures the right collaborators are chosen, and Project Monitoring is carried out to track progress and ensure timely and efficient execution.

The process ensures that each project progresses through necessary evaluations, approvals, and collaborations, fostering a structured approach to innovation and successful technology development in defence

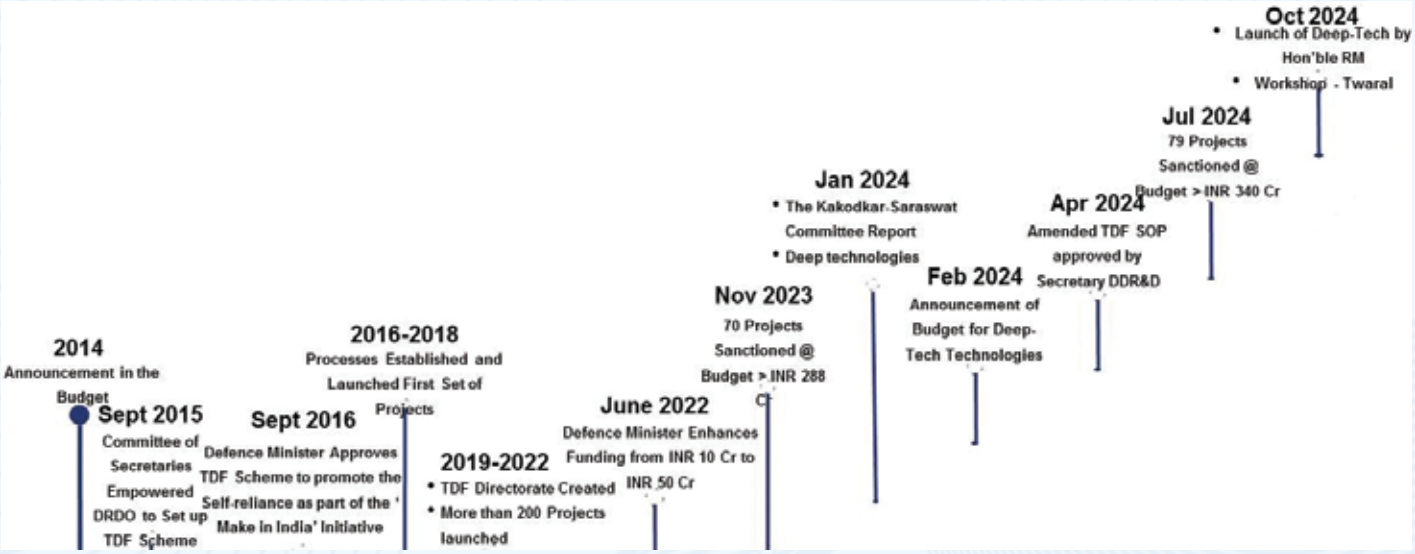


Process Flow of TDF Scheme

Progress Till Date

The progress of the TDF reflects significant strides in enhancing India's defence technological capabilities. Since its inception, TDF has supported 79 technology developments, with over Rs 325+ crore, focusing on fostering innovation and self-reliance in defence technology. The fund has been encouraging participation of MSMEs and startups, and 46 MSMEs and 20 start ups already benefitted from the scheme. The progress highlights the successful continuous mentoring through subject matter experts who have helped in identification of right collaborators: private & public sectors, R&D institutions and academia for strengthening the development of indigenous defence technologies and aligning with India's vision of becoming self-reliant in defence production.

The continuous progress of TDF demonstrates its crucial role in enabling the development of cutting-edge technologies for the defence application. With comprehensive support, including mentoring, testing, and monitoring, TDF has accelerated the creation of Atmanirbhar Bharat defence products, contributing to India's goal of becoming a global defence manufacturing hub.



Progress Timeline of TDF Scheme

Technologies Successfully Developed

Autonomous UAV for Search and Report Operations in Enclosed or Indoor Environments

The project developed an indoor UAV with an autonomous navigation stack, onboard object detection, and a localization fallback mechanism. It features 3D mapping, AI/ML-based exploration, and robust flight control. Its success enables applications in search and rescue, surveillance, industrial inspection, and hazardous environment exploration. The project was completed and handed over to DG MCC in the presence of Hon'ble RakshaMantri Shri Rajnath Singh on 18 October 2024.

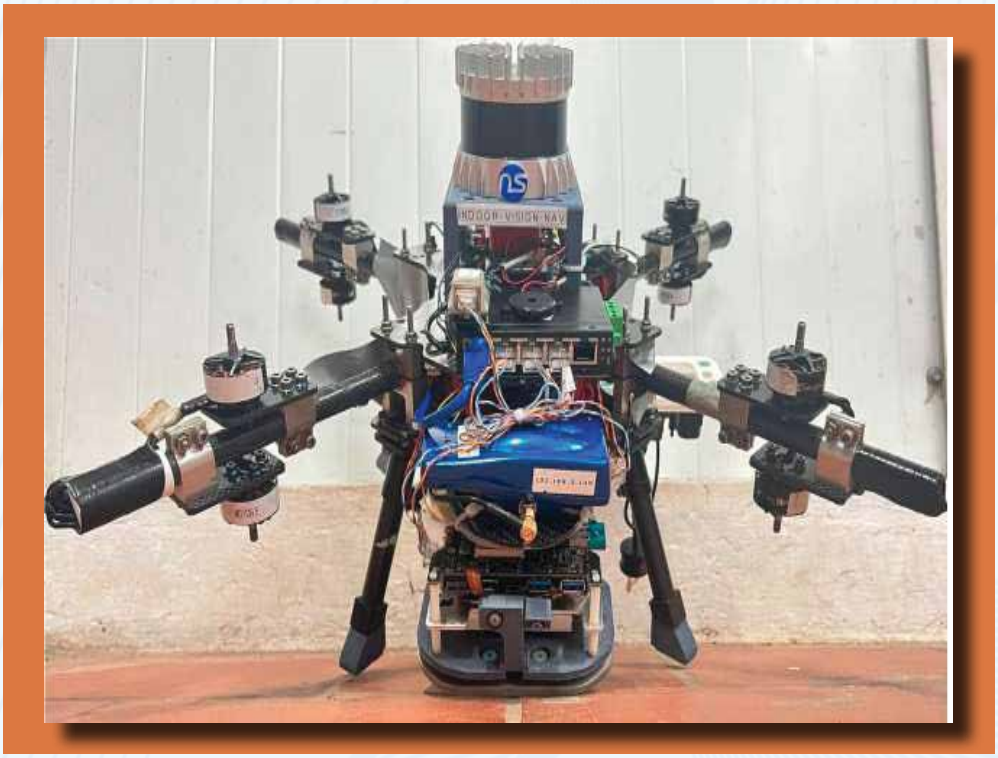
Detail Description

The project developed an autonomous indoor UAV with LiDAR-based 3D mapping and AI-powered EO/IR cameras for all-lighting personnel detection. Its navigation, optimized software, and failsafe mechanisms enhance tactical and rescue operations while reducing reliance on foreign drone technology.

