iDEX Innovations for Defence Excellence

PM Awardee

DEFENCE INNOVATION ORGANISATION

(Under Aegis of Department of Defence Production)

Ministry of Defence, Government of India

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Summary of Defence India Start-up Challenge-X (DISC X)

Problem Statements

S. No.	Name of Agency	Number of Problem Statements
1	Indian Army	3
2	Indian Navy	3
3	Indian Air Force	12
4	ICG	7
5	AVNL	3
6	GIL	3
7	HAL	4
8	IOL	3
9	BEL	6
10	MDL	8
11	BDL	2
12	GRSE	1
13	BEML	2
14	Defence Space Agency	2
15	BRO	4
Total		63

DISC-X Problem Statement

Problem Statement – 1 (Army)

Organization Name	**Indian Army**
Problem Statement/ Challenge title	Auto extraction of topographic features.
Challenge domain	DG MO
Challenge brief/definition	The proposal is to use AI/ ML to automatically extract manmade topographic features. It is proposed to generate a model which can extract building footprints, roads, railway lines and tracks in the first phase.
Future Expectation from the prototype / Technology developed	The AI/ML based solution to extract natural topographical features from satellite imagery will be used at Comd. & Cont. centres to ensure accurate map generation within shortest possible time span thereby ensuring faster decision making.

Problem Statement – 2 (Army)

Organization Name	**Indian Army**
Problem Statement/ Challenge title	Automatic activation device for combat free fall parachute.
Challenge domain	DG Infantry
Challenge brief/definition	This is req. to cater the eventualities when a CFF personnel is not able to deploy his main canopy or if any canopy malfunctions.
Future Expectation from the prototype / Technology developed	The AAD, being a critical component of CFF parachute system and lifesaving device will be used as safety equipment for unforeseen contingencies during combat freefall missions and training. Thus, ensuring safety and ensuring that the individual lands safely.

Problem Statement – 3 (Army)

Organization Name	**Indian Army**
Problem Statement/ Challenge title	Integrated digital cockpit.
Challenge domain	DG AC
Challenge brief/definition	Keeping recurring breakdowns and relatively inaccurate o/p given by analogue eqp. A digital Panel touch screen equipped with a warning system is needed to access all the data accurately at a glance and continuously monitor AFV's health.
Future Expectation from the prototype / Technology developed	The digital panel touchscreen equipment with a warning system will ensure data accuracy and continuous monitoring of the health of AFVs. The integrated digital cockpit will ensure timely repair without the need to search for the problem at hand thereby ensuring time critical repairs in situ.

Problem Statement – 4 (Indian Navy)

Organization Name	**Directorate of Marine Engineering**
Problem Statement/ Challenge title	Development of Laser-based Tools Techniques for Turbine (GT) to Reduction Gear (RG) and RG to Shaft Alignment.
Challenge domain	Laser-based technology for Shaft Line Alignment
Challenge brief/definition	Currently, the conventional methods (mechanical dial gauge) are being used for alignment of GT to RG and RG to shaft line on-board IN warships. This technique has a number of significant drawbacks including- • Conventional methods are tedious and time consuming which require multiple iterations and are inefficient. • During capture of readings, no concurrent work can be progressed in Engine Room. • Special tools required for carrying out alignment are nonstandard and different across all platform/ ships.
Future Expectation from the prototype / Technology developed	The laser-based GT to RG and RG to Shaft Line Alignment tools/ techniques should be able provide a universal solution to overcome the existing issues experienced while using the conventional methodology. The results will be more precise and able to capture sufficient readings to avoid multiple iterations.

Problem Statement – 5 (Indian Navy)

Organization Name	**Directorate of Staff Requirements**
Problem Statement/ Challenge title	Development of Underwater Target Structure (UTS).
Challenge domain	Underwater Target for Combat Torpedo Firings
Challenge brief/definition	Design and development of recoverable Underwater Target Structure capable of being deployed at sea by IN Ships for combat torpedo firings.
Future Expectation from the prototype / Technology developed	Development of Underwater Target Structure with following capabilities: 1. Capable of deployment upto 100 m. depth towable. 2. Recoverable. 3. Assembly/dismantling at Naval Dockyards. 4. Live feed of torpedo firings using underwater cameras. 5. Compatible with Acoustic Targets.

