DEFENCE INNOVATION ORGANISATION

(Under Aegis of Department of Defence Production)

Ministry of Defence, Government of India

New Delhi -110002

Summary of ADITI Edition 1.0 Problem Statements

S. No	Name of Agency	Number of Problem Statements
1	Indian Army	3
2	Indian Navy	5
3	Indian Air Force	5
4	Defence Space Agency	4
Total		17

ADITI PROBLEM STATEMENTS

Problem Statement – 1 (Army)

Organization Army	**Indian Army**
Problem Statement / Challenge Title	Indigenous Development of High-resolution Elevation model & ground control points using space-based SAR
Challenge Domain	Geo Spatial Capacity Development
Challenge Brief / Definition	Accurate and higher resolution Digital Elevation Model (DEM) and GCPs (Ground Control Points) from SAR (Synthetic Aperture Radar) satellite for providing accurate digital spatial information (Co-ordinates) in 3D
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	Creation of Digital Elevation Model (DEM) model of India and adjoining countries 3D with minimum 1m Horizontal accuracy & 5m vertical accuracy
Future Expectations from Prototype /Tech developed	Generation of high resolution DEM and accurate GCPs of any part of the world for strategic use.

Problem Statement – 2 (Army)

Organization Name	**Indian Army**
Problem Statement / Challenge Title	Precision TGT ACQN Software (P-TAS)
Challenge Domain	Target Acquisition
Challenge Brief / Definition	Indian Army is procuring Precision Guided Munition (PGM) which requires acquisition of target location with highest accuracy. The target acquisition capability of desired accuracy needs to be developed indigenously to meet operational requirements
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	(a) Location accuracy for target acquisition (b) Should be DSM compatible (c) Should be compatible with Indigenous Satellite Imagery
Future Expectations from Prototype / Tech developed	

Problem Statement – 3 (Army)

Organization Name	**Indian Army**
Problem Statement / Challenge Title	Two Man Tactical Aerial Vehicle for High Altitude (HA).
Challenge Domain	Logistic Drone
Challenge Brief / Definition	A Personal Aerial Vehicle (PAV), an eVTOL (electric vertical take-off and landing), human-size manned vehicle having a cabin/cockpit which is large enough to house a pilot and some additional payload. It can be utilized for quick low-altitude short and-medium-haul transportation.
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	The Solution will help logistical infrastructure to become more agile and flexible for critical supply chain. Having a personal aerial vehicle will help improve tactility and help achieve better strategic flexibility. The solution is intended to satisfy mission profiles including the infiltration and exfiltration of Special Operations Forces (SOF), personnel recovery, aeromedical evacuation, and tactical mobility at high speeds.
Future Expectations from Prototype / Tech developed	

Problem Statement – 4 (Indian Navy)

Organization Name	**Indian Navy**
Problem Statement / Challenge Title	Development of Ramjet Engine for fixed wing flying objects
Challenge Domain	Aviation
Challenge Brief/ Definition	Design and develop indigenously a high supersonic to hypersonic propulsion system for fixed wing flying objects e.g. missiles, aircraft etc
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	
Future Expectations from Prototype / Tech developed	The utility of the product is indigenously developed technology in-house

Problem Statement – 5 (Indian Navy)

Organization Name	Indian Navy
Problem Statement / Challenge Title	Create a close loop heat recovery system with a compact, high-efficiency micro-turbine with a 1MW-4MW shaft power capacity utilizing a supercritical cycle running on high endurance waste heat recovery cycle for generation of electric power. Close loop chemical energy storage bank.
Challenge Domain	Thermodynamics, Power Generation
Challenge Brief / Definition	Create a close loop high efficiency1MW-4MW zero emission micro turbine utilizing a super critical cycle for waste heat recovery including low grade source below 150 c. The design should eliminate fuel combustion, ensuring environmentally friendly operation. Target objectives include achieving a high mean time between Outages (MTBO), low Mean time to Repair (MTTR) and minimizing the footprint compared to existing gas turbines. The micro turbine will work on the principle of waste heat recovery from diverse sources on ship and store its output in an energy storage bank for subsequent use. It should be scalable.
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	Create a close loop high efficiency thermodynamic solution
Future Expectations from Prototype / Tech developed	Better efficiency, usage of alternate fuel

Problem Statement – 6 (Indian Navy)