Application

Autonomous drones aid search missions, disaster response, industrial inspection, security, and environmental monitoring by providing real-time data, detecting defects, and ensuring safety.

User	:	**DRDO**
Nodal Lab	:	CAIR
Developing Agency	:	M/s NewSpace Research Technologies, Bangalore



JATUKA - Autonomous Drone

ARINC 818 Video Processing & Switching Module and Smart Multi-functional Display- Military Grade

The ARNIC 818 Video Processing & Switching Module supports video conversation from analog and digital format to ARNIC 818. It has the ability of transmitting and receiving ARINC 818 video, symbol and control & control command data from displays.

The Smart Multi-Functional Display-Military Grade (SMFD) has built in fault tolerant real-time graphic processor which gives the ARINC-818 Digital video, MIL-1553B, ARINC-429 which is suitable for input and output.

Detail Description

The transmission of multiple videos in single ARINC 818 interface makes it a state-of-the-art device. It also transmit and receive ARINC 818 video, symbol and control and command data from displays.

The display comes with the resolution of 1400x1050, along with MIL-STD 810F, NVIS complaint, 461C qualification. It also support display of external video image overlaid with of ARINC 818 input video symbols display.

Application

The technology has vast application in any of the fighter aircraft to convert digital and analog format into ARINC 818.

User	:	**Indian Air Force**
Nodal Lab	:	DARE/ADE
Developing Agency	:	M/s Logic Fruit Technologies, Bangalore

Avionics Video Processing Switching Module(AVPSM) and Smart Multi-functional Display (SMFD)

Virtual Sensors for Aero Gas Turbine Engine Health Monitoring System

The project involves development of a comprehensive diagnostic system of various parts of Aero Gas Turbine Engine (AGTE), leading to increased operational reliability and longevity of the engine. The system is built on stronger foundation of modern Artificial Intelligence/Machine Learning (AI/ML) technologies. It efficiently handles large scale data, and conducts operational assessments rapidly with a high degree of accuracy. The virtual sensor framework, a critical component in the health monitoring of the aero gas turbine, is being developed indigenously. This is a significant step towards developing a digital twin of AGTE.

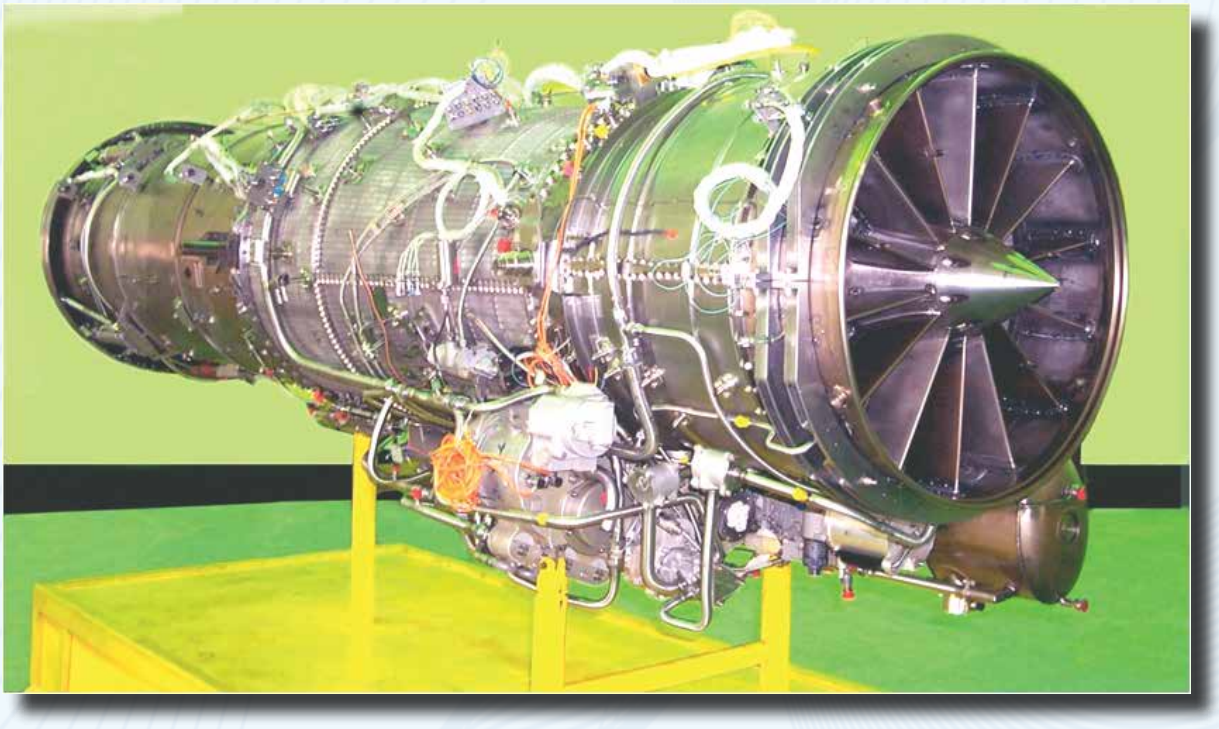
Detail Description

The project involves development of a comprehensive diagnostic system of various parts of AGTE, leading to increased operational reliability and longevity of AGTE. The system is built on stronger foundations of modern AI/ML technologies, efficiently handles large-scale data, and conducts operational assessments rapidly with a high degree of accuracy. The virtual sensor framework, a critical component in the health monitoring of the aero gas turbine, is being developed indigenously. This is a significant step towards developing a digital twin of AGTE, enabling health monitoring and simulation of adverse test conditions in laboratories before the actual run.

Application

The technology can be useful in the areas of civil aviation and energy power plants.