Problem Statement – 6 (Indian Navy)

Organization Name	**Directorate of Naval Intelligence**
Problem Statement/ Challenge title	Naval Imagery and Target Information Network (NITIN).
Challenge domain	Information Technology and Networking
Challenge brief/definition	Design and development of imaginary cum target software viz intended to carry of entire data-basing and make the authentic data available for other agencies for immediate use during hostilities breakout.
Future Expectation from the prototype / Technology developed	The two major submodules i.e. IMM (Imagery Management Module) and TAM (Target Analysis Module) should be able to upload and download heavy images (3GB), easy retrieval of data either by name, latitude/longitude, date, types, class of ships, or any other category by various agencies when they sight foreign warships and area/ vessels of interest and able to deal with the Integrated Geospatial target folders (IGTFS) and making them available for other User/ Agencies. Interface between GUI (Graphical User Interface) including GIS (Geographical Information System) and software in addition should have suitable Al engine for image recognition (as an when proven).

Problem Statement – 7 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**Indian Air Force - DGMS (Air)**
Problem Statement/ Challenge Title	Development of an indigenized Hypoxicator to provide Normobaric Hypoxia Indoctrination to the aircrew.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	The existing hypoxicator are imported. By virtue of which, they are expensive and require high maintenance. The availability of vendors and technical support is also limited for such hypoxicators. In addition, they do not conform to 'Make in India' clause. Development of an Indigenized hypoxicator would provide a safe and effective platform for Aeromedical Training in line with international Military Training. **Development-** Normobaric-hypoxia can be achieved by either of the following methods: • Air separation through semipermeable membrane. Extracting oxygen from ambient air. • Gas mixture from a single cylinder controlled by a solenoid valve and delivering different concentrations as per altitude (e.g., 8% O2 + 92% N2 to simulate 25000 ft). • Different gas mixture in separate cylinders simulating different altitudes. The air separation method is technology intensive and the integrated circuits needs to be imported whereas gas mixture is a simpler method not involving air separation. The QRs are as follows: • **Power supply:** Equipment to be compatible with Indian commercial electric supply. • **Desired Altitude Range:** From ≤ 5000 ft. upto 30000 ft. • **Duration of Operation:** The equipment should be able to function continuously up to 10h/day.

	• **One time compressor running hours without servicing:** upto 5000h. • **Number of simultaneous mask users:** One to five. • **Flow-rate:** Upto 50L Changeover from Hypoxia to Mormoxia should be within the Time of useful consciousness at that altitude. • **Noise Specification:** Less than 50 dB • **Output Pressure:** 14 to 110 psi • **Storage Humidity:** Upto 95% • **Operating Temperature:** 5 degree to 40 degree Celsius • **Mobility:** It should be feasible to move the equipment from one place to another. • **Sturdiness:** Connectors, tubing masks, mask harness and components which are prone for wear and tear should be of sturdy built. • **Installation and Demonstration:** Installation and demonstration of the equipment to be carried out at IAM IAF, Bengaluru. • **Warranty:** Onsite after sale servicing and repair of the equipment required for minimum 02 years. Comprehensive Annual Maintenance Contract for minimum 03 years. • **Training for Users:** For Medical Officers who will use equipment for training and research. • **Training for Technicians:** For technical staff to carry out daily inspection to assess serviceability of equipment and to undertake minor troubleshooting operations. Either independently or on telephonic consultation with OEM rep. • **Technical Manuals:** Provision of Technical Manuals giving out all the technical details of the equipment. • **Spare Masks:** Mask harness angles connections and consumables if any.

Problem Statement – 8 (Indian Air Force)

Details Sought	Indian Air Force - Staff Comments
Sponsoring Directorate/ Command/ Station	Dte of Ops (AD) (C & R)
Problem Statement /Challenge title (give brief Definition)	Design and Develop Pressurized Radome for Indian Airforce Radar.
Challenge Brief/ definition (Please give details of the innovation to be done by the start-up and expected deliverables at the end of the project)	These radars are already operational in IAF. In order to facilitate them operating in high altitude areas, it needs to be provisioned with Pressurized radomes.
Future expectation from the prototype/ Technology developed	Radomes to be dismountable for facilitating reassembly at a new location. The radomes must be capable of facilitating the radar to operate upto an altitude of 5 KM AMSL.

