



iDEX Innovations for
Defence Excellence
PM Awardee

DEFENCE INNOVATION ORGANISATION

(Under the aegis of Department of Defence Production)

Ministry of Defence, Government of India

New Delhi -110002

Acing Development of Innovative Technologies with iDEX

ADITI 4.0

Problem Statements

S. No.	Name of Agency	Number of Problem Statements
1	Indian Army	08
2	Indian Navy	06
3	Indian Air Force	08
4	Mission Def Space	03
Total		25

ADITI 4.0 PROBLEM STATEMENTS

Problem Statement 1 – (Indian Army)	5
Problem Statement 2 – (Indian Army)	7
Problem Statement 3 – (Indian Army)	8
Problem Statement 4 – (Indian Army)	10
Problem Statement 5 – (Indian Army)	12
Problem Statement 6 – (Indian Army)	14
Problem Statement 7 – (Indian Army)	16
Problem Statement 8 – (Indian Army)	19
Problem Statement 9 – (Indian Navy)	21
Problem Statement 10 – (Indian Navy)	25
Problem Statement 11 – (Indian Navy)	27
Problem Statement 12 – (Indian Navy)	29
Problem Statement 13 – (Indian Navy)	31
Problem Statement 14 – (Indian Navy)	32
Problem Statement 15 – (Indian Air Force)	34
Problem Statement 16 – (Indian Air Force)	37
Problem Statement 17 – (Indian Air Force)	39
Problem Statement 18 – (Indian Air Force)	41
Problem Statement 19 – (Indian Air Force)	43
Problem Statement 20 – (Indian Air Force)	45
Problem Statement 21 – (Indian Air Force)	47
Problem Statement 22 – (Indian Air Force)	49
Problem Statement 23 – (Mission DefSpace)	51
Problem Statement 24 – (Mission DefSpace)	53
Problem Statement 25 – (Mission DefSpace)	55

S. No	PS No.	Problem Statement	Nodal Agency
1	1	Conversion of Tank T-72 into Autonomous Armoured Fighting Veh (AFV) Platform.	Indian Army
2	2	155mm Terminally Guided Munition	Indian Army
3	3	Development of Ramjet Powered Supersonic Loitering Munition System.	Indian Army
4	4	Development of 125mm HEAT amn for T-72 & T-90.	Indian Army
5	5	Cognitive Electronic Warfare System.	Indian Army
6	6	Development of Smart Ammunition and Programming System for existing 40mm L/70 Gun of Indian Army.	Indian Army
7	7	Humanoid for Combat/ Humanoid Autonomous System.	Indian Army
8	8	Autonomous Load Carrier Trucks for Indian Army Ops.	Indian Army
9	9	Design and Development of Sovereign Quantum Radar.	Indian Navy
10	10	Diesel Engine Generator Exhaust System for Submarine.	Indian Navy
11	11	Guided Long Range 76mm Ammunition with Programmable Fuse.	Indian Navy
12	12	Development of submarine cable Fiber Optic cable embedded with Distributed Acoustic Sensing System for Underwater Detection.	Indian Navy
13	13	Automatic Ammunition Feeding System for 76 mm Gun.	Indian Navy
14	14	Ballistic Extended Range 76 mm Ammunition with Programmable Fuze.	Indian Navy
15	15	Design and Develop Indigenous re-usable High speed Expendable Aerial Target (HEAT) with EW capabilities which can simulate fighter aircraft profiles and can be employed to provide realistic target engagement for IAF fighter aircraft and SAGW systems	Indian Air Force
16	16	Air Launch Loitering Decoy (ALLD) EW	Indian Air Force
17	17	Booster assisted REK with EO-IR terminal guidance for 450 kg HSLD bomb	Indian Air Force
18	18	AI Based OSINT Analysis and monitoring system and social media stacks	Indian Air Force
19	19	Helmet Mounted Digital Night Vision Device	Indian Air Force
20	20	Design and Develop an Effective Helicopter Mounted Counter-UAS (Unmanned Aerial System) System or Jammer to Neutralize and Disrupt UAS Threats in Military and Civilian Environments	Indian Air Force
21	21	Design and Development of Self-propelled strap-on range extension and guidance kit for 100-120 kg bomb with EO/IR terminal guidance to enhance the range and accuracy of delivered weapon	Indian Air Force
22	22	Small Size Target Flare Bomb with Electrical Initiating Device	Indian Air Force

23	23	Development of High-Efficiency, Lightweight, Space-Grade Silicon-Perovskite Tandem Solar Panels (150 W Class) for Small Satellites (~200 kg Class)	DefSpace
24	24	Development of an Indigenous Tool for Space Domain Training, Surveillance, and Operations in the Indian Air Force (IAF).	DefSpace
25	25	Challenge 6.1: “Miniaturization of Payloads (EO and SAR) for Small Satellites up to 180 kg Class”.	DefSpace

Problem Statement 1: Conversion of Tank T-72 into Autonomous Armoured Fighting Veh (AFV) Platform

Organization Name	Indian Army
Challenge title	Conversion of Tank T-72 into Autonomous Armoured Fighting Veh (AFV) Platform
Problem Statement/	To convert T-72 tank into a digitised, remotely operatable vehicle that maintains mechanical reliability while enabling integration with higher-level control systems through an IP-based interface.
Challenge brief/definition	Tank T-72 is a legacy platform and has been the backbone of India's Armour profile since 1979. The tank is due to be replaced by an upgraded futuristic platform. Further, the Armoured Corps is in process of implementing MUM-T architecture in the operational philosophy which merits induction and integration of UAS and UGV with the MBT fleet as modern battlefield demands fusion of manned and unmanned systems to maintain combat edge over adversaries in transparent and highly visible digitised battlefield. Therefore, these legacy T-72 can be utilised in judicious manner by converting them to Autonomous AFV platforms to augment the manned tanks and implement MUM-T operational framework.
Existing Solution (if any)	<ul style="list-style-type: none"> • US Army's OMFV (Optionally Manned Fighting Vehicle) & Robotic Combat Vehicle (RCV) initiative. • Australian Army's RICO-led autonomous M113 trials.
Technology domain (s)	<ul style="list-style-type: none"> • Robotics • Sensor Fusion • Automation • Guidance, Navigation & Control
Application/Use Case	<ul style="list-style-type: none"> • Extends T-72 fleet life and relevance by 15-20 years at significantly lower cost than new MBTs. • Enables unmanned high-risk missions like minefield entry, breaching, act as decoy, advance guard, reconnaissance patrols etc.
Project Outcome	Deliver two prototypes of fully validated autonomous kit enabling the T-72 to function as an optionally manned autonomous battle tank.
Testing /Certification	<ul style="list-style-type: none"> • Laboratory & Bench Tests - Actuator response validation, DIP replacement module testing, Sensor fusion accuracy validation. • Mobility Tests— Low speed and high-speed autonomous runs, Route repetition accuracy • Safety Tests -Hardware e-stop activation, Communication loss • Communication Tests - Mesh MANET resilience
Future Expectation from the prototype / Technology developed	Induction into Indian Armed Forces and export to friendly foreign countries

Potential Market	Defence
Business Case	<ul style="list-style-type: none">• Yes (High likelihood of bulk orders and export potential due to it being a Niche Technology)

Problem Statement 2: 155mm Terminally Guided Munition

Organization Name	Indian Army
Challenge title	155mm Terminally Guided Munition
Problem Statement	Design & Development of 155 mm Terminally Guided Munition (TGM) for Indian Army through iDEX route
Challenge brief/definition	The Indian Army requires an indigenous 155mm Terminally Guided Munition compatible with existing and future 155mm artillery gun systems to engage point targets with high accuracy, reduce ammunition expenditure, minimize collateral damaged, and enable effective counter-battery and time-sensitive targeting. Current indigenous availability of such munitions is limited and dependence on foreign systems poses risks related to cost availability and supply-chain security.
Existing Solution (if any)	Procurement of 155mm Terminally Guided Munition Amn through foreign vendors as an interim measure. However, this has limitations of dependence on foreign vendors and high cost associated with it.
Technology domain (s)	Precision Targeting
Application/Use Case	Destruction of high-value targets, Collateral Damage Reduction.
Project Outcome	155mm Precision Guided Munition compatible with all existing and future with 155 mm/39, 45 and 52 caliber guns held in the inventory of IA.
Testing /Certification	To be ascertained later
Future Expectation from the prototype / Technology developed	<ul style="list-style-type: none"> • 155mm Terminally Guided Munition or guidance kit compatible with 155 mm/39, 45 and 52 caliber guns. • Indigenous guidance solution (GPS/INS, laser or hybrid). • CEP of $\leq 10\text{m}$ (goal $\leq 5\text{ m}$) at operational ranges. • All-weather ,day/night operational capability. • Capable of achieving desired parameters in all terrains in Indian Subcontinent • Compatibility with existing artillery fire-control systems. • Minimal or no modification to existing gun systems. • Prototype rounds for developmental and user trials.
Potential Market	<ul style="list-style-type: none"> • Indian Requirement. PGMs / TGMs are scaled at the rate of 1.5 rounds per gun in first line and 0.75 rounds per gun in second line. By 2037, Regt of Arty is likely to have 208x 155mm Caliber Medium regts, thus reqmt of approx. 25000 PGMs / TGMs. • Ability to strengthen defence export. Post induction of the Indigenously developed TGMs in IA, large no of countries not having similar capability are likely to import the TGMs
Business Case	Post procurement of initial qty on MoQ basis, bulk orders will be placed on the basis of existing 155mm Gun Systems held with IA.