Organization Name	Indian Navy
Problem Statement / Challenge Title	Fabrication, integration and testing of one prototype AUV as per 'Jalkapi' design by Indian Navy
Challenge Domain	Autonomous Underwater Vehicle
Challenge Brief/ Definition	The system functions are underwater vehicle, having Mission computer (software) that is able to take inputs form all sensors and take decisions for vehicle operations. Integration of all sensors (specified in Jalkapi design) and energy sources to enable reliable, maintenance-free operation for 30-40 days at sea along with power source selection and implementation for autonomously taking the AUV to surface, operating Diesel Generator to recharge Li-Ion battery pack and diving on completion.
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	(a) Develop Mission Computer (software) that is able to take inputs from all sensors and take decisions for vehicle operations. (b) Fault management for extended duration of 30-45 days for the self–sustaining AUV. (c) Integration of all sensors (specified in Jalkapi design) and energy sources to enable reliable, maintenance-free operation for 30-45 days at sea. (d) Power source selection and implementation for autonomously taking the AUV to surface, operating Diesel Generator to recharge Li-Ion battery pack and, diving on completion. (e) Record and analyse inputs of sensors to take appropriate actions. (f) Detailed design of vehicle and software to implement the above requirements. (g) Shore station with position acquisition, communication systems, monitoring and data processing capability.
Future Expectations from Prototype / Tech developed	

Problem Statement – 7 (Indian Navy)

Organization Name	**Indian Navy**
Problem Statement / Challenge Title	Advancing Under water Object Identification using Aerial Hyperspectral Imaging and AI
Challenge Domain	Underwater Domain
Challenge Brief / Definition	Under water Hyper Spectral Imaging (UHI) is capable of identifying and classifying objects on a fine scale. The challenge aims to leverage state–of–the art technology to significantly improve the accuracy and efficiency of identifying and classify Naval object of interest even at depth of several hundred meter below the sea surface.
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	
Future Expectations from Prototype / Tech developed	

Problem Statement – 8 (Indian Navy)

Organization Name	**Indian Navy**
Problem Statement/ Challenge Title	Perpetual power plant 1.28 MW
Challenge Brief/ Definition	Development of 3MW perpetual heat source linked to a 1.28MW 24x7 electricity generator. Enable remote control of the heat, source/power plant from a base station, necessitating a reliable 8 Mbps link. The Ascendance Wireless Perpetual Power system offers turnkey solution to provide 24/7 reliable uninterrupted power for remote application, eliminating expensive utility power configuration investments.
Challenge Domain	Power Generation
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	
Future Expectation from Prototype/ Tech developed	

Problem Statement – 9 (Indian Air Force)

Organization Name	**Indian Air Force**
Problem Statement / Challenge Title	Development of booster assisted REK with EO-IR terminal guidance
Challenge Brief/ Definition	A rocket/engine assisted Range Extension kit with EO-IR head for terminal guidance that can be fitted on the existing 250 Kg HSLD bombs.
Challenge Domain	Aerial Weapons
Details of Innovation to be Done by the startup and expected deliverables at the end of the project	To develop rocket/engine assisted Range Extension kit for conversion of 250 Kg High-Speed Low Drag bombs with EO-IR head for terminal guidance. Range >150 Km (for launch altitude of 5 km/ 0.8 Mach)Terminal guidance – through EO-IR seeker, scene matching capability, ability to work in GNSS denied environment, Starp- on existing HSLD 250 Kg bombs Store should be compatible with existing bomb rack of aircraft available in IAF Accurate delivery CEP<05 m, desirable <3 m Capability to define impact angle and attack direction through mission planning Ease of maintenance and handling Storage in starp on condition **Expected Deliverable**. five kits with integration, certification, maintenance equipment and storage facility
Future Expectation from Prototype / Tech developed	In future the technology may be used to develop kits for higher weight class weapons

Problem Statement – 10 (Indian Air Force)