Problem Statement – 9 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**Indian Air Force - Dte of Ops Met**
Problem Statement/ Challenge Title	Al/ML based prediction of Thunderstorm and Gale force wind over an airfield.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project	Al/ML can be effectively employed to analyse and interpret the dynamics of Thunder Storm & predict the Thunder Storm and the Gale force wind over an airfield. Forecasting and nowcasting of Thunderstorm is one of the most challenging task. Nowcasting associated with the Gale force wind mostly associated with Thunderstorm has been always a daunting task. **Innovation:** A prototype Al/ML based module to be developed using data of 4-5 airfields over different regions of the country as model stations, thereby enabling coverage of entire expanse of the country. Availability of airfield data in terms of actual weather observations, statistical data (Aviation Weather Summary). LDS data, satellite Images and inputs from available DWR can be utilised for the innovation. **Deliverables:** GUI based interactive Al/ML module to predict Thunderstorm and associated Gale force wind during pre-monsoon and monsoon seasons at 4-5 Airfield/ specified location 03-06 hours in advance.
Future Expectation from Prototype/technology developed	1. Al/ML module developed is expected to predict Thunderstorm and associated gale force winds 03-06 hours in advance by ingesting real time observational data. 2. On successful development and attaining desired capability similar module can be developed for all the airfield or locations for which past data is available.

Problem Statement – 10 (Indian Air Force)

Sponsoring Dte Command/ Station	**Indian Air Force - Dte of Trg**
Problem Statement/ Challenge Title	Development of Green and Saffron dye, same as the colors of the Indian National Flag, for Sanders SCSG-5R pods used in Suryakiran (Hawk Mk.-132) Aircraft. Coloured smoke for SCSG 5R smoke pods.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	Suryakiran Aerobatic Team uses SCSG-5R smoke pods to dispense white smoke. Coloured smoke oil (within specifications of flash point, viscosity, corrosiveness and toxicity), for dispensation of Saffron and Green colour smoke needs to be manufactured.
Future Expectation from Prototype/ technology developed	For trailing smoke depicting the Indian Tricolour by Suryakiran Aerobatic Team.

Problem Statement – 11 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**Indian Air Force – Dte of PM AIR**
Problem Statement/ Challenge Title	Development of IR Identifier Patches.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	To identify friend or foe in a Sub Con environment, IR tags/ patches/ identifiers were procured in the past by few IAF agencies. The IR tags were to be identified by the on board EOIR equipment of airborne assets to confirm as friend or foe. • Although, the IR patches/ Tags/ Identifier were picked up by NVG devices, however, same could not be picked up by EOIR equipment of the aircraft during the sorties flown in base defence profile. • The specifications of the equipment were studied and it was found that the EOIR equipment carried by the aircraft can only pick up IR signatures between 3 to 5 microns and was not compatible with the wavelength of the IR patches, which radiated at 0.850 micron wavelength. • The tags available as on date offered by Indian vendors are not compatible with EOIR eqpt. • There is a requirement to develop IR identifier patches which are in 3 to 5 microns or to provide a solution to overcome the issue.
Future Expectation from Prototype/ technology developed	IR Patch/Tags/Identifier as an innovation cum development project once found suitable during practical demonstration shall be implemented all over IAF.