Problem Statement 3: Development of Ramjet Powered Supersonic Loitering Munition System

Organization Name	Indian Army
Challenge title	Development of Ramjet Powered Supersonic Loitering Munition Sys
Problem Statement	To develop high speed (supersonic) Loiter Munition System using Ramjet Technology
Challenge brief/definition	The war scenario is evolving and current trend increasingly points towards the fact that conflicts will commence with aerial attacks using UAVs & small missiles. This requires countering enemy Air Defense and using element of surprise to strike high value/ high payoff targets in the first strike. Loiter Munitions (LMs) are a cost effective and less risky method of conducting missions in such a scenario. However, currently the LMs are subsonic/ low speed UAVs and thus can be neutralized through various counter measures which are evolving rapidly. Thus, there is a need to develop effective weapon systems to neutralise enemy assets. One proposed solution to stay ahead of enemy's evolving Air Defence counter measures is by developing a Ramjet Powered Supersonic Loiter Munition System which will provide very little reaction time to enemy for activating counter measures because of extremely high speeds of operation.
Existing Solution (if any)	<ul style="list-style-type: none"> • India—Nil • Globally - US Army's Ramjet Powered D-21 Drone, PLA's supersonic ramjet detonation engine
Technology domain (s)	<ul style="list-style-type: none"> • Propulsion & Aerodynamics – Ramjet Engine, Fuel control system • Guidance, Navigation & Control -Target Recognition & homing • Warhead and Fuze • Materials – Thermal Management
Application/Use Case	<ul style="list-style-type: none"> • The supersonic speed of Ramjet powered LM will make it nearly impossible for enemy to detect and counter this weapon system. • The system will be useful against time critical targets like Mobile Air Defence systems/ Armoured Fighting Vehicles/ Command & Control elements.
Project Outcome	Deliver three prototypes of fully validated Ramjet Powered Supersonic Loiter Munition System.

Testing /Certification	<ul style="list-style-type: none"> • Requirements Verification & Traceability Review against system specifications & operational requirements • Ground Qualification Testing :Structure, Propulsion,Avionics,Thermal and EMI/EMC. • Propulsion System Testing :Static firing. • Thermal & Environmental Testing (high temperature,altitude,humidity). • Avionics & Software Verification including HIL/SIL testing and cybersecurity assessment. • Validation of EO systems against representative targets and countermeasures. • Loiter, Transition & Terminal Attack Flight Trials with representative mission profiles. • Warhead Safety & Fuze Tests. • Operational User Trials in realistic environments.
Future Expectation from the prototype / Technology developed	Induction into Indian Armed Forces and export to friendly foreign countries.
Potential Market	Defence
Business Case	Yes (High likelihood of bulk orders and export potential due to it being a Niche Technology)

Problem Statement 4: Development of 125mm HEAT amn for T-72 & T-90

Organization Name	Indian Army
Challenge title	Development of 125mm HEAT amn for T-72 & T-90
Problem Statement/	<p>125 mm HEAT ammunition is employed by the Indian Army for engagement of armoured vehicles, field fortifications and battlefield targets from T-72 and T-90 tanks. With the advent of advanced armour protection technologies such as composite armour, Explosive Reactive Armour (ERA), the lethality of legacy HEAT ammunition requires enhancement. Modern battlefield conditions demand ammunition capable of defeating contemporary armour protection systems while maintaining compatibility with existing tank platforms and ammunition handling mechanisms. Therefore, the Indian Army seeks development of indigenous 125</p> <p>mm HEAT ammunition with improved lethality, reliability and safety features, compatible with existing gun systems and operational infrastructure.</p>
Challenge brief/definition	<p>125 mm HEAT ammunition is employed by the Indian Army for engagement of armoured vehicles, field fortifications and battlefield targets from T-72 and T-90 tanks. With the advent of advanced armour protection technologies such as composite armour, Explosive Reactive Armour (ERA), the lethality of legacy HEAT ammunition requires enhancement. Modern battlefield conditions demand ammunition capable of defeating contemporary armour protection systems while maintaining compatibility with existing tank platforms and ammunition handling mechanisms. Therefore, the Indian Army seeks development of indigenous 125</p> <p>mm HEAT ammunition with improved lethality, reliability and safety features, compatible with existing gun systems and operational infrastructure.</p>
Existing Solution (if any)	Global militaries are upgrading ammunition through improved warhead configuration, tandem charge technology and advanced liner materials to defeat modern armour protection systems. While indigenous HEAT ammunition exists, there is a requirement to enhance performance, safety, storage life and reliability in line with evolving operational requirements.
Technology domain (s)	<ul style="list-style-type: none"> • Advanced shaped charge design and modelling. • Tandem warhead and ERA defeat technology. • Precision explosive filling techniques. • Advanced liner material manufacturing.
Application/Use Case	Compatible with existing 125 mm Gun system & weapon platforms (T-90 & T-72).
Project Outcome	Development and validation of indigenous 125 mm HEAT ammunition with Higher DoP meeting operational, safety and compatibility requirements.

Testing /Certification	JSG 0102 standards, DGQA Technical Evaluation Programme and certification from NABL accredited laboratories.
Future Expectation from the prototype / Technology developed	<ul style="list-style-type: none"> • Enhanced lethality against modern battlefield targets. • Improved reliability and operational consistency. • Reduced logistic burden. • Indigenous design and manufacturing capability. • Import substitution and Atmanirbhar Bharat alignment. • Scalable design for future improvements.
Potential Market	Defence and Export market could be explored.
Business Case	Bulk Order followed by repeat order and annual recurring order with export potential.

Problem Statement 5: Cognitive Electronic Warfare System

Organization Name	Indian Army
Challenge title	Cognitive Electronic Warfare System
Problem Statement/	Autonomous EW System for fusion of data captured from various EW sensors integrated / EW systems, Carrying out predictive analysis and execute of ECM operations.
Challenge brief/definition	<p>a)Statement of Problem. EW has grown to become an important component of military operations. It includes three major subdivisions: electronic support(ES), electronic attack (EA) and electronic protection(EP) for either offensive or defensive operations thus to prevent hostile use, retain friendly use of the EMS. An EW system consists of antenna(s), receiver(s), processing unit(s), and database to provide the means to intercept, identify, analyze and locate radiated electromagnetic energy, and then deploy countermeasures. Historically, EW systems were developed based on knowledge of specific, previously learned threats. The received RF signals are processed, analyzed, and categorized as either threatening or non-threatening associated with actions to be taken. The database contains two tables, one stores previous known threats that the system had been thoroughly tested against, while the other contains the corresponding pre-programmed countermeasure techniques. Thus, there exists a close cooperation between ES and EA divisions. Figure below shows a block diagram of conventional EW system.</p> <p>(b) A hypothesis is that this challenge can be effectively addressed with cognitive technology by sensing, adapting and learning environment changes and possible interference, and embodying a feedback-based decision-making mechanism to intelligently deploy optimal countermeasures. Figure below shows a block diagram of generic Cognitive Electronic Warfare (CEW) system. In the system, Environmental Perception focuses on sensing of the operational environment and observing the changes to optimize further processing procedures. Intelligent Signal Characterization uses machine learning algorithms to assess and characterize EMS signals and classifies them as either known or unknown threats. The objective of the Cognitive Electronic Attack (CEA) module is to synthesize close-to-optimal countermeasures subject to transceiver limitations, user-input restrictions and performance goals. Dynamic Knowledge Base contains not only a priori information of environmental and target aspects, but also information on recently learned threats. The feedback loop plays a key role in monitoring and evaluating the jamming performance, and adjusting the transmission parameters to achieve optimal effectiveness. The ES and EA modules need to be enhanced with cognitive algorithms and act together synchronously and co-ordinately. This collaboration ensures the system could identify source and intent of signals in a highly</p>

	dense RF environment, and decide where and how to apply countermeasures to achieve optimum effects. In other words, the said capability boils down to intelligent threat identification, target acquisition with location fixing, orientation of ECM/Jammer resources and autonomous coordinated soft kill option to neutralise the threat
Existing Solution (if any)	Nil
Technology domain (s)	AI/ ML and Electronic Warfare
Application/Use Case	Autonomous EW System with prediction capability.
Project Outcome	Specify the final product/system to be developed. Comd Centre, Mon & DF System, Jx System
Testing /Certification	List of testing required from accredited agencies. Std envt test as applicable to EW Systems
Future Expectation from the prototype / Technology developed	The system should be able to automatically sense, identify, demodulate and decode , unknown signal using its inbuilt algorithm. The system should also be able to carryout analysis of location fix data in conjunction with terrain data for predicting the likely intent of the enemy.
Potential Market	<ul style="list-style-type: none"> • Present and future requirement of the product in service is inescapable • Possibility of commercial Adoption -Yes • The developed product be able to strengthen the defence export of India.
Business Case	Once realised, each EW bn may be given cognitive EW Sys

Problem Statement 6: Development of Smart Ammunition and Programming System for existing 40mm L/70 Gun of Indian Army.

Organization Name	Indian Army
Challenge title	Development of Smart Ammunition and Programming System for existing 40mm L/70 Gun of Indian Army.
Problem Statement/	<ul style="list-style-type: none"> • 40mm L/70 guns held in the inventory of AAD fires two types of ammunition namely, HET & PFFC. These are basic variants of 40mm ammunition being used since Yrs 1970 & 2000 respectively. None of these variants are programmable leading to firing of a very large number of rounds for destruction of target. • World over, there is a trend of using programable ammunition with the existing radar-controlled gun system for achieving higher hit probability thereby reducing the cost of engagement as well as logistic load of carriage of a larger quantum of ammunition. On date, there is no indigenous manufacturing of smart ammunition in India. • Hence, there is a need for developing smart ammunition and a programming system compatible with the existing 40mm L/70 gun and fire control radars of the Indian Army.
Challenge brief/definition	<p>As part of this challenges fwg are to be developed: -</p> <ul style="list-style-type: none"> • Smart Ammunition. 40mm ammunition consisting of primer, cartridge case, propellant, pre- fragmented shell and smart fuse. Smart fuse should have multiple modes of operation such as Air Burst, Proximity, Gated Proximity, Impact Detonation, Time Delay and Self-Destruction. In addition, the fuse should be resistant to ECM. • Programming System. Programming System will be responsible for programming the smart fuse before firing each round after taking required inputs (such as but not limited to muzzle velocity, meteorological data & target parameters) automatically from sensors installed on the gun and from the fire control radar. Requisite sensors for fitment on to the gun should also be designed as part of this challenge. • Integration. Integration of Programming System with the in-service 40mm L/70 gun as an external fitment without major modification to the gun.
Existing Solution (if any)	Currently, no such equipment exists in India.
Technology domain (s)	Ammunition systems.
Application/Use Case	Equipment will be utilised for improving the efficacy of existing L/70 Guns.