User	:	**DRDO**
Nodal Lab	:	GTRE
Developing Agency	:	M/s ChiStats Labs Private Limited, Pune



Comprehensive Diagnostic System for Aero Gas Turbine Engine

Development of Drone for Carriage of Stores in High Altitude Areas (ICE Engine-based, Electric-based, Hybrid-based)

Three variants of drones i.e. Engine-based, Electric-based, Hybrid-based are developed for carriage of load in High Altitude Area (HAA), with a payload capacity of 20 kg. The drone needs to deliver this payload within a CEP of 4 meter and with endurance of minimum 1 hour. The desired operating range is 10 km and above, by maintaining the height of 500 meter above the ground level. With integrated GCS map Google and MiL, it can be used offline. Along with the ability of working at -20 °C upto + 40 °C, the drone can be operated by both mediums, i.e. autonomous and manual.

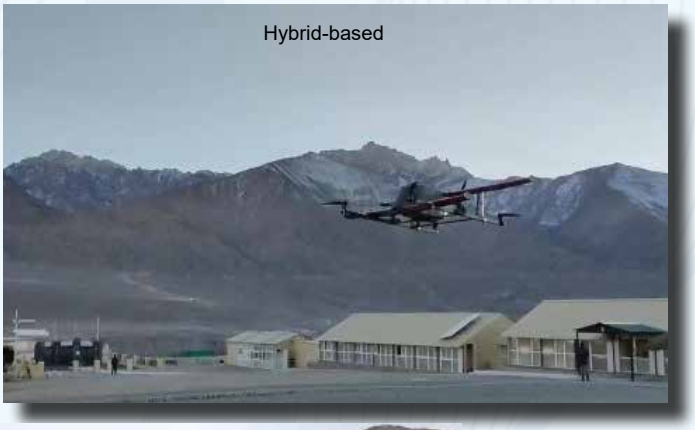
Detail Description

Drones should stay stable if the speed is more than 30 km/hr. As per the specifications, the maximum take-off altitude and service ceiling of the drone is 18000 ft AMSL and 20000 ft AMSL, respectively. It has a GPS System with IMU/INS.

Application

The technology has a wide application in the defence sector like in war zone, riot areas for surveillance and load carrying.

User	:	**Indian Army**
Nodal Lab	:	ADE
Developing Agencies:		M/s Raphe mPhibr Pvt. Ltd. M/s Yottec System LLP M/s Edall System



Logistic Drone Technologies at High Altitude

Fuel System - Temperature Transducer for Aircraft Applications

Indigenously developed temperature transducer for aircraft application is being mentored by ADA, Bangalore and is being developed by M/s Tejase Aerosense Pvt. Ltd, Rourkela. The developed sensor has completed major qualification tests. The sensor matches and exceeds the requirements of accuracy and endurance. The sensor has an accuracy of ±1 °C with a response time of less than 1 second and a measurement range from -40 °C to 150 °C.

Detail Description

The technologies realised in the project are really commendable in ab initio design of a wire wound platinum RTD element, Innovative material selection to ensure faster response time of transducer, fully indigenous manufacturing and quality control processes for production of a high accuracy and high reliability sensor, subjected to qualification testing conforming to Advanced Medium Combat Aircraft (AMCA) environmental map, life test confirming to 10,000 flying hours.

Application

The subject sensor can be used for future Indian Combat aircraft program like LCA Air Force (AF) Mk2, AMCA, and Twin-Engine Deck Based Fighter (TEDBF) and thereby saving the import cost significantly.

User	:	**ADA**
Nodal Lab	:	ADA
Developing Agency	:	M/s Tejase Aerosense Pvt., Ltd., Mumbai

Temperature Transducer for Aircraft Applications

VHF/UHF Blade Antenna for Aircraft Applications

VHF/UHF Blade antenna is an advanced, high performance broadband antenna specifically designed for use in multifunction communications systems. This antenna is a cutting edge solution that ensures reliable signal reception and transmission in harsh and dynamic environments, particularly high speed aerospace applications.

Detail Description

Engineered to meet the unique requirements of helicopters, supersonic aircraft and UAV, VHF/UHF Blade antenna offers seamless performance across an expansive frequency range of 108-400 MHz, providing versatile communications options. The VHF/UHF Blade antenna excels in providing low drag omnidirectional coverage in azimuth and outstanding durability in extreme conditions. The key benefits of the system are as:

- Broadband low profile design offering a streamlined, low drag form factor.
- Provides excellent signal coverage in all directions, ensuring consistent communication.
- Operates effectively in extreme temperatures and altitudes, making it perfect for a wide range of aerospace applications.

Application

The system has been primarily developed to be integrated with LCA; however the same can be can be used for various other aerospace applications in the operational frequency range.

User	:	**ADA**
Nodal Lab	:	ADA
Developing Agency	:	M/s Verdant Telemetry & Antenna Systems Pvt Ltd, Kochi

VHF/UHF Blade Antenna for Aircraft Applications

Solid State Power Amplifier for Radars

Solid State Power Amplifier (SSPA) unit, is a back-up for existing Stage 1 and Stage 2 amplifiers for AMDR radars. The SSPA unit is part of the transmitter system whose output is a single channel operating in a planner array S band radar. The transmitter receives low power RF input signal, amplifies and provides the high signal to the antenna via waveguide. The operating frequency range of SSPA is required to be between 3100-3300 MHz for the prototype. Currently, BPM of 1 kW has been achieved and optimization of power combining is in progress.

Detail Description

The 6 KW SSPA consists of a multi-drawer (19" Subracks) integrated subsystem housed in a 19" 18U rack, producing a minimum of 6 KW peak pulsed power with a 100 µ sec pulse width and 10 % duty cycle in the 2.9 GHz to 3.3 GHz frequency range. It features power combining of eight 1.5 KW peak power solid-state amplifier modules using high-power GaN on SiC devices for wide frequency response, high gain, and peak power. Each drawer has forced air cooling, and the subsystem operates on a 380 V/440V, 3-phase AC power supply. It includes built-in control, monitoring, protection functions, and remote management via Ethernet and RS422.

Application

The basic high peak power 1.5 KW Modules already developed for the 6 KW Solid State Amplifier, can be used as basic buliding blocks for realising high technology high peak power solid state radar transmitters, with a higher efficiency and reliability as compared to the earlier technology, Microwave Tube-based Radar Transmitters.