Problem Statement – 12 (Indian Air Force)

Sponsoring Directorate/Command/Station	**Indian Air Force - Dte of Ops (Off)**
Problem Statement /Challenge title	A starting aggregate that can supply the required electrical hydraulic and pneumatic output for slatting an Apache helicopter at altitudes upto 16000 ft.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	There is a need to develop an air transportable starting aggregate which can provide the following outputs- **Electrical:** AC: 115V, 3Amp DC: 28V, 300Amp continuous. **Hydraulic:** Fluid at 145-3480 psi with fluid utilized Mil PRF 83282 or equivalent. **Pneumatic**: Provide Air at minimum 35 psi at a supply rate of 60 pound/min. • The aggregate should be capable of providing the above mentioned outputs from sea level to a height of upto 16000 ft. • The aggregate should be modular in construction and capable of being transported by Mi-17 class of ac. • The aggregate should have the capability of operating stand alone and or with input supply from commercial electric grid (220V).
Future expectation from the prototype/ Technology developed	As per ORs mentioned above.

Problem Statement – 13 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**AIR HQ VB (OPS H)**
Problem Statement/ Challenge Title	Smoke Generators for Sarang display Team. Intermittent smoke during display sorties. The smoke generators used in Sarang Helicopter Display Team (ALH) for display sorties use the principle of burning oil along with 100 LL to produce smoke. However, due to reduced RAM air the smoke generation is inadequately dispersed at times thus reducing the visual appeal. Additionally, even after repeated colour smoke trials, the desired result is not achieved.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	• The smoke generators get regularly clogged due to unburnt oil particles and more so due to unburnt colour particles during colour smoke trials. The helicopter is flown at speeds as low as zero (hover) to max speeds of 210 Kmph. • Due to the lesser speeds the required air to disperse the smoke can only be generated by a fan installed on the smoke generator. This is quite inadequate to provide required results and the reliability of smoke generator serviceability is not guaranteed. Thus, canister type smoke generator may be explored to be utilized for display. • The major requirement is to be able to generate smoke (white as well as coloured) while undertaking display manoeuvres and aerobatics.
Future Expectation from Prototype/ technology developed	The same can be used regularly for all displays by helicopters in IAF.

Problem Statement – 14 (Indian Air Force)

Sponsoring Directorate/ Command/Station	**AIR HQ VB (OPS H)**
Problem Statement/ Challenge title	Wireless Headset for flight gunner. The current/ legacy headsets allow external noise from engine and rotors to hinder the communication between crew, thereby reducing crew SA and hampering CRM. This has connotations for flight safety, as well as the health of aircrew (possibility of hearing loss due to persistent high noise levels). Further, the MLH fleet is being used in various roles where the Flt Gnr has to go outside the cargo and assist the operations (e.g. handling underslung load, crowd control etc). While doing the same he is not able to communicate with the Capt and vice versa. Availability of wireless communication between them would greatly aid safety and efficacy of ops.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	A secure/ encrypted, ergonomic, noise cancelling, wireless (range of 50m) headset with adequate battery life and, integrated (plug and play capable) with existing ICS of MLH.
Future expectation from the prototype/Technology developed	Nil, (One-time successful development will suffice for foreseeable requirements till MLH are in service)

Problem Statement – 15 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**Directorate of Eng T(R2), Air HQ (VB)**
Problem Statement/ Challenge Title	Standalone data decoder for AWACS aircraft and aero engines.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	Processing of recorded flight data, stored on memory card of solid state recorder unit TBN-K and DFDR, is performed by means of ground processing integrated system Topaz-M using special software SKAT. The Topaz-M presently runs on Dell P37 G laptop with Windows XP and Windows-7 operating systems. However, processing the SKAT software requires a HASP key provided by the OEM. Recording and processing of engine parameters is through ASK-PKO. The ASK-PKO system is currently using different software like ASK-convert, ASK-DB, ASK-PKO & ASK-TCP running on Windows XP operating system. Porting of Topaz-M and ASK-PKO system software along with required tools and keys on additional PC/desktop computer. Development of Software tool for analyzing the engine data (Presently being carried out by OEM) and for health monitoring of airframe system and engine.
Future Expectation from Prototype/ technology developed	The standalone item will be used for extracting data/ decoding and in-depth analysis of AWACS aircraft and engine parameters independently by the operating unit thus reducing dependence on OEM. Sufficient number of these tools will enhance operational readiness of strategic asset especially for detachment tasks.