Project Outcome	Development of process & smart ammunition & its integration with L/70 Gun.
Testing /Certification	To be specified by vendor.
Future Expectation from the prototype / Technology developed	Customization of the programming system and the smart ammunition for employment with Successor AD Gun system and other Fire Control Radars.
Potential Market	Very High (both domestic as well as in the international market).
Business Case	Bulk order for Indian Army as well as globally.

Problem Statement 7: Humanoid for Combat/Humanoid Autonomous System

Organization Name	Indian Army
Challenge title	Humanoid for Combat/Humanoid Autonomous System
Problem Statement/	Soldiers continue to be exposed to extreme physical risk, injury and fatality in environments where robotic systems can be deployed instead. Indian Armed Forces operate across diverse and hostile terrains including high altitude borders exceeding 7,500 km, insurgency affected zones, disaster hit regions and active combat areas. Soldiers routinely carry 20—25 kg loads while negotiating steep inclines above 30 degrees on icy, unstable surfaces at altitudes exceeding 10,000 feet, where reduced oxygen severely limits endurance and performance. Prolonged exposure leads to musculoskeletal injuries, reduced mission effectiveness, shortened deployment cycles and long-term health impact. During combat and counter insurgency operations, human exposure to direct fire, ambush and IED threats remains unavoidable. There is a critical need to offload the most dangerous tasks to machines so that soldiers do not bleed when robots can fight.
Challenge brief/definition	The challenge is to indigenously design, develop and prototype a combat capable humanoid robot with high dexterity, stability and autonomy that can operate alongside or ahead of soldiers in hostile environments. The humanoid platform must be capable of human-like mobility, terrain negotiation, load handling and tactical task execution while being software upgradable and modular. The system should reduce direct soldier exposure to risk in combat, counter-insurgency and hazardous missions, while remaining adaptable for future operational requirements. Development will be stage wise, enabling progressive capability enhancement leading to a fully deployable combat humanoid system
Existing Solution (if any)	<ul style="list-style-type: none"> • There are no deployable indigenous humanoid combat robots currently available that meet Indian Armed Forces operational requirements. International developments by companies such as Boston Dynamics, Tesla (USA) and Unitree (China) are ongoing, however: • These systems are not combat certified for Indian conditions • They are export-restricted and non-customisable <ul style="list-style-type: none"> • Core technologies remain controlled by foreign entities • Integration with Indian doctrine, terrain, and command systems is limited • Dependence on foreign humanoid

	platforms poses strategic, operational and supply chain risks
Technology domain (s)	<ul style="list-style-type: none"> • Developing a combat capable humanoid involves several domains. • Robotics and Actuation Systems: High-torque, rugged actuators for humanoid motion • Sensors and Controls: Multi-sensor fusion for balance, perception and navigation • AI / ML: Reinforcement learning for gait generation, stability, decision-making and autonomy • Advanced Battery and Power Systems: High density, field swappable energy modules • Unmanned and Autonomous Systems: Secure autonomy, human in the loop control
Application/Use Case	<ul style="list-style-type: none"> • Combat Operations. Forward deployment in active combat zones including engagement with adversaries and hostile robots • Counter-Insurgency. First-line reconnaissance, entry and threat neutralization • Load Assistance. Carrying equipment, ammunition, and supplies in high-altitude terrain • Surveillance and Reconnaissance. Persistent observation in hazardous or denied
Project Outcome	Stage 1 ,2,3 will result in 3 deployable products — Exo skeletons Stage 4 A combat-ready indigenous humanoid robotic platform capable of assisting or replacing soldiers in high-risk operational scenarios.
Testing /Certification	<ul style="list-style-type: none"> • Mobility and endurance trials in high-altitude terrain using specified loads • Environmental testing (cold, dust, moisture) • Safety and reliability validation • AI autonomy and failsafe testing • Certification through accredited defence agencies (DGQA)
Future Expectation from the prototype / Technology developed	<ul style="list-style-type: none"> • Stable humanoid locomotion on uneven, icy and inclined terrain • Human like dexterity for object manipulation and equipment handling of weapons • Autonomous and semi-autonomous operation modes

	<ul style="list-style-type: none"> • Modular architecture for payloads, sensors, and mission profiles • Software upgradable AI for continuous capability improvement • Demonstrated reduction in soldier exposure during trials
Potential Market	<ul style="list-style-type: none"> • Indian Army, Air Force, Navy • BSF, Paramilitary, ITBP, CRPF, Special forces etc. • NDRF - Disaster response agencies • Strong export potential to friendly foreign nations
Business Case	<ul style="list-style-type: none"> • High probability of bulk procurement post validation • Long-term repeat orders for upgrades and variants • Significant defence export potential supporting Bharat

Problem Statement 8: Autonomous Load Carrier Trucks for Indian Army Operations

Organization Name	Indian Army
Challenge title	Autonomous Load Carrier Trucks for Indian Army Operations
Problem Statement/	<ul style="list-style-type: none"> • Military logistics convoys face high risk from terrain, weather and hostile threats. • Dependence on human-driven vehicles increases casualties and limits operational endurance. • An autonomous load carrier capability is required to enhance logistics survivability.
Challenge brief/definition	<ul style="list-style-type: none"> • Develop military trucks with autonomous driving capability for logistics operations. • Vehicles shall retain load capacity equivalent to existing Army B Vehicle fleet. • The system shall support autonomous, supervised and manual driving modes. • The solution shall be suitable for all terrains and operational environments.
Existing Solution (if any)	<ul style="list-style-type: none"> • Current Army logistics vehicles are fully manned and manually driven. • Limited driver assistance systems exist but lack autonomous capability. • No indigenous autonomous heavy duty vehicles are existing.
Technology domain (s)	<ul style="list-style-type: none"> • Autonomous Vehicle Systems and Robotics • Artificial Intelligence and Sensor Fusion • Satellite Navigation and Inertial Navigation Systems • Secure Communications and Electronic Counter-Countermeasures • Automotive and Military Vehicle Engineering
Application/Use Case	<ul style="list-style-type: none"> • Autonomous load carriers shall be used for routine and operational logistics convoys.

	<ul style="list-style-type: none"> • The system shall operate in plains, deserts, jungle and high-altitude terrain. • Autonomous capability shall support operations in high-risk or denied areas.
Project Outcome	<ul style="list-style-type: none"> • A validated autonomous load carrier with military-grade autonomy. • The system shall be suitable for limited induction and scaling.
Testing /Certification	<ul style="list-style-type: none"> • Autonomous driving performance and safety trials. Navigation accuracy and ECCM resilience testing. • User trials and validation by Indian Army.
Future Expectation from the prototype / Technology developed	<ul style="list-style-type: none"> • The prototype shall demonstrate reliable autonomous navigation across varied terrains. • The system shall integrate NAVIC, INS and redundant navigation sensors. • ECCM features shall ensure resilience against jamming and spoofing. • Vehicles shall seamlessly transition between autonomous and manual control modes.
Potential Market	<ul style="list-style-type: none"> • Indian Army and other Armed Forces. • Paramilitary and strategic logistics organisations. • Select dual-use disaster response applications.
Business Case	<ul style="list-style-type: none"> • High potential for bulk induction across logistics vehicle fleets. • Repeat orders expected due to fleet modernisation. • Export potential exists for friendly foreign militaries.

Problem Statement 9: Design and Development of Sovereign Quantum Radar

Organization Name	Indian Navy
Challenge title	Design and Development of Sovereign Quantum Radar
Problem Statement/	To design and develop an indigenous quantum radar system exploiting quantum illumination and entangled photon pairs generated at room temperature for detection of low-observable stealth and electronically jammed targets in maritime and aerospace operational environments, addressing the absence of any such indigenous capability within the Indian Armed Forces.
Challenge brief/definition	<p>Quantum radar is an emerging class of sensing technology that exploits quantum mechanical phenomena, principally quantum entanglement, quantum illumination and quantum correlations, to achieve detection performance fundamentally superior to classical radar in specific operational regimes.</p> <p>The core principle involves generating entangled photon pairs (signal and idler) where the signal beam is transmitted toward the target area and the idler beam is retained locally as a reference. Upon return of the signal photons (reflected from a target), a joint measurement comparing returned signal with stored idler exploits residual quantum correlations to distinguish genuine target returns from background thermal noise with significantly higher confidence than any classical radar of equivalent transmitted power. This capability is termed quantum illumination.</p> <p>A critical and distinguishing requirement of this challenge is the ability to generate entangled photon pairs at room temperature without dependence on cryogenic cooling infrastructure. Current state-of-the-art microwave quantum radar prototypes globally rely on Josephson parametric amplifiers (JPAs) or Josephson parametric converters (JPCs) operating inside dilution refrigerators at millikelvin temperatures, severely limiting deployability, size, weight, power and cost. This challenge seeks innovation in room-temperature entangled pair generation using approaches such as spontaneous parametric down-conversion (SPDC) in nonlinear crystals (PPKTP, PPLN, BBO), semiconductor quantum dots, or novel electro-optomechanical transduction architectures that bypass cryogenic requirements. Achieving operationally viable entangled pair generation rates and fidelity at room temperature is the primary deep-tech innovation target.</p> <p>The quantum radar system shall demonstrate measurable quantum advantage over a classical radar baseline of equivalent transmitted energy in a controlled test environment, specifically improved signal-to-noise ratio in the presence of noise and clutter, improved detection probability against low radar cross-section targets, inherent resistance to</p>