Organization Name	**Indian Air Force**
Problem Statement / Challenge Title	Development of Anti-Radar Decoy Swarm with Chaff dispensation and EW payloads
Challenge Brief/ Definition	The Expendable active decoy swarm to confuse enemy Air defence. High speed drones with EW payloads and Chaff dispensation inbuilt in system. 500 km or more range with speed of 0.9 Mach or better.
Challenge Domain	Jet engine Drone, Electronic warfare
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	To develop drones with high speed 0.9 Mach or better with range minimum 500 km. The drone must carry electronic warfare payload to detect and emit EW radiations automatically or as per the plan. Drone must carry large number of chaffs to assist in making a chaff corridor for EW planning. The launch mechanism must be simple to use without requirement of runway, infrastructure requirement must be minimal and self contained. Navigation system to be GPS independent. The payload space may be upgradable/ swappable for future requirements Must be capable of being launched in large numbers from multiple locations and act in swarm for better capability/ combined payload **Expected Deliverable**. 10 high speed drones with EW capability, two ground stations, four launchers and maintenance equipment.
Future Expectation from Prototype / Tech developed	The tech developed may be used for additional payloads in future

Problem Statement – 11 (Indian Air Force)

Organization Name	**Indian Air Force**
Problem Statement / Challenge Title	Development of SAR Image Disruptor
Challenge Brief/ Definition	To develop a portable Synthetic Aperture Radar Image disrupter and prevent accurate imaging through SAR
Challenge Domain	Electronic warfare
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	The system should be able to disrupt SAR surveillance imaging from aerial platforms. It should have both swept noise and pattern distortion modes. It must be able to target onboard radars operating in side – looking mode of surveillance with synthetic aperture synthesis amd strike aircraft onboard radars operating in stripmap mode. The system should be able to simultaneously jam upto four on-board radars. It must be portable to relocate on vehicles, buildings and ground based on requirement **Expected Deliverable**. Four sets of SAR image disrupters and maintenance equipment
Future Expectation from Prototype / Tech developed	The tech may be spirally developed for different platforms and airborne systems

Problem Statement – 12 (Indian Air Force)

Organization Name	**Indian Air Force**
Problem Statement / Challenge Title	Development of Helicopter launched weaponised Drone
Challenge Brief / Definition	To develop a helicopter launched weaponised drone with Man-unmanned teaming capability. It should be capable of launching from Mi-17 class helicopter truss/ wings with a minimum warhead of 50 kgs and a minimum range of 40 Kms.
Challenge Domain	Radar and signal processing
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	To develop weaponised drone with 50 kg warhead EO-IR head for guidance GNSS denied environment navigation Pilot in loop control and video relay Range >40 Km Store should be compatible with existing bomb rack of aircraft available in IAF Accurate delivery CEP<05 m, desirable <3 m Capability to define impact angle and attack direction through mission planning Ease of maintenance and handling Storage in starp on condition Environmentally sealed for carriage and handling Multiple weapons may be able to communicate with single aircraft **Expected Deliverable**. Set of eight Mi-17 class helicopter launched drones with complete control station, aircraft integration, warhead certification and maintenance equipment
Future Expectation from Prototype / Tech developed	The technology may be developed spirally for other platforms (Mi-25U/35, ALH, Chinook etc)

Problem Statement – 13 (Indian Air Force)

Organization Name	Indian Air Force
Problem Statement / Challenge Title	Development of Humanitarian Assistance and Disaster Relief platform for Chinook Helicopter
Challenge Brief / Definition	To develop a modular underslung platform for (a) Mass casualty evacuation with seating capability of minimum of 30 that can be underslung to rescue large number of casualties. Dual redundant underslung connections, communication system, individual restraints, rapid evacuation platform. (b) Module for firefighting from aircraft with rapid water suction, storage and dispensation capability for fire fighting.
Challenge Domain	Airborne systems engineering
Details of Innovation to be Done by the startup and expected deliverable at the end of the project	To design develop and certify a light weight carriage platform for Chinook helicopter to undertake mass casualty evacuation from buildings, rivers, islands and mountain tops The platform must have slings to be connected with helicopter underslung system The platform to have multiple safety features to ensure safety of rescued personnel Individual restraints, directly connected to primary platform/ any other technology to preserve human life like ballistic parachute/ individual protection system etc Communication system with helicopter and ground teams Good visibility to enable carriage of rescue assistance teams Stability in flight to prevent any swing Rapid ingress and egress design Module for firefighting equipment like rapid water filling pumps, hoses and storage

	Controlled rate water dispensation capability Water carriage from a water source to fire area **Expected Deliverable**. One modular platform with two modules for HADR operation – Rescue and firefighting with complete maintenance equipment
Future Expectation from Prototype / Tech developed	The technology may be developed spirally for other platforms