Problem Statement – 16 (Indian Air Force)

Sponsoring Dte Command/ Station	**Dte of Ops (Off) / Garud**
Problem Statement/ Challenge Title	Real Time RPA Video Feed to Garud Special Task Force. SATCOM based RPA Handheld Receiver for IAF Special Forces Garud.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project	Special Forces operate in conventional and sub-conventional operations where real time RPA/UAV feed through SATCOM link can exponentially enhance their situational awareness and therefore, the effectiveness of special operations.
Future Expectation from Prototype/ technology developed	Live feed received on the Receiver through SATCOM or V-SAT Mobile Vehicle should be compatible with NAVIC Handheld Terminal and should seamlessly integrate with its existing configuration.

Problem Statement – 17 (Indian Air Force)

Sponsoring Dte/ Command/ Station	**Dte of Ops Met**
Problem Statement/ Challenge Title	Automated cloud observation and reporting using Al/ ML. Al/ML can be effectively employed for automated cloud observation and reporting at an ALG/ Helipad/ DZ/ Airfield.
Challenge Brief/ Definition (Give details of innovation to be done by the start-up and expected deliverables at the end of the project)	Presently, clouds are reported based on visual observation. It has certain limitations due to limited view from the observation point and difference in observation skills of observers which leads to some subjectivity. At present equipment available at Met sections for the cloud measurements are Laser Range Finder (LRF) and Laser Ceilometers. These equipment observe only overhead cloud height and LRF cannot be used during precipitation. **Innovation:** • A prototype AI/ML based module integrated with camera/ imaging device to be developed for installed at 4-5 airfields over different regions of the country as model stations for real time observation and reporting of clouds (as per the cloud reporting guidelines issued by World Meteorological Office (WMO) and International Civil Aviation Organisation (ICAO) in Met observation). • The innovation is expected to scan the sky 360° and convert it in cloud observation report. **Deliverables:** • GUI based interactive AI/ML module integrated with suitable imaging device (which scans the sky 360°) for installation at 4-5 airfields over different regions of the country as model stations to observe and report cloud.

	• It may be programmed to apply correction in height of clouds, considering the angle at which equipment is scanning. • It should also have provision of integration with cloud measuring equipment like ceilometer to provide complete cloud image instead of only overhead observation.
Future Expectation from Prototype/ technology developed	• Automated cloud observation and reporting capability in integration with an equipment/camera for scanning the sky. • Provision for time period selection for automated cloud reporting (i.e. every 10 min, 30 min or 1 hr etc.). • Provisions for integration with other cloud measuring equipment like ceilometer. • If performance is found satisfactory, equipment may also be integrated with Automatic Weather Stations (AWS).

Problem Statement – 18 (Indian Air Force)

Sponsoring Directorate/ Command/Station	**Indian Air Force - DGMS (Air)**
Problem Statement/ Challenge title (give brief Definition)	Development of a full coverage, lightweight, airworthy, Anti-G suit to provide protection up to 9 Gz automatically, without straining by the pilot.
Challenge Brief/definition (Please give details of the innovation to be done by the start-up and expected deliverables at the end of the project)	The current Anti-G suits provide protection up to 6 Gz. While aircraft are capable of 9 Gz. The gap between 6-9 Gz is covered by the pilot's straining. This results in an ever present danger of G-induced loss of consciousness, wavering of attention from the task at hand, fatigue especially when several Gz is to be sustained and abandoning of a situation of advantage, in the event of a grey-out. The Anti-G Suit (AGS) will consist of a full coverage garment, covering the entire torso, legs and arms. The head and neck, hands and feet will not be enclosed in the garment. The garment will be pressurized using inflatable bladders. Developing of the AGS would entail the following- **Selection of a suitable fabric, that is:** • Breathable. • Non-stretchable. • Durable. • Non-friable. • Light weight. • Wearable. • Gentle on the skin. **Design and Development of a bladder system that is:** • Lightweight. • Correctly sized for adequate protection. • Correctly positioned for adequate protection. • A correct number for adequate protection.