	electronic countermeasures including jamming and spoofing, and low probability of intercept due to extremely low signal power emission
Existing Solution (if any)	<p>Current radar systems in the Indian Navy utilise conventional radio frequency electromagnetic waves to detect, locate and track objects by analysing reflected pulses. These systems face fundamental limitations:</p> <p>(a) Stealth targets. Modern low-observable platforms employ radar-absorbing materials, geometric shaping and active cancellation to reduce radar cross-section to levels below the detection threshold of conventional radar at operationally useful ranges.</p> <p>(b) Electronic warfare. Hostile electronic countermeasures including noise jamming, deceptive jamming, chaff and digital RF memory (DRFM) based repeater jamming can severely degrade conventional radar performance, masking targets or creating false returns.</p> <p>(c) Clutter environments. Sea clutter, ground clutter, weather returns and multipath propagation in littoral and congested environments reduce detection reliability against slow-moving or low- altitude targets.</p> <p>(d) No indigenous quantum sensing capability. India currently possesses no operational or developmental quantum radar system. All existing detection capability relies on classical electromagnetic sensing. No sovereign capability exists in entangled photon generation for sensing, quantum illumination receivers or quantum- enhanced signal processing for radar applications.</p>
Technology domain (s)	Quantum illumination, quantum entanglement, quantum sensing, room-temperature entangled photon pair generation, quantum-enhanced radar signal processing
Application/Use Case	<p>a) Detection and tracking of low-observable (stealth) surface and air targets in maritime and littoral operational environments.</p> <p>(b) Detection of targets in heavy electronic warfare environments where conventional radar is jammed or degraded.</p> <p>(c) Short-to-medium range high-confidence target discrimination in high-clutter scenarios (sea surface, littoral, congested airspace).</p> <p>(d) Low probability of intercept (LPI) surveillance where the radar must operate without revealing its presence to hostile electronic support measures.</p> <p>(e) Potential extension to submarine detection via quantum-enhanced acoustic or electromagnetic sensing in underwater environments.</p>

Project Outcome	<p>(a) A functioning laboratory demonstrator of quantum radar based on room-temperature entangled photon pair generation demonstrating measurable quantum advantage over classical baseline.</p> <p>(b) Documented room-temperature entangled photon source with characterised generation rate, fidelity, spectral brightness and Bell parameter.</p> <p>(c) Quantum illumination receiver with demonstrated signal-to-noise improvement over classical detection at equivalent transmitted energy.</p> <p>(d) Technology roadmap for progression to field- testable prototype deployable on naval platforms.</p> <p>(e) All source code, design documentation, fabrication processes and IP generated under the project</p>
Testing /Certification	<p>Testing and certification shall include:</p> <p>(a) Characterisation of entangled photon source: pair generation rate, spectral brightness, Bell parameter ($S > 2$ required to confirm entanglement), coincidence-to-accidental ratio, and stability over continuous operation at room temperature.</p> <p>(b) Quantum advantage verification: comparative detection trials against classical radar baseline of identical transmitted energy, measuring detection probability, false alarm rate and SNR improvement in controlled thermal noise environment.</p> <p>(c) Electronic countermeasure resilience: demonstration of resistance to simulated jamming and spoofing scenarios where classical radar R performance degrades.</p> <p>(d) Range and sensitivity characterisation: documented detection range under laboratory conditions with calibrated target RCS and noise floor.</p> <p>(e) Independent validation by accredited national laboratory (DRDO, IISc, national metrology institute or equivalent) for quantum entanglement metrics and detection performance claims.</p>
Future Expectation from the prototype / Technology developed	<p>The prototype development is expected to deliver:</p> <p>(a) A laboratory demonstrator (TRL 3-4) proving quantum advantage in target detection over a classical radar baseline under controlled conditions, using room-temperature entangled photon pair from the prototype generation.</p> <p>(b) Characterisation of entangled pair generation rates, fidelity, and Bell inequality violation metrics at room temperature with documented performance bounds.</p> <p>(c) A receiver architecture demonstrating practical joint measurement or digital phase-conjugate detection of returned signal photons correlated against stored idler reference. (d) A technology roadmap for progression</p>

	<p>from laboratory demonstrator to field-testable prototype (TRL 5-6) suitable for evaluation in representative naval environments (shore-based, shipboard or airborne platform) with defined SWaP (size, weight and power) targets.</p> <p>(e) Assessment of scalability to operational ranges and integration pathway with existing naval radar infrastructure.</p>
Potential Market	<p>(a) Defence (Indian Navy): Ship-based and shore-based quantum radar for stealth detection, anti-submarine warfare enhancement, harbour and coastal surveillance in ECM-dense environments.</p> <p>(b) Defence (Tri-Service): Air defence detection of stealth aircraft and UAVs. Army forward surveillance in electronically contested environments. Air Force early warning enhancement.</p> <p>(c) Defence (Export): Friendly foreign navies and allied nations currently lacking indigenous quantum radar capability represent a significant export market once technology matures to TRL 7+.</p> <p>(d) Civil/Commercial: Maritime traffic management, airport surveillance in adverse weather, border security, non-invasive biomedical imaging and industrial non-destructive testing.</p> <p>(e) Quantum ecosystem development: Core technologies developed (entangled photon sources, single-photon detectors, quantum receivers) will have spillover applications in quantum communication, quantum key distribution and quantum computing infrastructure.</p>
Business Case	<p>Quantum radar as a deployable system does not yet exist in any global market. However, the enabling technology components (entangled photon sources, single-photon detectors, quantum receivers) have a rapidly growing market.</p> <p>(a) Estimated initial procurement: Minimum 3 systems for Indian Navy (shore demonstrator, ship integration prototype, air platform evaluation unit) upon successful TRL 6+ demonstration.</p> <p>(b) Tri-service expansion: Up to 15-20 systems across Indian Army, Indian Air Force and Defence Space Agency upon successful operational validation.</p> <p>(c) Export potential: Allied nations in the Indo-Pacific region represent addressable market of 30- 50 systems within first decade of operational maturity.</p> <p>(d) Global quantum radar market projected at USD 662 million by 2031 (CAGR 7.4%). Indigenous P/R capability positions India to capture a significant share rather than import.</p>

Problem Statement 10. Diesel Engine Generator Exhaust System for Submarine

Organization Name	Indian Navy
Challenge title	Diesel Engine Generator Exhaust System for Submarine
Problem Statement/	Development of Diesel Engine Generator Exhaust System for a conventional submarine, which will carry the exhaust on surface and in submerged condition against a known back-pressure (depth) as per Technical specifications. Technical specifications of the exhaust valves (which will constitute a major part of the design) are placed at Annexure 1.
Challenge brief/definition	Indigenous development of Diesel Engine Generator Exhaust System for a conventional submarine, which will carry the exhaust on surface and in submerged condition against a known back-pressure (depth). The major challenge being faced is that there are three exhaust valves in each of Port and Starboard sides, depending on operation of the generator in surface or submerged condition respectively. These exhaust valves, if not holding in shut position, result in seawater ingress through them inside the submarine, thereby resulting in flooding. It also leads to lesser reliability in submarine operations. A reliable exhaust system, therefore, should be designed and developed by an Indian firm.
Existing Solution (if any)	Nil
Technology domain (s)	Diesel Engine Exhaust System for Submarine
Application/Use Case	Nil
Project Outcome	Nil
Testing /Certification	Nil
Future Expectation from the prototype / Technology developed	Development of a robust and reliable Diesel Engine Exhaust System with low failure rates and defects for use onboard the Submarine.
Potential Market	(a) Presently and future requirements of the products in Services (from procurement perspective)- Once developed the Diesel Engine Exhaust System could be used onboard Kalvari class submarines and thereafter be progressively considered for future conventional submarines platforms planned for induction in the Indian Navy. (b) Will the development product be able to strengthen the defence export of India? Yes

	(c) Any other relevant info. No
Business Case	Nil

Problem Statement 11. Guided Long Range 76mm Ammunition with Programmable Fuze.

Organization Name	Indian Navy
Challenge title	Guided Long Range 76mm Ammunition with Programmable Fuze.
Problem Statement/	To develop Guided Long Range 76mm Ammunition with Programmable Fuze.
Challenge brief/definition	GLR shall be a single piece munition with the projectile rigidly assembled to the cartridge case. The projectile is sub-caliber fin stabilized. The GLR outer shape shell fit standard 76mm cartridge by the means of a sabot. The warhead shall include pre-notched tungsten rings & steel and shall be filled with pre-formed insensitive high explosive (PFEx-IM-HE). The GLR shall be canard controlled and shall perform guidance by the means of IMU-GPS technology. Depending upon the configuration, the projectile shall equip a programmable RF multi- functional fuze (Time, Impact, Delayed Impact, Height of Burst).
Existing Solution (if any)	Presently conventional 76/62 mm ammunition is being fired from SRGM gun. The range of this ammunition is limited to 15.6 Km.
Technology domain (s)	Ammunition
Application/Use Case	The GLR Ammunition with Programmable Fuze shall be suitable for following roles:- <ul style="list-style-type: none"> • Anti surface warfare • Shore bombardment
Project Outcome	Guided Long Range (GLR) Ammunition with Programmable Fuze
Testing /Certification	Testing would be undertaken in accordance with QAP/ ATP. Draft QAP/ ATP document shall be prepared by the Development Agency (DA) and submitted to IN for vetting and approval.

Future Expectation from the prototype / Technology developed	The ammunition, once developed, would be required firing from SRGM(U) by IN
Potential Market	The ammunition, once developed, would be required firing from SRGM(U) by IN
Business Case	Chance of repeat order

Problem Statement 12. Development of submarine cable Fiber Optic cable embedded with Distributed Acoustic Sensing System for Underwater Detection.