User	:	**Indian Navy**
Nodal Lab	:	LRDE
Developing Agency	:	M/s Aidin Technologies Pvt. Ltd., Bangalore

Various Components of Solid State Power Amplifier for AMDR Radars

Composite Materials Seawater Pumps (40 TPH & 125 TPH)

The recirculation pumps are centrifugal in nature, particularly used for supply of sea water as coolant for naval applications. The pump is dynamically balanced to reduce vibration, which makes it lighter by 44 % and is modular for easy maintenance. It is durable and reliable and reduction in weight is achieved by 1/4th of the pump/casing compared to metal. The pump comes with the flow rate of 125 m^3/Hr, 2100 LPM, 550 GPM, along with power rating of 25 HP/18.6 kW.

The pump is designed to give emergency response in constricted spaces. It is portable to be operated by just two persons.. It has monoblock construction for compactness with 15 min dry run capability.The flow rate is 40m^3/Hr, 666 LPM, 176 GPM, along with power rating of 5 HP/3.7 kWg.

Detail Description

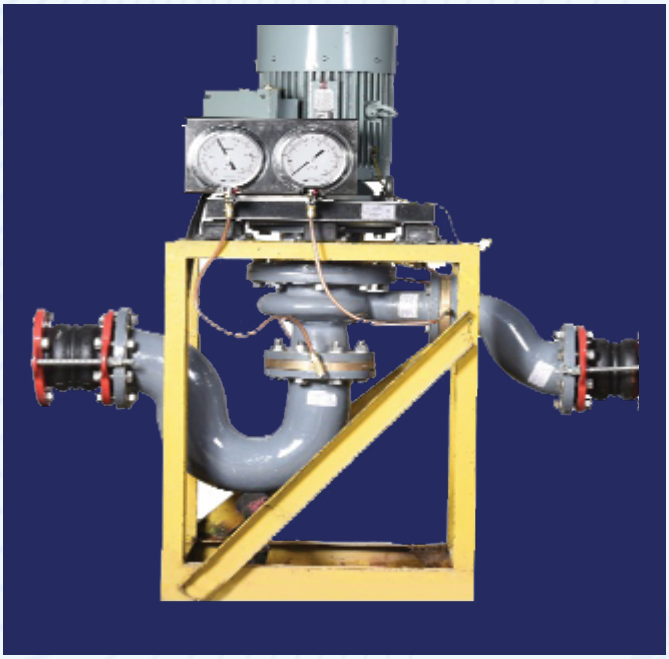
It is durable and reliable and reduction in weight is achieved by 1/4th of the pump/ casing compared to metal.

The pump is IP 68 certified and can pump debris upto 6 mm size.

Application

It has a wide use in naval application like corrosion proof seawater pumps for naval applications, fire fighting and recirculation of saline waters and pump may be utilized by defence as well civil application.

User	:	**Indian Navy**
Nodal Lab	:	R&DE
Developing Agency	:	M/s Zeus Numerix Pvt. Ltd., Pune



Composite Pumps for Saline Water (40 TPH & 125 TPH) for Naval Platforms

Development of Water Tight (WT) Gas Tight (GT) & Fire Class EMI-EMC Complaint Doors and Hatches for Indian Naval Ships

The primary purpose for development of this project is to overcome the issue of the heavy weight and higher maintainability of the existing steel water tight/gas tight doors and hatches. the use of composite material for development of water tight/ gas tight doors and hatches significantly reduces the weight of the doors, which makes them easier to handle. The composite material reduces the weight and does not corrode. The method of construction is preferably grid stiffened sandwich structure for lowering the weight and increasing stiffness to limit the deflection.

Detail Description

It has a EMI Resistant of Attenuation of 60 db upto 18 ghz, light weight and effortless openings and closing. It also have a fire resistant as it is Qualified for IMO FTP Part 3 A60 and Part 5.

Application

It has a wide application in the field of marine and can be utilised by various user SHQRs. especially in Indian Navy, Indian Coastguard, etc.

User	:	**Indian Navy**
Nodal Lab	:	NMRL
Developing Agency	:	M/s Valdel Advanced Technologies, Bengaluru

Composite Doors & Hatches for Naval Platforms

VLF Loop Aerial

VLF Loop Aerial is required for underwater platforms to receive VLF broadcast being transmitted from a land-based VLF station. The VLF loop aerial is fitted in the water exposed area of the underwater platforms and the pressure tested RF cable runs into the underwater platforms. The VLF signals intercepted are pre-processed in the below deck equipment prior feeding the same into an existing VLF receiver.

The system has completed QT, FATS and HATS. SATs and limited production are in progress on Kalvari Class of vessel.

Detail Description

This invention is a compact Very Low Frequency (VLF) antenna designed to improve signal reception in the 3 kHz to 30 kHz range, addressing issues like size, sensitivity, bandwidth, and physical constraints. It features a unique configuration with orthogonal, helically wound ferrite-loaded cores and advanced materials, enhancing performance while reducing size. The helical design boosts inductance and radiation efficiency, while a matching network optimizes load efficiency. It also includes a high-gain LNA and voltage protection, with a modular design for easy installation and scalability in military, submarine, and time synchronization applications.

Application

Submarine communication provides reliable one-way or two-way communication with naval bases and enables long-range control of unmanned underwater vehicles like AUVs and ROVs. It is also used in oceanographic research and environmental monitoring, particularly in sensor networks for deep-sea data collection. Additionally, it plays a crucial role in disaster communication, operating effectively in extreme conditions such as earthquakes and deep-sea exploration.

User	:	**Indian Navy**
Nodal Lab	:	DEAL
Developing Agency	:	M/s Verdant Telemetry & Antenna Systems Pvt Ltd, Kochi

VLF Loop Aerial Antenna for Underwater Platforms

VLF-HF Matrix

VLF-HF antenna matrix is intended to receive VLF broadcast from a land-based VLF station using the HF whip antenna. The matrix is required to process HF frequencies received using whip antenna. The antenna matrix would be fitted in the radio room of the submarine. The signals intercepted by the HF whip antenna are pre-processed in the below deck requirement prior feeding the same into an existing VLF/HF receiver onboard. The VLF/HF antenna matrix is also capable of simultaneously processing VLF and HF signals from multiple antenna with enhanced accuracy. The system has completed QT and is in final stage of clearance.