	• Designed and placed so that undue heat load is not applied on the pilot. • Designed for pilot comfort. **Stitching and fitment:** • Snug fitment for adequate protection. • Adjustable fitment so as to reduce the logistic challenge. • Tear proof stitching. Integration with the existing Anti-G system of the aircraft of the IAF.
Future expectation from the prototype/ Technology developed	If the technology is successful, it would be a game changer for combat effectiveness in the IAF, providing a definite military edge over the adversary.

Problem Statement – 19 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Interconnected Wearable Safety Bands. It has proved difficult to locate sea-farers during night in an eventual case of going overboard especially during monsoon season. There is a need to electronically monitor movement of personnel on weather decks.
Challenge domain	Marine Electronics/ Safety of life at Sea
Challenge brief/definition	• Wearable Safety bands to be worn by all sea-farers which are interconnected to each other and also connected to a mother device in the ship. During sailing if a person goes overboard, the loop of connection will be broken and alarm will be generated in the mother device. • The Safety band worn by person overboard will automatically send GPS coordinates to the mother device thus helping in easier location of the person at distress.
Future Expectation from the prototype/ Technology developed	The wearable safety bands can be worn by all sea-farers during sailing and will provide additional boost in confidence for keeping lives safe at sea. The safety bands can have features like waterproofing, SOS signal projection, active GPS which can be lifesaving in case of any eventuality.

Problem Statement – 20 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Indigenisation on Vacuum Toilet System with sewage treatment plant.
Challenge domain	Environmental / Ecological requirements
Challenge brief/definition	Ships to be provided with Vacuum Toilet System for collection of sewage from WC's fitted onboard. The collected sewage is to be treated prior as per MARPOL (Annex IV requirement). ICG ships are equipped with foreign make Vacuum Toilet System. The non-operationalization of toilet system affects the habitability and in turn affects the operational availability of ships.
Future Expectation from the prototype / Technology developed	Lesser dependency on foreign firms and easier availability of spare parts.

Problem Statement – 21 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Integrated M-SAR Incident Management and Op Planning Software.
Challenge domain	Indian Search and Rescue Region (Maritime) and Indian Ocean Region
Challenge brief/definition	• ICG has been entrusted with duties of nodal agency for coordination of Maritime Search & Rescue in the ISRR as well as larger IOR/Indo-Pacific Region. The region witnesses large number of merchant traffic, fishing, small vessels and air traffic, coupled with increased frequency of cyclonic disturbances increase likelihood of threat to life/property. • Analysis, Collation, Fusion and Management of large number of merchant, fishing, small vessels aviation traffic data on single GIU and utilizing the same for SAR/maritime incident management requires integration of many databases and in-house Incident Management Software. • Besides, an Integrated Planning software with Met/Oceanic and Topographical oceanic inputs as well as maritime traffic databases would optimize the planning of search areas/search patterns, identifying SRUs, accurate and timely dispatch of Search and Rescue Services to mariners in Distress including fishermen at sea. Similar software have been developed in-house by foreign countries for Coast Guards in collaboration with IT companies such as SAROPs, SAR Master 600, BMT SARIS.
Future Expectation from the prototype / Technology developed	1. The software can be integrated with real-time inputs and AI from SRUs, On Scene Coordinators, and Surveillance Units for Real Time Management of SAR Operation. The technology would assist in realizing aims of digitization, meta-data analytics, integration of AI, UAVs and technology in saving lives.

	2. It will serve the larger obligations and commitment of India under the SAR Convention, 1979 and UNCLOS.

Problem Statement – 22 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Designing and Manufacturing of Outer loop, Inner loop and skirt segment for H 187 class of ACV.
Challenge domain	All ACVs operated by the Indian Coast Guard are of flexible skirt type with a high lift. A special flexible fibre reinforced rubber composite outer loop, inner loop and skirt segment is fitted around the hull frame and 128 rubber skirting fitted within the outer loop act together to trap the air pumped in by four centrifugal lift fans driven by diesel engines. These loops have tendency to tear off due to rough terrain on which crafts are operated. The cost of single unit of outer loop along with anti-plough diaphragm and rear inner loop is approximately 96 lakhs which is manufactured in M/s Griffon Hoverwork Ltd, UK which includes the shipping charges and custom duty. High cost and long lead time for procurement and supply of these spare not only keeps the craft non-operational but also in views loss to government.
Challenge brief/definition	Manufacturing of outer loop, inner loop and skirt segment along with anti-plough diaphragm and rear inner loop for all ACVs along with design machinery by DRDO/MSME in India will enhance the operational capabilities and will be cost effective for the Indian Coast Guard. The cost of the spare will be nominal and the lead time will considerably reduce.
Future Expectation from the prototype / Technology developed	Once the firm/vendor is finalised for manufacturing and designing the loop, its durability and operation ability can be tested on NCNC basis.