Organization Name	Indian Navy
Challenge title	Development of submarine cable Fiber Optic cable embedded with Distributed Acoustic Sensing System for Underwater Detection.
Problem Statement/	Underwater intrusions by adversary pose a major security threat to own assets, VAs and VPs. Conventional hydrophone/ acoustic based sensors reliant on environmental characteristics which limits their performance. In this regards, area surveillance using optical fibre based DAS system is a preferred alternative. DAS system is envisaged for detection of underwater threats by utilising optical fibre cables laid on seabed using advanced techniques for detection in underwater medium.
Challenge brief/definition	<ol style="list-style-type: none"> 1.Design and develop optical fiber based DAS system. 2.Capable of intrusion monitoring/ underwater events in water column and sea bed with a monitoring range of upto 100 km (using single DAS) and detection range more than 5 km. 3. Development of AI/ML based algorithm for classification and interpretation of DAS data. 4.Generate automatic alert report on target detection specifying parameters viz. track ID, date with time stamp, target, bearing and range, target classification, confidence level etc. 5. Establish ground control station with compatible communication suite for near real time communication with the cable. Supply associated system hardware/ software. 6. Interface with IN NCO grid and Target Database Management System. 7. System shall be ruggedised to withstand harsh marine underwater environment and adhere to industry standards/ Quality Assurance standards specified by IN.
Existing Solution (if any)	Nil
Technology domain (s)	<ol style="list-style-type: none"> 1. Laser interrogators, photo detectors and high speed DSP hardware. 2. Submarine fiber optic cable. 3. AI/ ML detection and classification algorithm.

	4. Subsurface and seabed detection using non acoustic means.
Application/Use Case	1. Undertake subsurface and seabed detection of targets. 2. Offshore asset protection, marine seismic monitoring and disaster early warning systems.
Project Outcome	1. Lay submarine cable fiber optic cable embedded with DAS system to detect underwater and seabed threats. 2. Generate automatic alert report on target detection at Ground Control Station.
Testing /Certification	DQA (N)/ Class
Future Expectation from the prototype / Technology developed	1. Seamless detection, localisation, classification, and continuous generation of target parameters for targets by DAS at depths of existing submarine cable. 2. Real time data access to intrusions including big data computation(edge-based algorithm). 3. Should be capable of handling high acoustic data density. 4. Enhanced monitoring range ≥ 100 km. 5. Design and development of interface unit/ data input device where external data can be fed into the system for training of AI/ML enabled system for classification of U/W target. 6. Consistent performance in high spatial variability of sound velocity profile in IOR. 7. Detection of low amplitude acoustic disturbances/ perturbations while operating in high ambient noise environments utilising Ultra low noise lasers and high coherence optical interrogators. 8. Immunity from environmental drift and phase incoherence/ coherence loss caused due to fiber strain, temperature variation and pressure changes. 9. High localisation and classification accuracy and less probability of false alarm. 10. Narrow and broadband frequency monitoring.
Potential Market	Defence /Commercial
Business Case	Yes

Problem Statement 13. Automatic Ammunition Feeding System for 76 mm Gun.

Organization Name	Indian Navy
Challenge title	Automatic Ammunition Feeding System for 76 mm Gun.
Problem Statement/	To develop and ammunition feeding cum stowage system that provides stowage of 76mm ammunition and enables automatic loading of gun mount from magazine.
Challenge brief/definition	The challenge involves design and development of an ammunition feeding cum stowage system for 76mm gun mount in service in <i>IN</i> . The system is envisaged to provide stowage to the aforementioned ammunition iaw extant policy of <i>IN</i> and enables automatic loading of gun mount from magazine.
Existing Solution (if any)	Presently the work is undertaken manually and is labour intensive.
Technology domain (s)	Automation, forging, metallurgy, electro-mechanical and hydraulic.
Application/Use Case	The system will be utilised onboard <i>IN</i> warships
Project Outcome	Nil
Testing /Certification	Nil
Future Expectation from the prototype / Technology developed	The system will ensure continuous and automated supply of ammunition for exploitation ensuring more number of rounds available for ready use and augmenting safety in gun mount operations
Potential Market	Nil
Business Case	Nil

Problem Statement 14. Ballistic Extended Range 76 mm Ammunition with Programmable Fuze

Organization Name	Indian Navy
Challenge title	Ballistic Extended Range 76 mm Ammunition with Programmable Fuze
Problem Statement/	To develop Ballistic Extended Range (BER) Ammunition with Programmable Fuze
Challenge brief/definition	BER shall be a single piece munition with the projectile rigidly assembled to the cartridge case. The projectile shall be sub-caliber fin stabilized. The BER outer shape fits standard 76mm cartridge by the means of a sabot. This feature shall guarantee full compatibility with the loading system of 76/62 mm guns. The warhead shall include pre- notched tungsten rings & steel and shall be filled with pre- formed insensitive high explosive (PFEx-IM-HE). The BER equips electronic programmable RF multi-functional fuze (Time, Impact, Delayed Impact, Height of Burst, Proximity).
Existing Solution (if any)	Presently conventional 76/62 mm ammunition is being fired from SRGM gun. The range of this ammunition is limited to 15.6 Km.
Technology domain (s)	Ammunition
Application/Use Case	The BER Ammunition with Programmable Fuze shall be suitable for following roles:- Anti Air Warfare Anti Surface Warfare Shore Bombardment
Project Outcome	Guided Long Range (GLR) Ammunition with Programmable Fuze.
Testing /Certification	Testing would be undertaken in accordance with QAP/ ATP. Draft QAP/ ATP document shall be prepared by the Development Agency (DA) and submitted to IN for vetting and approval.

Future Expectation from the prototype / Technology developed	The ammunition, once developed, would be required by IN for firing from SRGM (U)
Potential Market	The ammunition, once developed, would be required firing from SRGM (U) by IN
Business Case	Chances of repeat order.

Problem Statement 15: Design and Develop Indigenous re-usable High speed Expendable Aerial Target (HEAT) with EW capabilities which can simulate fighter aircraft profiles and can be employed to provide realistic target engagement for IAF fighter aircraft and SAGW systems

Organization Name	IAF
Challenge Title	Design and Develop Indigenous re-usable High speed Expendable Aerial Target (HEAT) with EW capabilities which can simulate fighter aircraft profiles and can be employed to provide realistic target engagement for IAF fighter aircraft and SAGW systems
Problem Statement	<ol style="list-style-type: none"> 1. Currently the IAF is operating three types of MEAT which include Jet 40, Jet 40+, and Jet 80+. These target systems have limitations both in terms of altitude and speed. 2. The present class of MEAT do not meet the requirements to simulate real time fighter aircraft. The operating altitudes for fighter class of aircraft ranges from 30,000 ft and beyond which is an optimum altitude to employ long/ medium range Beyond Visual Range missiles. 3. Thus there exists an operational necessity to indigenously design and develop a High-Speed Aerial Target (HEAT) which can reach altitudes from 40,000 ft (essential) to 50,000 ft (desirable). It should be capable of reaching speeds of 0.8-0.9 M (250 m/s) with an additional capability to achieve ranges of 200 Km (one side, essential) and 400 Km (desirable).
Challenge Brief/ Definition	<ol style="list-style-type: none"> 1. Design and develop Indigenous re-usable High speed Expendable Aerial Target (HEAT) which can simulate fighter aircraft profiles and can be employed to provide realistic target engagement for IAF fighter aircraft. The challenge brief is listed out: <ol style="list-style-type: none"> 1.1. HEAT should be able to climb to altitudes in excess of 40,000 ft since all present day AD aircraft/ ASFs operate >30,000 ft to optimise LR/ MR BVR weapon launch zones. 1.2. It should be able to reach speeds of 0.8-0.9 M. 1.3. It should be able to achieve ranges of 400 Km (200 Km one side) for exploiting engagement of LR BVRs. It must retain its telemetry (data relay) and manoeuvring capability at farthest ranges. 1.4. It should sustain flight up to 60 minutes to provide multiple runs for airborne fighters. Medium Level Endurance (>30,000 ft) should cater for 60 mins of operation.

	<p>1.5. It should be able to generate RCS of 0.3-0.5 Sq m so as to simulate Fighter/ Transport/ Helicopter or cruise missiles. Fitment of luneberg lens in both nose/ beam/ tail profiles so that firing can be undertaken in all aspects.</p> <p>1.6. It should be able to calculate the miss distance of a missile for validating the engagement.</p> <p>1.7. It should be able to sustain 4 ‘g’ turns so as to mimic a manoeuvring fighter.</p> <p>1.8. It should have capability to generate IR signatures so as to provide engagement of IR missiles.</p> <p>1.9. System should be able to operate minimum four HEAT together from one GCS/ Laptop.</p> <p>1.10. System should have automatic re-loading capability for using multiple HEAT within a time of 15 mins (including pre-flight BIT and engine start).</p> <p>1.11. Size of the launcher should cater for carriage through IL76 class of transport ac.</p> <p>1.12. The system should be able to exhibit deploy and employ capability through a mobile platform.</p> <p>1.13. The system should be maintenance friendly with quick assembly and readiness after containerisation.</p> <p>1.14. The system should be capable of carrying a Re-usable Jammer pod.</p> <p>1.15. It should be capable of carrying and dispensing chaffs and flares to simulate realistic combat situations.</p>
Existing Solution (if any)	No such high speed manoeuvrable target system with desired capabilities exists with IAF.
Technology Domain	UAVs/ EW Sensors
Application/ Use Case	The product will be utilised as a target system for long range firing of both Air to Air and Surface to Air missiles.

