iDEX Innovations for Defence Excellence

PM Awardee

DEFENCE INNOVATION ORGANISATION

(Under Aegis of Department of Defence Production)

Ministry of Defence, Government of India

New Delhi -110002

SummaryofiDEXPrime(X)

ProblemStatements

S. No.	Name of Agency	Number of Problem Statements
1	Indian Navy	2
2	Indian Air Force	2
3	IOL	1
4	BEL	2
5	Defence Space Agency	6
	Total	13

iDEXPrime(DISCX)ProblemStatement

ProblemStatement(Prime)–1(IndianNavy)

Organization Name	**Directorate of Naval Architecture**
Problem Statement/ Challenge title	Replenishment at Sea (RAS)/Fuelling at Sea (FAS)
Challenge domain	Advanced Technology for Naval Application
Challenge brief/definition	The objective of Replenishment Fuelling at Sea is to permit fleet ships to remain at sea for prolonged periods. The fleet tankers and auxiliaries are equipped to replenish ships underway with fuel, provisions, stores, and spare parts to achieve the goal. The present RAS/FAS systems fitted onboard IN ships on both foreign OEM make on both delivery as well as receiving ships. The dependency on foreign OEM results prolonged downtime for the want of spares/ services during defect.
Future Expectation from the prototype / Technology developed	1. The RAS/FAS permits the restocking of a ship with personnel, ammunition, fuel and water while underway. 2. The Replenishment must accomplish within shortest possible time consistent with safety.

ProblemStatement(Prime)–2(IndianNavy)

Organization Name	**Indian Navy Incubation Centre for Artificial Intelligence - Bangalore**
Problem Statement/ Challenge title	Artificial Intelligence Based Smart Ship Operations
Challenge domain	Al based Technology
Challenge brief/definition	Navigation safety at sea including collision avoidance is a constant activity and mandates continuous and a tentative manning of bridge and Operational room by trained manpower. The significant progress in the field of Al improves the operations and eliminate the possibilities of accident at sea
Future Expectation from the prototype / Technology developed	1. Enhance operational efficiency through dependable inputs. 2. Effective in adverse weather conditions. 3. Alleviate operator overload through automated identification of threads. 4. Decision support aid for the ship's crew.

ProblemStatement(Prime)–3(IndianAirForce)

Sponsoring Dte/ Command/ Station	**Indian Air Force - DGMS(Air)**
Problem Statement/ Challenge Title	Development of a completely portable, integrated, lightweight, airworthy Patient Transportation Unit with lightweight oxygen supply for use in all transport aircraft and helicopters of the IAF. **Challenges:** A few, locally developed Patient Transportation Units (PTUs) are in use in the IAF. The challenges with these are as follows- · **Weight Penalty**: The PTUs in use are heavy and unwieldy. · **Battery life:** The battery life of equipment is poor, requiring carriage of an additional battery, which adds to both the weight penalty and the bulk. · **Airworthiness**: The said equipment is not airworthy, with its attendant risks in use on board aircraft. · **Carriage in Aircraft:** The current equipment is mounted on a large trolley, precluding its use in many including the Chetak and Dornier-228. The trolley also interferes with its use in certain ambulances.
Challenge Brief/ Definition **(Give details of innovation to be done by the start-up and expected deliverables at the end of the project)**	**Equipment:** Each PTU will consist of the below mentioned equipment mounted on a rigid stretcher structure. The equipment to be mounted is as follows: · Transport Ventilator · Defibrillator · Multi-Parameter patient monitor · Syringe infusion pump · Suction apparatus · 8 h battery life · 3600 liters of oxygen in a carbon fiber cylinder, pressurized at 180 Kg/cm2. · The cylinder is to be mounted on castor wheels so as to allow it to be dragged as a trolley.