Problem Statement – 23 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Hanging underwater probe (with camera and other sensors) for ships.
Challenge domain	Maritime
Challenge brief/definition	Hanging underwater probe with camera and other sensors can aid to maritime surface platforms in many ways like, underwater search & surveillance. In terms of specification, it can be in cylindrical shape with dia. not exceeding 50 cm, equipped with camera & light, multiple sensors for depth, pressure & temperature, magnetic compass and audio frequency receiver. It should be controlled though hanging wire and able to operate upto 500 metre depth. It should have safety feature for auto resurfacing in case of lost control or any other emergency.
Future Expectation from the prototype / Technology developed	ICG Ships may use the device for multi-purposes like, underwater search for survivors/bodies, debris of aircraft/Helo, vessels and also for underwater surveillance and inspecting underwater fittings amongst others.

Problem Statement – 24 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Wireless Boarding Camera set for VBSS (Visit, Board, Search and Seizure) in Indian Coast Guard Ships.
Challenge domain	The idea is to provide the team with a wireless camera to establish a live video coverage of the vessel boarded. The prototype developed consist of the following: • Helmet mounted wide angle IP camera. • 02 Radio transmitter (Onboard and BO). • Battery Pack for power supply to camera and transmitter (Held with BO). • System Integrated with router onboard.
Challenge brief/definition	Indian Coast Guard is a maritime law enforcement (Anti-poaching /Anti-narcotics /Anti-Human trafficking ops) and Search & Rescue agency of India with jurisdiction over MZI. The surface platforms are immensely responsible for majority of the above activities and they are carried out through dedicated boarding teams. Presently, only radio sets i.e. walkie-talkie are the only source of communication (Voice) between boarding teams and mother ship. Presently, the scenario onboard the boarded vessel cannot be ascertained through any visual aids. Therefore, Provision of a live relay of the events during the course of boarding is considered to be essential. Hence, a live streaming of events are relayed through an IP camera held with Boarding officer (BO) for clear Surpic and adding on to the flawless boarding operations at sea.

Future Expectation from the prototype / Technology developed	1. The prototype may be expanded to include microphone to enable audio/video coverage. 2. The camera transmission may be integrated with ship's VDR unit to provide recording of the same which might help in future processing and collation of data. 3. Expansion of range of wireless transmission using high power transmitters. 4. Use of low weight to power ratio battery pack.

Problem Statement – 25 (Indian Coast Guard)

Organization Name	**Indian Coast Guard**
Problem Statement/ Challenge title	Virtual Reality based Fire Fighting and Damage Control training module. Fire Fighting (FF) and Damage Control (DC) proficiency is essential in the professional repertoire of ICG personnel. Exposure to realistic situations during routine training is most effective method to develop FF and DC skills and also familiarize personnel to different contingencies. However, simulating realistic fire or flooding onboard is dangerous and not permitted. Simulators are elaborate, prohibitively costly and maintenance intensive shore-based facilities. Hence such simulators cannot be installed at multiple locations. ICG units are based at different ports.
Challenge domain	Virtual Reality aided training
Challenge brief/definition	Developing Virtual Reality based FF and DC training module. The VR based training module should mimic real life fire and flooding situations authentically so that training can be conducted in safe environments without exposing equipment and personnel to any significant risk.
Future Expectation from the prototype / Technology developed	The VR based FF and DC training module can be used by ships for imparting credible training onboard in a cost effective and safe way. It can also be developed to train ICG personnel to conduct FF and DC operations onboard Merchant Vessels, Fishing Boats etc.