Detail Description

The system enhances reliability in underwater communication by automatically adapting to depth, interference, and signal conditions. It is optimized for data transmission, utilizing VLF for long-range, low-data messaging and HF for short-range, high-bandwidth communication. Advanced metamaterials enable miniaturization, while corrosion-resistant coatings ensure durability in saltwater environments.

Application

The system features a compact and efficient design that is light weight, making it ideal for use in submarines and portables naval systems. Its versatility allows it to be easily adapted for Autonomous Underwater Vehicles (AUVs), Remotely Operated Vehicles (ROVs), and underwater sensor networks.

User	:	**Indian Navy**
Nodal Lab	:	DEAL
Developing Agency	:	M/s Verdant Telemetry & Antenna Systems Pvt Ltd, Kochi

VLF-HF Antenna Matrix for Underwater Platforms

Tide Efficient Gangway

Naval logistics face the challenge of ensuring safe, efficient access to ships amid changing tidal conditions. The Tide Efficient Gangway (TEG) is designed to address this with a mechanized system that keeps steps horizontal across slopes from -15° to +65°. It's a passive mechanism, eliminating the need for external power sources, ensuring reliability even in remote conditions. Key features include tidal adaptability, a load capacity of up to 4,000 kg UDL, and various safety features. The TEG is being developed in three lengths—6.5m, 15m, and 20 m—to meet specific operational needs.

Detail Description

Traditional gangways with inclined planks are hazardous due to steep slopes, slippery surfaces, and movement difficulties, especially in extreme tides and weather. The TEG addresses these issues with a mechanized, passive system that keeps steps horizontal, ensuring improved stability, safety, and efficiency.

Application

Tide-resilient pedestrian bridges are floating walkways for flood-prone cities, while AI-powered gangways with safety sensors enhance security for floating platforms. Amphibious temporary bridges offer deployable access for disaster relief teams. Eco-friendly floating infrastructure includes urban walkways and commercial spaces, supporting sustainable development. Accommodation ladders on ships provide essential access for personnel.

User	:	**Indian Navy**
Nodal Lab	:	NPOL
Developing Agency	:	M/s Trinitech Infrastructure (India) Limited, Visakhapatnam

20 m Long Tide Efficient Gangway for Indian Navy

Development of Tools for Data Assessment, Active Learning & Believability for Visual Data

The project is aimed at enhancing AI model validation and optimisation for defence applications. It will facilitate collaboration among scientists through shared and reproducible experiments. All the tools are accessible via a user-friendly web interface. The project focuses on developing a comprehensive framework to address the unique challenges posed by the vast amounts of data generated in defence scenarios. It consists of four key modules, namely data/feature assessment, active learning, ai believability and web application. It will empower defence organisations to build more accurate, reliable, and efficient AI models, leading to improved decision-making and enhanced capabilities in various critical applications.

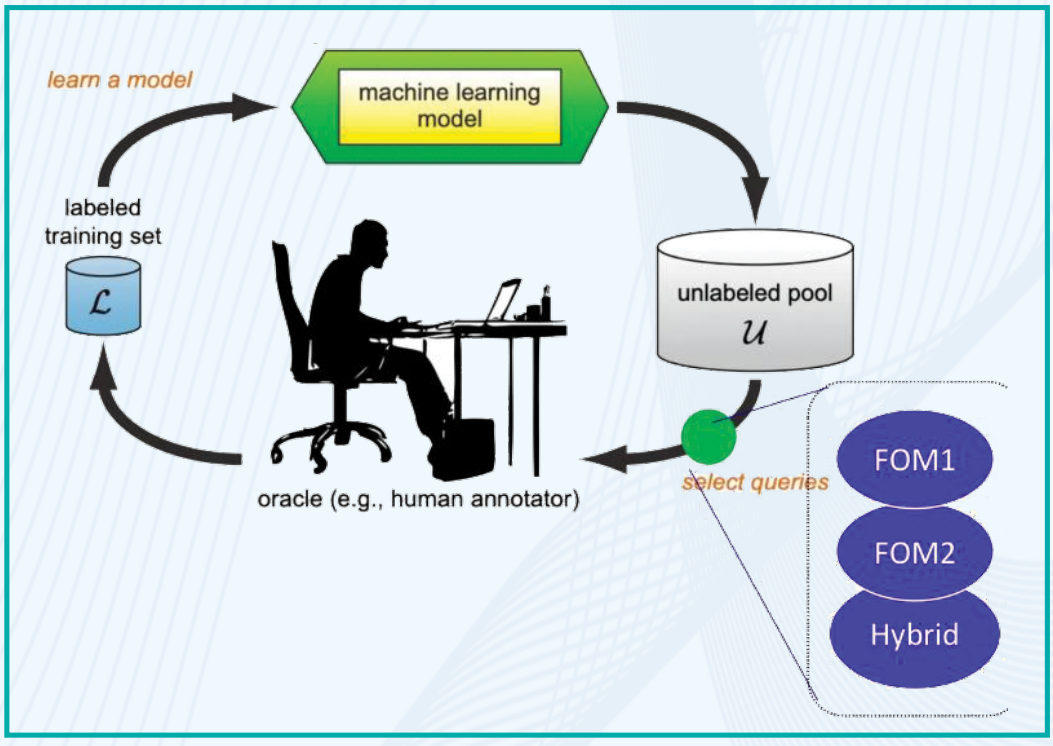
Detail Description

The project introduces an active learning strategy using two novel metrics, FoM-1 and FoM-2, to optimize training sample selection. FoM-1 assesses model familiarity using KNN analysis, while FoM-2 measures classification confidence, reducing manual annotation while maintaining accuracy. Additionally, an AI believability score system enhances trust in AI-generated outputs across classification, object detection, and segmentation tasks.

Application

The technology enhances AI-driven decision-making in defence and commercial sectors, improving target detection, autonomous navigation, and cybersecurity. It also benefits medical imaging, autonomous vehicles, and industrial inspection. By integrating active learning, it optimizes AI training and ensures reliable, explainable models.

User	:	**DRDO**
Nodal Lab	:	CAIR
Developing Agency	:	M/s ChiStats Labs Private Limited, Pune



AI Driven Tools/ Models in Decision Making in Defence

Simulator for Unmanned Ground, Marine (Sea-surface and underwater) and Aerial Vehicles

The simulator, developed for testing autonomous unmanned vehicles, features comprehensive environmental modeling across desert, underwater, surface, and aerial scenarios with dynamic weather conditions. It enables scenario and vehicle modeling with obstacle simulation, offers intuitive control systems for customization, and includes extensive developer documentation.