Future Expectation from the prototype developed	Future development will include enhanced performance to represent supersonic targets.
Project Outcome	Successful D&D will result in a highly maneuverable expendable aerial target system with EW Capabilities. This will be utilised as a realistic target for Air to Air & Surface to Air missile firing.
Testing Certification	All relevant applicable tests as defined by certifying /QA agencies during D&D. (including compliance to specific Mil Stds/ EMI-EMC/ JSS 55555 etc.)
Potential Market for product/ technology (Defence/ Commercial)	<ol style="list-style-type: none"> 1. Product likely to engage variety of users (different class of Fighters/ SAGW). 2. Will the developed product will be able to strengthen the defence export of India? YES, to other MEAT operating countries. 3. In case the platform is inducted into the IAF then it can pave way to germination of requirements of similar product from other services/fleets (SAGW).
Business Case (Bulk Order/ repeat order/ export potential)	<p>Bulk order case exists as product can be utilised by all three services.</p> <p>It can be considered for export to friendly foreign countries.</p>

Problem Statement 16: Air Launch Loitering Decoy (ALLD) EW

Organization Name	IAF
Challenge Title	Air Launch Loitering Decoy (ALLD) EW
Problem Statement	To develop Air Launch Loitering Decoy (ALLD) EW with sub sonic launch capability from Su-30 MKI ac for Suppression of Enemy Air Defence (SEAD) and Destruction of Enemy Air Defence (DEAD) missions.
Challenge Brief/ Definition	<ol style="list-style-type: none"> 1. In the battle area, enemy Air Defence network comprising of early warning and weapon system radars would always pose imminent threat to friendly ac. To achieve mission goals by friendly airborne forces, suppression of enemy air defence is a mandatory factor. 2. SEAD missions can be accomplished by using soft kill methods like jamming and spoofing of hostile radars by injecting the enemy radars with false targets using Air launched Loitering Decoys capable of carrying out EW missions. 3. With option for integrating a warhead inside the decoy itself, the ALLDs should also be capable of DEAD missions. 4. Therefore, the challenge is for development of Air Launched Loitering Decoys capable of carrying out SEAD and DEAD missions. 5. The project includes design, development and certification of a fighter aircraft carried weapon system and its integration in aircraft systems for launch. Complete flight testing, safety clearances, life cycle support of the developed system are envisaged. 6. The ALLD-EW will operate in autonomous mode after release from the aircraft based on Pre Flight Programs (PFMs) for navigation and EW operations. The ALLD-EW will pick-up enemy search and acquisition radar signals and manipulate them to put multiple false targets in the target Radars. False targets in search/ acquisition radars would further stimulate the enemy tracking and weapon system radars which would again be deceived with multiple false targets generated by the ALLDs resulting in Suppression of Enemy Air Defence (SEAD). 7. System may have recovery capability using parachute. Post recovery, the ALLD may be capable of being made flight worthy

	at the 'O' level. In operational mode, the parachute recovery assembly may be replaced by a warhead thereby achieving the DEAD objective.
Existing Solution (if any)	Nil
Technology Domain	Electronic Warfare
Application/ Use Case	The developed product will be utilised as an Air launched EW loitering decoy for SEAD and DEAD mission by Su-30 MKI Aircraft.
Future Expectation from the prototype developed	The tech may be spirally developed for different platforms and airborne systems.
Project Outcome	Development of Air launched EW loitering decoys capable of launch from Su-30 MKI aircraft for executing SEAD & DEAD mission.
Testing Certification	All relevant applicable tests as defined by certifying /QA agencies during D&D. (including compliance to specific Mil Stds/ EMI-EMC/ JSS 55555 etc.)
Potential Market for product/ technology (Defence/ Commercial)	If successful, the ALLDs EW will be utilized by various combat units of IAF.
Business Case (Bulk Order/ repeat order/ export potential)	Bulk order case exists for Su-30 MKI aircraft subject to successful D&D. It can be considered for export to friendly foreign countries using Su-27/ Su-30 class of aircraft.

Problem Statement 17: Booster assisted REK with EO-IR terminal guidance for 450 kg HSLD bomb

Organization Name	IAF
Challenge Title	Booster assisted REK with EO-IR terminal guidance for 450 kg HSLD bomb
Problem Statement	Existing 450 kg HSLD bombs available in IAF inventory are dumb bombs which have limited launch range and accuracy. To achieve the desired effect while delivering these bombs, the carrier aircraft has to go very close to the target, compromising the safety of platform and pilot. These dumb bombs are required to be converted into a smart precision bomb with required accuracy and extended range.
Challenge Definition	<p>A booster assisted Range Extension Kit with EO-IR terminal guidance needs to be developed for existing 450 kg HSLD bombs held in IAF inventory. This will enable the IAF to convert dumb bombs into the smart weapon with enhanced range and accuracy.</p> <p>Essential parameters</p> <p>To develop booster assisted Range Extension kit for conversion of 450 Kg High Speed Low Drag (HSLD)</p> <ol style="list-style-type: none"> 1. bombs with EO-IR head for terminal guidance. 2. Range > 200 km (for launch altitude of 5 km/ 0.9 Mach). Terminal guidance through EO-IR seeker, scene matching capability and ability to work in GNSS denied environment. 3. The accuracy of weapon should be CEP < 5 m. (Desirable CEP < 3 m). 4. Strap-on kit to existing 450 Kg HSLD bombs. 5. Kit should not hamper compatibility of the bomb with existing bomb rack of Russian and Western origin aircraft available in IAF. 6. Capability to define impact angle and attack direction through mission planning. 7. Ease of assembly, maintenance and handling. 8. Storage in strap-on condition without affecting shelf life. 9. Assembled weapon container for storage, transportation and ease of operation towards loading / off-loading of the weapon onto / from the aircraft.

Existing Solution (if any)	Nil
Technology Domain	Weapon Technology
Application/ Use Case	The developed product will be utilised as stand-off weapon system on fighter aircraft.
Future Expectation from the prototype developed	Integration of developed kit on similar caliber bombs and different fighter types in IAF inventory.
Project Outcome	Development of Booster assisted REK with EO-IR terminal guidance for 450 kg HSLD bomb that will be integrated with IAF fighter aircraft.
Testing Certification	All relevant applicable tests as defined by certifying /QA agencies during D&D. (including compliance to specific Mil Stds/ EMI-EMC/ JSS 55555 etc.)
Potential Market for product/ technology (Defence/ Commercial)	Defence. Present and future requirements of the product by IAF exists.
Business Case (Bulk Order/ repeat order/export potential)	1. The developed products can be exported to FFCs in the longer run and can strengthen the defence export of India. 2. The critical technologies developed by the industries will ensure self-reliance, as well as, pave way for development of newer types of advanced weapon systems in future.

Problem Statement 18: AI Based OSINT Analysis and monitoring system and social media stacks

Organization Name	IAF
Challenge Title	AI Based OSINT Analysis and monitoring system and social media stacks
Problem Statement	To develop an AI-Powered OSINT Analysis and Monitoring system that can apply advanced and state of the art AI and statistical Algorithms to undertake analysis and real time monitoring of user defined subjects/ topics/ information domain through sifting of vast amount of global OSINT Data.
Challenge Brief/ Definition	<ol style="list-style-type: none"> 1. The surge of OSINT data coupled with the exponential increase in computational capabilities, necessitates the integration of advanced algorithms to effectively manage and analyse this information. 2. Traditional methods of data handling are increasingly inadequate due to the sheer volume of data, limited manpower, and the time-sensitive nature of intelligence needs. Recent conflicts testify the same. 3. Employment of advanced AI algorithms such as Natural Language Processing (NLP), Large Language Models (LLM), Web Scraping, Computer Vision, clustering tools and other data mining techniques is now essential. These methods can automate the extraction, analysis and interpretation of data. 4. Identification and weeding out artificially generated content/ deep fake content often called as “Misinformation” also needs to be addressed to produce actionable and accurate intelligence. These activities are not only labour-intensive but also prone to inconsistencies and errors due to human limitation. 5. Therefore, there is a critical need for an OSINT Analysis and monitoring system that can automate these processes to a very large extent that provides relevant, reliable and timely information from vast amount of global data. Post extraction and analysis of OSINT data through user defined contextual filters, intuitive presentation of actionable intelligence is vital which is also proposed to be addressed through an interactive application as the foundation. 6. Broad plan is to develop a 5 module application.

	<p>6.1 Module 1- Source credibility check definition of credibility based on user defined factors/ criterion.</p> <p>6.2 Module 2- Open-Source content analysis.</p> <p>6.3 Module 3- Social media content analysis.</p> <p>6.4 Module 4- Images & video analysis.</p> <p>6.5 Module 5- Report extraction and GIS based outputs (Intuitive visualisation) based on open source LLMs).</p> <p>7. Data mining and aggregation for sifting through vast amounts of data to extract and aggregates the most relevant information. User defined real time monitoring of specific aspects.</p>
Existing Solution (if any)	Nil
Technology Domain	AI/ML/OSINT
Application/ Use Case	The tool would be utilised as one of the inputs to the overall Intelligence architecture of IAF.
Future Expectation from the prototype developed	Serve as a vital intelligence system/ application and a comprehensive OSINT analysis tool at various levels of organisation depending on dynamic need to fulfil specific tasks.
Project Outcome	Development of AI powered OSINT tool capable of analysis & real time monitoring of user defined subject & social media stacks.
Testing Certification	All relevant applicable tests as defined by certifying/ QA agencies during D&D.
Potential Market for product/ technology (Defence/ Commercial)	Defence
Business Case (Bulk Order/ repeat order/export potential)	All three services (IAF/IA/IN) along with other Indian Security Organisations

Problem Statement 19: Helmet Mounted Digital Night Vision Device

Organization Name	IAF
Challenge Title	Helmet Mounted Digital Night Vision Device
Problem Statement	<p>Presently IAF uses analog night vision devices using Microchannel plate (MCP) technology for light amplification. This technology is export controlled and available only through specific sources. Best performing NVGs are tightly regulated and seldom not available for import.</p> <p>Aircraft cockpits have to be specially modified to use existing NVGs. Night amplification capabilities are limited and they get impeded by high intensity light sources in very dark areas. Since the source is analog, overlay of additional information is challenging.</p>
Challenge Brief / Definition	<p>Mandatory objectives. Following objectives are required to be achieved.</p> <ol style="list-style-type: none"> 1. To make helmet mounted digital night vision devices. The devices will use digital CMOS sensors or equivalent digital sensor to amplify light and show the image to the pilot on integrated display. 2. Adapt these devices to existing helmets for flying in fighters, helicopters and transport aircraft and tactical helmets for IAF special forces. 3. Device should be binocular and focused at infinity. 4. Should be robust to take on the rigours of flying environment. 5. It should have following technical capabilities: <ol style="list-style-type: none"> 5.1 Sensor Resolution: 1280 x 1024 or better. 5.2 Frame Rate \geq 60fps 5.3 FoV: \geq 40degrees 5.4 Spectrum of operation: 400-1100 nm or wider. 5.5 AMOLED/ Micro LED Display: 1920 x 1080. 5.6 Diopter Adjustment: -4 to +4 5.7 Eye relief: 25 mm or more. 5.8 Built in compass, GPS, and 3D orientation sensor. 5.9 On board storage: 14 hours of video on removable card. 5.10 On board battery: Preferably rechargeable or COTS replaceable. 5.11 Quick disconnect mechanism for any component projecting outwards (front or sides) of the helmet. 5.12 Size should be smaller or equal to existing NVG F4949. 5.13 MIL STD 810 drop test.