	The equipment is to be mounted on a rigid molded, plastic board, patient transportation stretcher similar to a spinal board. The equipment will be attached to a premounted step at the foot end of the spinal board. The equipment is to be secured, so as to be compliant with the national ambulance code. The step is to give adequate clearance to accommodate the patient's feet. The harness system on the spinal board is to be designed so as to allow vertical winching of the board while carrying the patient and equipment the entire assembly is to be airworthy. The weight of the entire assembly is to not exceed 25 Kg though below 20 kg would be preferable.
Future Expectation from Prototype/ technology developed	The technology developed can be used to turn any ambulance into a critical care ambulance. It can also be used to transform any hospital bed into an ICU bed. This will greatly enhance the capability of any health care establishment even on ground. Hence, it will see widespread application.

Problem Statement (Prime) – 4 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**Indian Air Force - Directorate of Operations (Strategy)**
Problem Statement/ Challenge Title	Inflatable/modular sun shelters
Challenge Brief/ Definition	Operational Requirement
Give details of innovation to be done by the start-up and expected deliverables at the end of the project	During operations, combat units are required to undertake operations from off base sites. Due to the sensitivities of the equipment being operated, there is a requirement of inflatable/modular shelters which can be utilized both for the equipment as well as office work space. · To provide environmental protection for mobile elements/systems. (Radar, missile system, weapon storage, aircraft) · To provide work space and equipment shelter at off base sites. · At airfields, provide shelters at low cost which are not static/permanent structure. · Deny satellite ISR update in regard to critical equipment deployment through obfuscation. **Vital design features:** · Rapid deployment and redeployment capability. · Extreme weather sustenance. · Easily transportable across Indian terrain (hilly and desert). · Compact storage in Indian environment conditions. · Integrated power and network sockets.
Future Expectation from Prototype/ technology developed	Modular toilet and kitchen.

ProblemStatement(Prime)–5(IOL)

Organization Name	**IOL**
Problem Statement/ Challenge title	Development of an Infrared Detector Dewar Cooler Electronic Assembly including development of the infrared detector which is currently not being made in India.
Challenge domain	Electro optical domain
Challenge brief/definition	The detector dewar cooler electronic assembly is an electro-optical assembly which converts infrared radiant energy in the MWIR spectral band into electrical signals. System consists of the detector array which is housed in an evacuated dewar. • The detector array shall have 640X512 array and shall be developed indigenously. On focal plane signal processing electronics shall provide analog to digital converters and provide multiplexing of the detector signals. • The detector signal processor sub-assembly shall be mounted on the cold stage of an integral, closed cycle, cryogenic cooler. • This detector dewar cooler electronic assembly is connected to the Flex-Rigid electronic board. This board shall provide the relevant interfaces to operate the detector assembly. • The cooler shall be controlled for stabilized focal Plane Array temperature by an electronic controller.
Future Expectation from the prototype / Technology developed	As of now this sensor and Detector is not being manufactured in India.

ProblemStatement(Prime)–6(BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	Electro-Optic Modulator upto 20 GHz
Challenge domain	Electro-Optic Modulator (Phase /Intensity)
Challenge brief/definition	All High Power Lasers use Electro-Optic Modulators for Line Width reduction. Presently, being imported and are quite costly. **Specifications for typical applications are as follows :** **Material:** Lithium Niobate / Silicon **Wavelength Range:** 900 to 1700 nm **Output:** Polarization Maintained **Optical Input Level:** +18 dBm Max **Modulator Bias Mode:** Q+ for linear Operation **Extinction Ratio:** 25 dB **Operational Frequency Range:** DC to 20GHz **S21 Bandwidth:** 3 dB, 17 GHz Typical **IIP3 @ 10 GHz:** 25 dBm Typical **Input RF Voltage:** 25 dBm Max **RF Return Loss:** > 10 dB@ 20 GHz **Operating Voltage (Vπ):** < 3.5 V **Fiber Type:** PANDA input and Output **RF Connector:** SMA **Electrical Connector:** 6/9 pin for control and supply. **Dimensions:** Not exceeding 150 mm x 30 mm x 25 mm. **Operating Temperature:** -55°C to +75°C
Future Expectation from the prototype / Technology developed	The prototypes will be integrated with other sub systems of High Power Lasers and RF over fiber and evaluated.