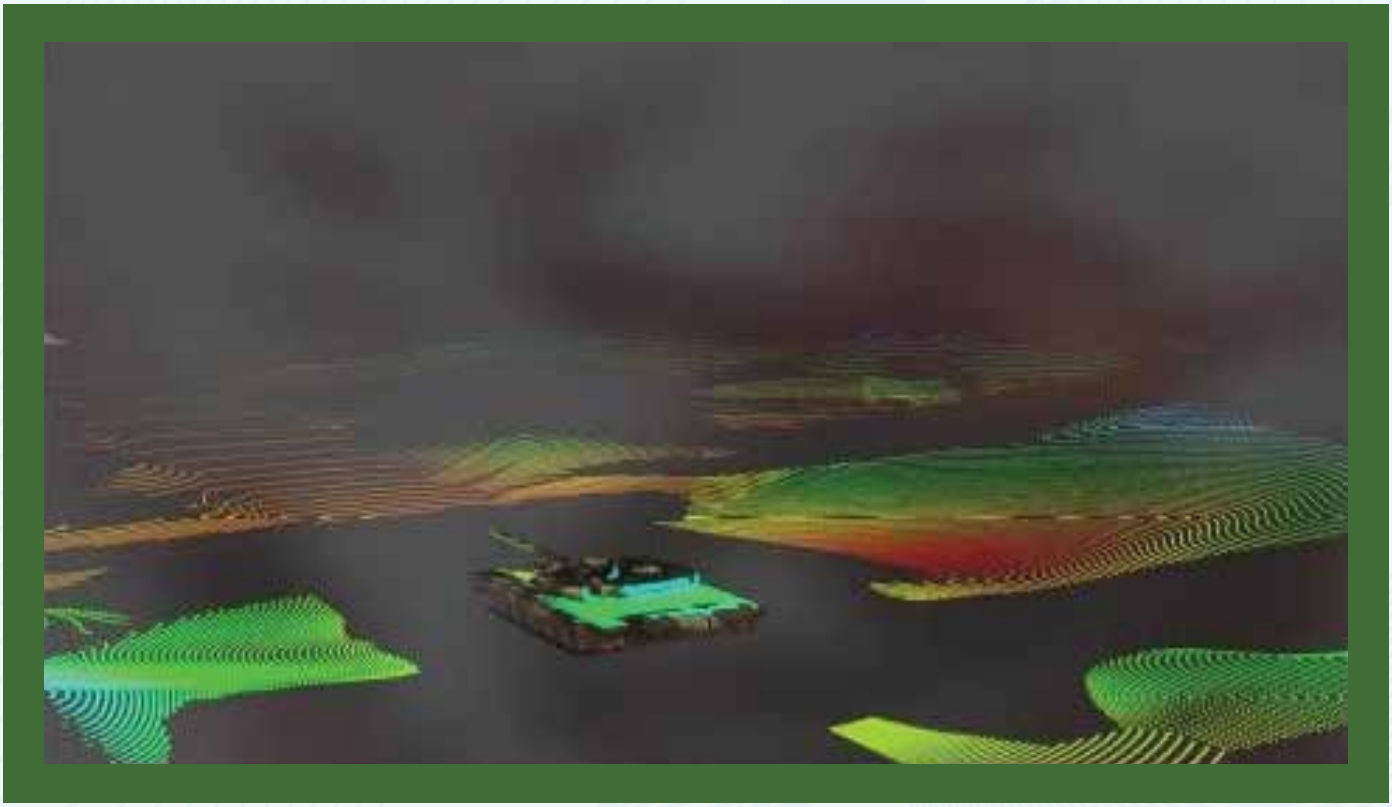
Detail Description

The simulator offers high realism with advanced physics, enabling accurate environmental modeling and autonomous testing under adverse conditions. It supports scalable integration, swarm simulations, and operator training. With multi-domain capabilities, dynamic weather effects, and extensive customization, it is a versatile and innovative simulation tool.

Application

The simulator aids defence, commercial, and research sectors in mission rehearsal, AI development, disaster management, and maritime operations. Its VR integration enhances soldier training with immersive, cost-effective scenarios.

User	:	**DRDO**
Nodal Lab	:	CAIR
Developing Agency	:	M/s Combat Robotics India Pvt. Ltd., Pune



Simulator for Unmanned Ground Marine and Aerial Vehicles

Divya Drishti- A Cutting-edge AI Tool for Personal Identification

The AI tool creates a robust and multifaceted authentication system by combining facial recognition with gait analysis. This dual approach enhances the accuracy of identification, minimizing the risk of false positives or identity fraud and has versatile applications across diverse sectors including defence, law enforcement, corporate and public infrastructure.