	<p>5.14 Flexible mounting options for various helmets. Baseline helmet will be MSA Gallet LA100, available with IAF.</p> <p>Desirable objectives</p> <ol style="list-style-type: none"> 1. Overlay digital information on the night vision video. 2. Automatic detection of certain objects/ shapes in the video i.e. high terrain, other aircraft, rotating objects, obstructions, humans, vehicles, pre-fed or pre-determined waypoints, etc.
Existing Solution (if any)	Part capabilities of the projected problem are available through Image Intensifier based NVGs. They are limited by weight, bulk and production capabilities. Further evolution through existing technologies is not possible.
Technology Domain	Digital Night Vision Device/Sensors
Application/Use Case	The product will be utilised by all aircraft types as a sensor with enhanced capabilities.
Future Expectation from the prototype developed	In the future, overlaying of aircraft information on the digital NVG will be explored to convert the helmet-mounted digital NVG into a Helmet Mounted Digital NVG Sighting and Display System in line with HMDS available in IAF.
Project Outcome	Design & Development of digital NVG compatible with existing helmets that will enhance night operations capabilities of IAF.
Testing Certification	All relevant applicable tests as defined by certifying /QA agencies during D&D. (including compliance to specific Mil Stds/ EMI-EMC/ JSS 55555 etc.)
Potential Market for product/ technology (Defence/ Commercial)	Friendly foreign forces may be considered as potential clients, thereby bolstering Indian Defence Exports.
Business Case (Bulk Order/ repeat order/export potential)	Use Case exists for procurement of bulk order for all aircraft types including utilisation by special forces. Can be considered for export to friendly foreign countries.

Problem Statement 20: Design and Develop an Effective Helicopter Mounted Counter-UAS (Unmanned Aerial System) System or Jammer to Neutralize and Disrupt UAS Threats in Military and Civilian Environments

Organization Name	IAF
Challenge Title	Design and Develop an Effective Helicopter Mounted Counter-UAS (Unmanned Aerial System) System or Jammer to Neutralize and Disrupt UAS Threats in Military and Civilian Environments
Problem Statement	Design and Develop an Effective Helicopter Mounted Counter-UAS (Unmanned Aerial System) System or Jammer to Neutralize and Disrupt UAS Threats in Military and Civilian Environments.
Challenge Definition	<p>Brief/</p> <ol style="list-style-type: none"> 1. The increasing use of UAS in various domains, including military and civilian applications, has raised concerns about their potential misuse. UAS can be employed for malicious purposes such as surveillance, reconnaissance, and even attacks. To counter this threat, a helicopter-mounted counter-UAS system or jammer is required to effectively neutralize and disrupt UAS operations. 2. Objectives: <ol style="list-style-type: none"> 2.1. Neutralize UAS Threats 2.2. Disrupt UAS Communication 2.3. Jam UAS Signals 2.4. Provide Real-Time Intelligence 3. Requirements: <ol style="list-style-type: none"> 3.1. Range and Accuracy: The system should have a range of at least 10 km and an accuracy of ± 10 meters. 3.2. Frequency Agility: The system should be able to operate on multiple frequency bands, including L, S, C, X, and Ku bands. 3.3. Power and Cooling: The system should be able to operate for extended periods ensuring reliable performance. 3.4. Weight and Size: The system should be lightweight & compact, allowing for easy integration onto a helicopter. 3.5. User Interface: The system should have a user-friendly interface, enabling easy operation and monitoring. 3.6. Redundancy and Fault Tolerance: The system should have redundant components and fault-tolerant design to ensure continued operation in case of component failure. 3.7. EMI/EMC: System should cater for EMI/EMC from on-board systems. The jammer should be omni-directional. 3.8. Weight Penalty: System should be of maximum 200 kgs for it to be fitted onto ALH Mk III class of helicopter.

	<p>3.9. Power requirements: The system should be able to operate on 400 Hz/ 115 V AC and max current which is available from ALH MKIII emergency bus bar.</p> <p>3.10. Hard Kill/ Soft kill options: The soft kill option may comprise of jammers. However, in case of hard-kill options like DEW, the system should be integrated in a manner so as not to damage the aircraft itself i.e., safety angles etc. are to be catered for even at the cost of having limited area coverage.</p>
Existing Solution (if any)	Nil
Technology Domain	CUAS
Application/ Use Case	Helicopter mounted CUAS could be employed to address increasing UAS threats.
Future Expectation from the prototype developed	The system could be utilized for fitment on to RPAs or drones.
Project Outcome	The developed product will be provide an effective helicopter mounted CUAS capability to neutralise & disrupt UAS treats in military & civilian environment.
Testing Certification	All relevant applicable tests as defined by certifying/ QA agencies during D&D. (including compliance to specific Mil Stds/ EMI-EMC/ JSS 55555, etc.)
Potential Market for product/ technology (Defence/ Commercial)	Defence
Business Case (Bulk Order/ repeat order/ export potential)	<p>Can be utilised by other defence services.</p> <p>Can be considered for expect to friendly foreign countries.</p>

Problem Statement 21: Design and Development of Self-propelled strap-on range extension and guidance kit for 100-120 kg bomb with EO/IR terminal guidance to enhance the range and accuracy of delivered weapon

Organization Name	IAF
Challenge Title	Design and Development of Self-propelled strap-on range extension and guidance kit for 100-120 kg bomb with EO/IR terminal guidance to enhance the range and accuracy of delivered weapon
Problem Statement	Existing 100-120 kg bomb available in IAF inventory are categorized as dumb bombs which has limited launch range and accuracy. To achieve the desired effect while delivering these bombs, the carrier aircraft has to go very close to the target which compromises the safety of platform and pilot.
Challenge Brief/ Definition	<p>1. Design and Develop a Self-propelled strap-on range extension and guidance kit which can be fitted on the existing 100-120 kg bombs can boost the launch range and accuracy of bomb.</p> <p>2. Essential parameters.</p> <p>2.1 Range > 200 km (For launch altitude of 5 km and speed 0.9 M).</p> <p>2.2 EO/IR terminal guidance with suitable midcourse guidance. Adequate anti-jamming and anti-spoofing measures needs to be provisioned.</p> <p>2.3 Kit should be compatible with existing bomb rack of aircraft available in IAF.</p> <p>2.4 The accuracy of weapon should be CEP < 5 m. (Desirable CEP < 3 m).</p> <p>2.5 Ease of assembly, maintenance and handling.</p> <p>2.6 Minimum 15 years of service life.</p> <p>Desirable parameters. Simple test equipment for GO and NO-GO results to operators during preparation of weapon and other test equipment to check module wise serviceability as per maintenance philosophy.</p>
Existing Solution (if any)	Nil
Technology Domain	Weapon

Application/ Use Case	The developed product will be utilised as stand-off weapon system on fighter aircraft.
Future Expectation from the prototype developed	Integration of developed kit on similar caliber bombs / aircraft utilising same bomb.
Project Outcome	Project is expected to deliver Self-propelled strap-on range extension and guidance kit for 100-120 kg bomb that will be integrated with IAF defined fighter aircraft as part of iDEX project.
Testing Certification	All relevant applicable tests as defined by certifying / QA agencies during D&D. (including compliance to specific Mil-Stds / EMI-EMC / JSS 55555 etc.)
Potential Market for product/ technology (Defence/ Commercial)	Defence
Business Case (Bulk Order/ repeat order/ export potential)	<ol style="list-style-type: none"> 1. Present and future requirements of the product by IAF exists. 2. The developed product will be able to strengthen the defence export of India. 3. The critical technologies developed by the industry will ensure self-reliance, as well as, development of newer types of advanced weapon systems in future.