ProblemStatement(Prime)–7(BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	Low Light Image Sensors for Next Generation Armoured Vehicle
Challenge domain	Indigenous Development of Imaging Sensors
Challenge brief/definition	Presently there is a lot of dependency on the foreign OEMs for Detectors required for Imaging Applications. Hence, CMOS sensors are required to be indigenized. **Specifications for typical applications are as follows:** **Technology:** CMOS **Total number of pixels:** 1920 x 1080 **Horizontal:** 1920 **Vertical:** 1080 **Pixel size:** 6-10 µm **Charge Capacity:** > 25000 electrons **Output Capacity:** < 4 mLux **Quantum Efficiency:** Better than 70% **Dark Noise:** 1e **Dynamic Range:** 80 dB **Frame Rate:** 100 Hz **Shutter Scan Type:** Rolling & Global **Output:** Digital **Operating Temperature:** -40°C to 55°C
Future Expectation from the prototype / Technology developed	1. Detector to be made complying to the above specifications, however Prototype may be demonstrated meeting 0°C to 50°C. However it shall finally meet -40°C to 55°C operation. 2. The Technology developed can be further integrated with the ROIC for compactness.

ProblemStatement(Prime)–8(DefenceSpaceAgency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	Integration of Optical and Radar Sensors into a network with AI based Analytical Platform
Challenge brief/definition	Presently, the capability for detecting, tracking and monitoring satellites/ space debris is very limited. There is a need for development of an integrated optical and radar sensors network along with AI based analytical system. The developed system should be scalable in terms of addition of incremental number of sensors for credible and real time Space Situational Awareness (SSA). The system should be capable of real time monitoring and trajectory analysis of very large number of space objects, confluence analysis and collision prediction of any space object and provide timely warning and window for evasive manoeuvres.

Problem Statement (Prime) – 9 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	Training Simulator for Space Activities
Challenge brief/definition	There is a requirement to simulate space-based contingency scenarios periodically so as to train upon the requisite counter measures and also to test the efficacy of these counter measures once they are developed. It is proposed to develop a space simulator, which is a software-based training simulator specifically designed for simulating dynamic space situations. The simulator should be scalable to include many feasible scenarios and its counter measures.

ProblemStatement(Prime)–10(DefenceSpaceAgency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	200-Watt Ka band Solid State Power Amplifier (SSPA) for Satellite Ground Station
Challenge brief/definition	The SSPA plays a critical role in establishing the ground to satellite communication link. Currently, there are no indigenous brands available which offer Ka band SSPAs with a power rating of 200 Watt. With future satellites operating in high frequency bands like Ka which offer high data rates and most LEO imaging satellites using Ka band for satellite to ground links, it would be imperative to develop this capability as an indigenous product.

Problem Statement (Prime) – 11 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	Space-grade Robotic Arm with Ground-Control for Orbital Transfer Vehicle
Challenge brief/definition	As a component of Challenge 10, a robotic arm is one of the prevalent ideas for orbital debris removal. · It is proposed to develop a 3m long robotic arm, with at least 4 degrees of freedom. · This arm must not derive too much power from the host satellite. · It must be able to fold easily when not in use. · The arm should be dexterous enough to capture even misshapen debris and release them in a designated orbit/towards Earth. · Another desirable capability would be that the arm can aid in proximity operations and docking of satellites.

Problem Statement (Prime) – 12 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	Intelligent Object Identification System with Light Detection and Ranging (LIDAR) and Electro Optical (EO) sensors
Challenge brief/definition	As a component of Challenge 10, it is proposed to develop an AI-based system to recognise potential threats to the satellite from debris. The satellite will carry LIDAR and EO sensors as payloads, whose data will be analysed by the on-board AI tool to predict approaching debris for collision avoidance and for providing inputs to the proximity and docking operations.

Problem Statement (Prime) – 13 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	High Resolution Optical Telescope with Aperture size of 1-3 meters
Challenge brief/definition	Ground based optical telescopes are essential for sourcing the inputs for Space Situational Awareness (SSA). Optical telescopes have shorter developmental time lines and can be developed in a cost-effective way, thereby helping for building sovereign Space Sensor Network capability in shortened time lines. It is proposed to develop a HR optical telescope which should be able to detect and track space objects (minimum size 10cm x 10cm) accurately.