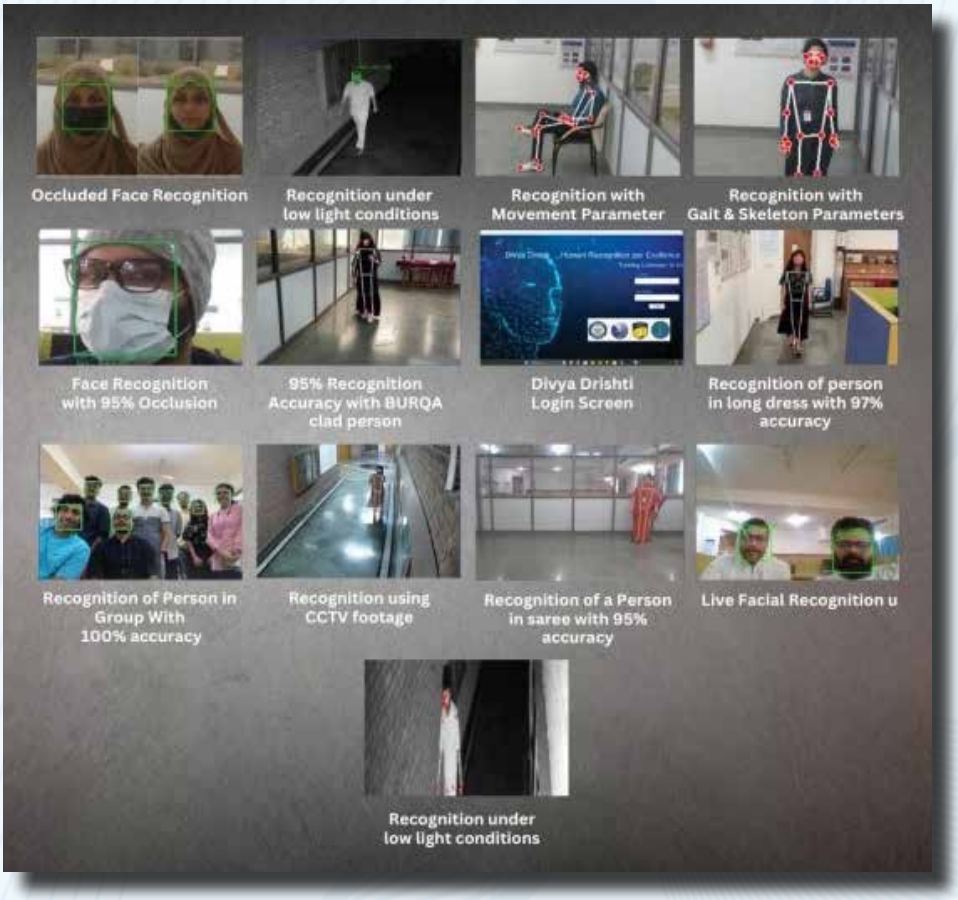
Detail Description

'Divya Drishti' integrates face recognition with immutable Physiological parameters such as gait and skeleton. This innovative solution marks a significant advancement in biometric authentication technology, offering significantly enhanced accuracy and reliability in identifying individuals. By combining facial recognition with gait analysis, Divya Drishti creates a robust and multifaceted authentication system. This dual approach enhances the accuracy of identification, minimizing the risk of false positives or identity fraud

Application:

The technology has dual use application and has vast use for CAPF, NDRF and law enforcement, corporate and public infrastructure including in riot and Access Management System

User	**: Dual Use**
Nodal Lab	: CAIR
Developing Agency	: M/s Ingenious Research Solutions Pvt. Ltd., Faridabad



Divya Drishti - AI Tool for Person identification with Gait and Facial Analysis

Futuristic High Performance Propulsion System for Small Satellites EOR & Station Keeping-based on HAN (Hydroxy Ammonium Nitrate) Catalyst & Thruster Technology

The project developed a green monopropellant propulsion system as a non-toxic alternative to Hydrazine. It successfully demonstrated indigenized technologies in low-orbit missions and has been handed over to DSP, DRDO, for further use.

Detail Description

The green propulsion system is an advanced alternative to Hydrazine-based systems, tested in a high-altitude facility. It offers higher specific impulse, increased Delta-V, and reduced tankage volume. The system will be integrated into a satellite-like platform and delivered to DSP, DRDO. Key indigenization achievements include the development of a green mono-propellant, an indigenous catalyst, flow control and fill & drain valves, a space-qualified potting compound, a catalyst bed heater, a 3D-printed propellant tank, and a universal propulsion control unit for telemetry and data handling.

Application

The indigenously developed green propulsion system is suitable for satellite manoeuvring, orbit raising, and orbit keeping. Its green propellant can serve as a liquid gun propellant, while filters are useful for launch vehicles and missiles. Valves can be adapted for electric propulsion, pressure vessels can meet other satellite needs, and the propulsion control unit can be used independently in various satellites.

User	:	**DRDO**
Nodal Lab	:	DSP, LRDE
Developing Agency	:	M/s Bellatrix Aerospace Private Limited, Bangalore.

Hydroxy Ammonium Nitrate(HAN) Monopropellant firing in the Satellite Assembly

Futuristic High Performance Propulsion System for Small Satellites EOR & Station Keeping based on Hydrogen Peroxide & Ethanol Catalyst & Thruster Technology

The project develops a Low Orbit Propellant System for satellite corrections and orientation adjustments, using an Ethanol-Hydrogen Peroxide-based propellant that offers specific impulse at lower temperatures than conventional liquid propellants. The system and necessary facilities have been successfully developed, with a domestic supply chain established for components. The technical objectives have been completed, and the product has been handed over to DSP, DRDO for further use.

Detail Description

The I-booster propulsion system uses MS-289, a hydrogen peroxide-based mono-propellant, offering 50 % higher efficiency, 30 % less fuel use, and reduced launch costs. It is 60 % more affordable and 40 times safer than hydrazine, non-toxic and easy to handle. The system enables faster manoeuvrability, in-space refuelling, and satellite de-orbiting. Compact, lightweight, and ideal for 100-500 kg satellites, it features a high-temperature catalyst and long firing capabilities, enhancing longevity while supporting India's propulsion technology development.

Application

The I-booster propulsion system supports military satellites, commercial operations, and deep-space missions. It enables station-keeping, collision avoidance, and life support in oxygen-lean environments. The non-toxic fuel is also suitable for UAVs, drones, reusable spacecraft, and planetary rovers. Additionally, it supports in-space refuelling, orbital servicing, and space debris mitigation for sustainable space operations.

User	:	**DRDO**
Nodal Lab	:	DSP
Developing Agency	:	M/s Manastu Space Technologies Private Limited, Mumbai

Hydrogen Peroxide & Ethanol Monopropellant firing in the Satellite Assembly

Development of Dual Flow Self-regulation Joule-thomson Cooler

The JT Cooler is developed indigenously. This miniature cryocooler is used for the operation of high performance cooled infrared detectors in missile applications. The cool down time required for these detectors is less than 10 seconds. In the self-regulating JT cooler, as soon as the desired cold temperature is achieved, a built-in self-regulation mechanism reduces the mass flow of the cryogen to just 5 % to 10 % of its initial value.

Detail Description

A self-regulating miniature dual flow cryocooler is used for achieving an operating temperature 80/90 K. it has the mechanism to reduces the mass flow of the cryogen to just 5 to 10% of its initial value.

Application

It has a wide use in the defence sector especially in Missile application.

User	:	**DRDO**
Nodal Lab	:	SSPL, RCI
Developing Agency	:	M/s Techno Defence Private Limited, Thane Mumbai

Dual Flow Self Regulating Joule - Thomson Cooler for IR Missile Seeker

Prussian Blue Formulations (Capsules)

The critical drug has been developed for radiological nuclear emergencies and has been approved by Drug Controller General of India (DCGI). The drug has been developed by the industry M/s Scott Edil Pharmacia Ltd.) based on the technology of Institute of Nuclear Medicine & Allied Sciences (INMAS), Delhi and M/s Scott Edilpharmacia Ltd. The drug is available under the trade name of Pru-DecorpTM and PruDecorp-MG. The formulations are used for the decontamination of Cesium & Thallium. The drug is CDSCO approved and one of the critical medicines listed by World Health Organization (WHO) for radiological and nuclear emergencies.