Problem Statement – 14 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement / Challenge Title	Mobile Ground Station in S/X/Ka band for Transmitting and Receiving Data from Satellite
Challenge Domain	Mobile Ground Earth Stations
Challenge Brief / Definition	It is intended to develop a mobile satellite ground station that can be vehicle mounted and for supporting data transmit and receive operations from LEO satellites. The mobile satellite ground station should support data transmit and receive operations in S, X and Ka bands. The data rates to be supported are upto 2 Mbps in S band and upto 1 Gbps in X band and upto 3 Gbps in Ka band (assuming the satellite has the required power budget).
Details of Innovation to be Done by the startup and expected deliverable	For S, X and Ka bands, the entire equipment of RF and baseband should be in redundant configuration to render reliability and minimum down time. The Antenna control system also should have main and redundant chains to support operations. The entire mobile ground station should be able to function with in-site control (power equipment included). All monitoring and controlling functions should be capable of handled by personnel located with the mobile ground stations and also should have the capability to get linked to network of ground stations to support remote operations. The ground station should also have adequate inbuilt memory storage to store the telemetry data and the payload data.
Future Expectation from Prototype / Tech developed	The mobile GES will provide adequate flexibility wrt the ground segment operations for all future mil space activities.

Problem Statement – 15 (Defence Space Agency)

Organization Name	Defence Space Agency
Problem Statement / Challenge Title	Small Satellite with Neuromorphic Sensors based EO Payload.
Challenge Domain	ISR and SSA
Challenge Brief / Definition	It is proposed to develop a small satellite weighing upto 200 Kgs with EO payload equipped with Neuromorphic sensors as sensing element with indigenous detectors.
Details of Innovation to be Done by the startup and expected deliverable	The payload shall be used for obtaining SSA data. The SSA imagery obtained using neuromorphic sensor payload should be able to process this data on-board using neuromorphic computing. The neuromorphic processing algorithms would also have to be developed as part of the solution. The detector chips shall be indigenous. The satellite should have TTC data in S band supporting 1 Mbps data rate and payload data in X band supporting upto 640 Mbps data rate.
Future Expectation from Prototype / Tech developed	This will greatly reduce the existing Turn Around Time (TAT) for satl imagery and also enhance the data transfer rates.

Problem Statement – 16 (Defence Space Agency)

Organization Name	Defence Space Agency
Problem Statement / Challenge Title	Development of CubeSat Deployers of Various Configurations
Challenge Domain	Cubesat Deployers (Launch Systems)
Challenge Brief / Definition	It is proposed to design and develop a series of scalable CubeSat deployers that can accommodate 1U, 3U, 6U, 12U, and 16U CubeSat
Details of Innovation to be Done by the startup and expected deliverable	These deployers have to ensure full compliance with the International CubeSat Design Specifications including dimensions, mass constraints, and deployment mechanisms. The challenge also includes innovation in the areas of deployer reliability, safety mechanisms, and integration processes to support a wide range of satellite missions. The deployer has to incorporate advanced materials and technologies to minimize weight and maximize strength and durability in the harsh conditions of space. They also have to provide versatile interfaces for different launch vehicles, ensuring broad accessibility and adaptability.
Future Expectation from Prototype / Tech developed	This innovation will greatly support the realisation of the emerging trend of large cubesat constellations and their deployment.

Problem Statement – 17 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement / Challenge Title	Development of Solar Panels with Triple Junction GaAs Solar Cells with Solar Drive Mechanism for Small Satellites
Challenge Domain	Satl Electrical Power Mgmt System
Challenge Brief / Definition	It is proposed to develop solar panel with triple junction GaAS solar cells for space grade applications along with solar array drive mechanism indigenously.
Details of Innovation to be Done by the startup and expected deliverable	The designed GaAs solar cells to offer efficiency greater than 45%. This high density, high efficiency solar cell development includes development of cover glass that could withstand radiation. All interconnecting diodes also would form the part of prototype along with GaAs solar cells. Solar concentrators have to be used for focusing solar radiation over each cell area. The complete solar panel with these advanced technologies will have to be coupled with a low weight, high stability solar array drive mechanism that is suitable for small satellites upto 200 kgs class.
Future Expectation from Prototype/Tech developed	This innovation will enhance the existing capability of the most critical sub system of the Satl i.e.,Electrical Power System resulting in accommodating more payloads and features.