Problem Statement 22: Small Size Target Flare Bomb with Electrical Initiating Device

Organization Name	IAF
Challenge Title	Small Size Target Flare Bomb with Electrical Initiating Device
Problem Statement	Presentably, IAF has M6-T flare bomb supplied by foreign OEM which needs to be indigenised.
Challenge Definition	<p>Brief/</p> <p>Design and Development of small Size target flare bomb with electrical Initiating Device to Simulate Air targets with prominent radar and thermal signatures. After 9 ± 1 second release from aircraft, the bursting charge ignites the main flare and initiates parachute system for controlled descent of burning flares. The main parachute system consists of radar reflectors and high intensity luminous flare provide thermal signatures.</p> <p>Essential parameters</p> <ol style="list-style-type: none"> 1. Small Size Target Flare Bomb with Electrical Initiating Device akin to Russian M6T. 2. Length (without Target Opening Device (TOD)), (maximum): 1065 mm. 3. Diameter (Max): 280 mm. 4. Weight: Should be less than 250 kg. 5. Flare Burning Time: Not less than 420 sec. 6. Luminous intensity : Not less than One Million Candelas (MCD). 7. Radar Reflector: Radar reflector is to be provided along with the parachute mechanism for reflecting radar signals. 8. Target Opening Device (TOD)/ fuze delay time: 9 ± 1 seconds. 9. Aircraft Compatibility: To be compatible with IAF defined fighter aircraft. 10. Life: At least 10 yrs. 11. Storage conditions: Temperature between -40°C to $+60^{\circ}\text{C}$ and RH below 95%. <p>Stage wise weapon safeties for various phases like preparation, testing, carriage on aircraft launch initiation and safe separation to be ensured.</p>
Existing Solution (if any)	Nil
Technology Domain	Weapon

Application/ Use Case	The small size target flare bomb will be utilised for firing of IR Air to Air missiles.
Future Expectation from the prototype developed	Development of Small Size Target Flare Bomb with Electrical Initiating Device.
Project Outcome	Project will lead to development of airborne small size target flare bombs with electrical initiating device that will be utilised for firing of Air to Air missiles.
Testing Certification	All relevant applicable tests as defined by certifying/ QA agencies during D&D. (including compliance to specific Mil Stds/ EMI-EMC /JSS 55555, etc.)
Potential Market for product/ technology (Defence/ Commercial)	<p>Defence</p> <ol style="list-style-type: none"> 1. Present and future requirements of the product by IAF exists. 2. The developed product will be able to strengthen the defence export of India. 3. The critical technologies developed by the industry will ensure self-reliance, as well as, development of newer types of advanced weapon system in future.
Business Case (Bulk Order/ repeat order/ export potential)	The capability can lead to development of enhanced weapon system. This will enable export of weapon system from domestic industry to friendly foreign nation.

Problem Statement 23: DEVELOPMENT OF HIGH-EFFICIENCY, LIGHTWEIGHT, SPACE-GRADE SILICON-PEROVSKITE TANDEM SOLAR PANELS (150 W CLASS) FOR SMALL SATELLITES (~200 KG CLASS)

Organization Name	Defense Space Agency
Challenge title	Development of High-Efficiency, Lightweight, Space-Grade Silicon-Perovskite Tandem Solar Panels (150 W Class) for Small Satellites (~200 kg class)
Problem Statement/	Indian small satellite missions require high power density, lightweight, cost-effective solar panels. Current silicon-based panels are limited in areal efficiency and specific power. There is a need to develop indigenous space- grade Silicon-Perovskite tandem solar panels (TRL-8) with $\geq 22\%$ AM0 efficiency and ≥ 80 W/kg specific power for 200 kg class satellites.
Challenge brief/definition	<p>The challenge seeks development of:</p> <ul style="list-style-type: none"> • Space-grade thin Silicon solar cells (60– 80 μm) • Space-grade Perovskite cells • Silicon-Perovskite tandem cells • 150 W rigid solar panel (mandatory) • Flexible rollout panel (desirable) • Demonstration to TRL-8 (ground qualification), TRL-9 (flight optional) <p>Performance targets:</p> <ul style="list-style-type: none"> • $\geq 22\%$ efficiency at AM0 (28°C) • ≥ 200 W/m² areal power density (BOL) • ≥ 80 W/kg specific power • Radiation tolerant encapsulation • Thermo-vac capability -120°C to +120°C • Deployment demonstration (1g or 0g)
Existing Solution (if any)	<p>Global:</p> <ul style="list-style-type: none"> • GaAs triple junction cells (28–32% efficiency) • Lab-scale perovskite tandem ~30% at AM1.5 <p>Limitations:</p> <ul style="list-style-type: none"> • GaAs: Expensive, import dependent • No indigenous TRL-8 tandem solution available
Technology domain (s)	<ul style="list-style-type: none"> • Advanced Materials (Perovskite absorbers) • Thin-film photovoltaics • Space-grade encapsulation systems • Radiation engineering • High reliability space electronics

	<p>integration</p> <ul style="list-style-type: none"> • Deployment mechanisms
Application/Use Case	<ul style="list-style-type: none"> • ISR small satellites • SSA payload buses • Tactical Satcom satellites • Responsive launch satellites • LEO military constellations (~200 kg class)
Project Outcome	<p>Development of a TRL-8 qualified, 150 W class Silicon–Perovskite tandem solar panel for ~200 kg small satellites, achieving $\geq 22\%$ efficiency under AM0 conditions. The system shall deliver ≥ 200 W/m² areal power density and ≥ 80 W/kg specific power, with full thermovac, vibration, acoustic and radiation qualification. The outcome will be a space- ready, integration-compatible, indigenous solar power solution, enabling higher payload capability and reduced import dependence.</p>
Testing /Certification	<ul style="list-style-type: none"> • AM0 performance test • Electroluminescence • Thermal shock: -100°C to $+100^{\circ}\text{C}$ (500 cycles) • Thermo-vac: 1×10^{-6} torr • Vibration & acoustic (PSLV/ASLV loads) • Insulation resistance tests • LAPSS validation
Future Expectation from the prototype / Technology developed	<ul style="list-style-type: none"> • Increase power density by 25–40% • Reduce stowed volume • Reduce lifecycle cost • Enable modular power augmentation • Indigenous supply chain establishment
Potential Market	<p><u>Defence:</u></p> <ul style="list-style-type: none"> • 200 kg class ISR satellites • LoD satellites • SSA nodes <p><u>Commercial:</u></p> <ul style="list-style-type: none"> • Earth Observation constellations • Communication cubesats • Export to emerging space nations
Business Case	<ul style="list-style-type: none"> • Expected MPQ: 20–50 panels per constellation phase • Repeat demand across ISR & SSA constellations • Export potential to friendly foreign countries • Commercial space startups

Problem Statement 24: DEVELOPMENT OF INDIGENOUS TOOL FOR SPACE DOMAIN TRAINING, SURVEILLANCE AND OPERATIONS IN IAF

Organization Name	Indian Air Force
Challenge title	Development of indigenous tool for Space domain training, Surveillance and Operations in IAF
Problem Statement/	Indigenous development of analytics for Space domain training, Surveillance and Operations in IAF
Challenge brief/definition	<ol style="list-style-type: none"> 1. The design and development of indigenous tool for space domain training, surveillance and operations in IAF. The capabilities envisaged in the indigenous tool are as follows:- <ol style="list-style-type: none"> a) Volumetric Scan. The volumetric scan provides the capability to select user defined region on the earth and detect, scan and monitor all the space objects through the selected region. b) Neighbourhood Watch Screening. This capability provides ability for comprehensive identification, record, screening and analysis of objects passing close to, interjecting or intercepting Indian Satellites. c) Conjunction Analysis. This capability provides predicted conjunctions and its analysis in terms of possible closest time of approach, relative velocity etc for the space objects. d) Collision Detection. The detection of probability of collision, time of collision, relative velocities etc wrt to our satellite. e) Blind Spot Detection. The capability to detect the absence of adversary satellites coverage over selected user defined areas. f) Manoeuvre Detection. Detect, analyse and characterise the intentional/unintentional manoeuvres other than routine manoeuvres undertaken by any/selected satellites and their associated probability of threat to Indian space assets. g) Characterisation and Cataloguing of Space Object. This characterisation of detected space object as a correlated or un-correlated object by correlating it existing database of space objects. The un-related tracks will be tracked for its identification by tasking the ground/space- based sensors for more number of observations and manual input of INT data related to the space object. h) Re-entry Analysis. The analysis for re-entry space objects which may potentially cause harms to national strategic installations. i) Rapid Processing. The rapid processing capability on the data collected for identification of sub- orbital delivery systems such as ballistic missiles, hypersonic, and other missions. 2. The software tool and associated hardware should be

	<p>compatible for working in IAF network environment.</p> <ol style="list-style-type: none"> 3. The data for this software tool would be sourced from open source, high definition ephemeris data or own sources. 4. The software tool should be developed following Software Development Life Cycle (SDLC) and necessary certification need to be provided as per the IAF requirement to run in IAF environment. 5. The software tool should be scalable for further capability development and to be maintained for its availability by the developing agency. 6. The licensing would be perpetual based licensing.
Existing Solution (if any)	NA
Technology domain (s)	Space Situational Awareness
Testing /Certification	NA
Future Expectation from the prototype / Technology developed	Future integration with the existing C2 systems in IAF.
Business Case	Seven instances with perpetual licenses and associated hardware provided software tool would pass the required capabilities and certification criteria.

Problem Statement 25: MINIATURISATION OF PAYLOADS (EO & SAR) FOR SMALL SATELLITE UPTO 180 KGS

Organization Name	INDIAN AIRFORCE
Challenge title	Miniaturisation of Payloads (EO&SAR) for small satellite upto 180 kgs
Problem Statement/	A combined Electro -Optical (EO) imaging and Synthetic Aperture (SAR) Radar payloads package for a small satellite with overall weight of 180 kgs or less
Challenge brief/definition	Typically, most earth observation satellites use large, bulky, heavy, and use corollary, expensive sensors. There is a need to leverage advancements in technology and manufacturing to facilitate miniaturization, without compromising on quality of images. Along with development of low weight satellites, compatible payloads (viz, EO & SAR) also need to be developed, so as to enable low cost, large scale manufacture. This challenge is a sub challenge of an ongoing challenge under iDEX DefSpace i.e. Miniaturized Multi-Payload Satellite (EO, IR, SAR Hyperspectral) upto 180 kgs. The payloads, therefore, being developed needs to be compatible with satellite buses being developed under the main challenge.
Existing Solution (if any)	NA
Technology domain (s)	ISR
Application/Use Case	The developed payloads should be capable of integrating with the bus developed under challenge "Miniaturized Multi-Payload Satellite (EO, IR, SAR & Hyperspectral) upto 180 kgs". The developed prototype should not exceed the permissible volume/mass constraints and if payload permits, should be capable of integrating more than one payload on the same satellite bus.
Testing /Certification	NA
Future Expectation from the prototype / Technology developed	NA
Potential Market	NA
Business Case	NA