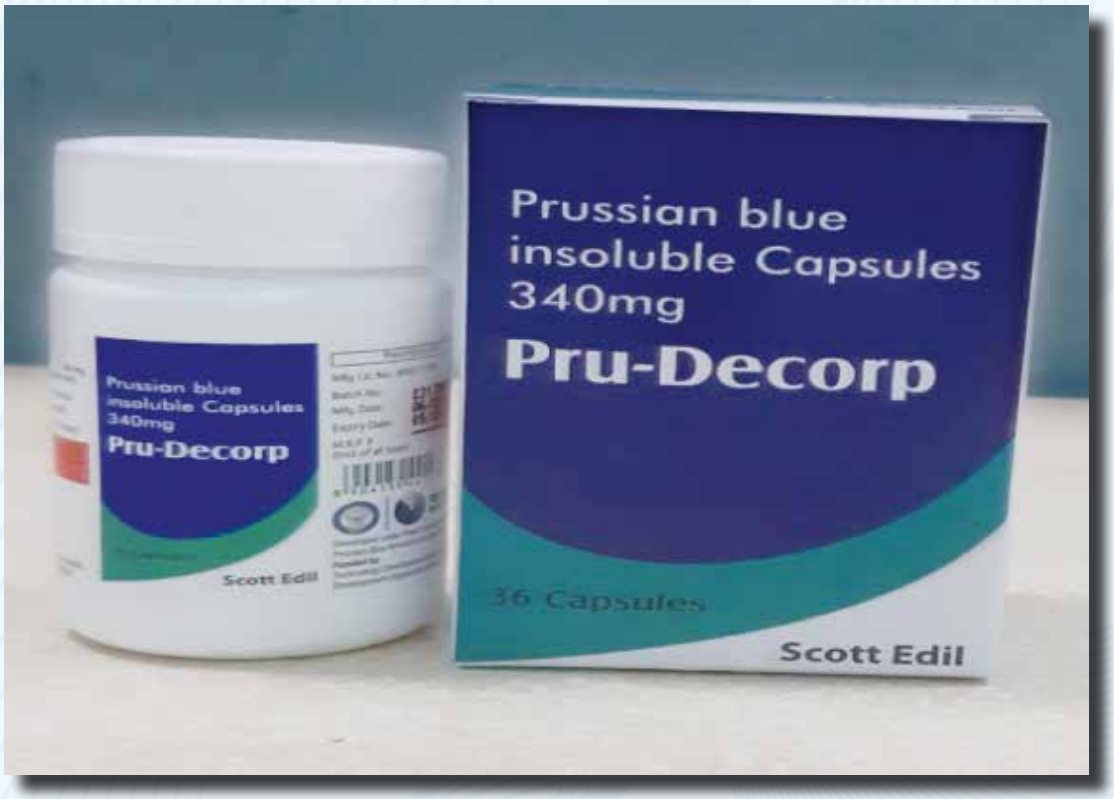
Detail Description

It has an antidote for radioactive and non-radioactive Caesium and Thallium with one time use capsule dosage from developed for rescue responders or subjects entering a zone contaminated with radioactive isotopes of Caesium or Thallium.

Application

It has a wide use in civil/ defence sector during any nuclear emergencies and can be used by hospitals/ under doctors' supervision for decontaminations of (S&T).

User	:	**DRDO**
Nodal Lab	:	INMAS
Developing Agency	:	M/s Scott Edil Pharmacia Ltd, Baddi, Chandigarh



Drugs for Decontamination of Cesium & Thallium in Nuclear Emergency

Multi-therapeutic Technology for Faster Healing of Wounds

The project aims to develop multi-therapeutic wound care technology for faster healing of complex non-healing wounds. The dual use technology will facilitate healing of wounds and avoid related complications like infections. Timely healing, avoiding complications like infections, ease of use, deployment in existing infrastructure, reduced treatment time and nursing time, lesser overall cost, etc. will be significant outcomes of using this technology.

Detail Description

The project's aim is to design and develop advanced multi-therapeutic technology for faster healing of wounds for defence use cases. The technology offers clinicians both negative pressure wound therapy and topical oxygen therapy options, which they can use based on their needs. The multi-therapeutic wound healing technology has been designed and developed for wounds most commonly observed in defence personnel. These wounds include:

- Bullet injuries
- Mine blast injuries
- Dirty wounds developed in counterinsurgency operations

Application

The technology has dual use application and has vast use for CAPF, NDRF and civil application including rail and road accident cases.

User	:	**DRDO**
Nodal Lab	:	INMAS
Developing Agency	:	M/s Inochi Care Private Limited, Assam

Multi-therapeutic Device for Faster Healing of Wound

Dare to Dream Innovation Contest

"Dare to Dream" (D2D) contest is designed to inspire and foster innovation in the defence and aerospace sectors. Since its inception in 2019, a total of four successful editions of the contest have been held, attracting over 22000+ registrations and 6350+ submissions. The contest encourages individuals, startups, and micro-enterprises to submit their cutting-edge ideas, focusing on technological solutions that address real-world defence challenges. With each edition, D2D has continued to be a driving force behind India's self-reliance in technology and innovation.

The benefits of participating in the D2D contest are immense. Winners receive recognition for their innovations as well as cash prizes that help fund the next stages of their projects. Moreover, winners may gain access to the TDF scheme. This support helps transform ideas into tangible technologies with the potential to make a significant impact in the defence sector. The contest also provides invaluable networking opportunities and access to mentorship from DRDO experts and industry leaders, helping participants refine and scale their innovations.

Ultimately, the D2D contest is more than just a competition; it's a cornerstone of India's technological advancement in defence. With four successful editions to date, the contest continues to be a vital tool for nurturing the next generation of tech innovators, ensuring India's leadership in the global defence and aerospace landscape. Through this initiative, participants are not only advancing their careers but are also contributing to a stronger, self-reliant future for the nation.

The contest has identified and recognized and awarded unique ideas in its first 4 edition and have awarded prize worth Rs. 465 lakhs. In addition the contest has further led to 9 projects under TDF scheme.

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