Problem Statement – 26 (AVNL)

Organization Name	**AVNL**
Problem Statement/ Challenge title	Design & Development of- 1. Converter. 2. Gyro Unit. 3. Frequency And Voltage Regulating Unit.
Challenge domain	Weapon stabilizer Assembly involves Hydraulic Power system controlled by High precision Electronic stabilizer system with the help of Gyro Unit (It involves complicated electro mechanical assemblies).
Challenge brief/definition	**CONVERTER ALONG WITH FREQUENCY AND VOLTAGE REGULATOR [T-90]** TECHNICAL DESCRIPTION Converter along with regulator RChN 3/3 generates the 3 phase 36V, 400Hz AC current from 27 V DC supply to power the FCS system components which work on AC current such as gyro, synchro-resolvers etc. It is an electro-mechanical type converter. Frequency and voltage regulator RChN 3/3 regulates output voltage and frequency. The voltage converter PT 800 is located below the gun cradle while the regulator unit is located on the turret base plate in front. **RATE GYRO** TECHNICAL DESCRIPTION The rate gyro unit is designed to generate electric signals proportional to the angular laying speed of the gun in elevation and azimuth, which are required for the steady operation of the weapon stabilizer and for obtaining the desired transient. Besides, the signal generated by the elevation rate gyro unit is used for the hydraulic locking of the gun when it

	rebounds from the upper or lower stop at an angular speed exceeding 7+15 deg/s and for its additional braking when it goes down at an angular speed exceeding 7+15 deg/s in order to prevent it from coming in contact with the ground. The rate gyro unit is located on the base of the gun guard.
Future Expectation from the prototype / Technology developed	T-90 tanks production. T-90, OE Tanks. T-90, OH Tanks.

Problem Statement – 27 (AVNL)

Organization Name	**AVNL**
Problem Statement/ Challenge title	Design & Development of- 1. Supply Unit (Hydraulic Booster) Assembly. 2. Actuating Cylinder.
Challenge domain	Weapon stabilizer Assembly involves Hydraulic Power system controlled by High precision Electronic stabilizer system with the help of Gyro Unit (It involves complicated electro mechanical assemblies).
Challenge brief/definition	**HYDRAULIC BOOSTER** TECHNICAL DESCRIPTION The hydraulic booster is designed to transform the electric energy in the working fluid flow energy. The hydraulic booster is located on the gun guard base. **ACTUATING CYLINDER** TECHNICAL DESCRIPTION The actuating cylinder is designed to transform the working fluid flow energy into the stabilizing or locking moment upon arrival of the respective electric signals. The body of the actuating cylinder is connected to the turret roof and its piston, to the gun cradle. The actuating cylinder is located to the left of the gun ahead of sight 1G46.
Future Expectation from the prototype / Technology developed	T-90 tanks production. T-90, OE Tanks. T-90, OH Tanks.

Problem Statement – 28 (AVNL)

Organization Name	**AVNL**
Problem Statement/ Challenge title	Design & Development of- 1. Amplidyne Assembly. 2. Electric Motor Edm-1500. 3. Pump With Drive Motor.
Challenge domain	Weapon stabilizer Assembly involves Hydraulic Power system controlled by High precision Electronic stabilizer system with the help of Gyro Unit (It involves complicated electro mechanical assemblies).
Challenge brief/definition	**AMPLIDYNE T-90 TANKS ONLY** TECHNICAL DESCRIPTION The Amplidyne is an electromechanical power amplifier designed to amplify the electric control signal (coming from K1) up to the value required for the operation of the actuating motor. The Amplidyne is composed of a drive, electric motor and special generator mounted in one and the same housing on a common shaft. The Amplidyne is located in the left part of the hull near the storage batteries. **ELECTRIC MOTOR EDM-1500 SPECIFICATIONS T-90 Tanks Only** TECHNICAL DESCRIPTION The Hydraulic Motor converts the energy of working fluid into mechanical energy of output shaft. The High Torque Hydraulic Motor consists of Hydraulic Motor and Distributor.

Future Expectation from the prototype / Technology developed	T-90 tanks production. T-90, OE Tanks. T-90, OH Tanks.

Problem Statement – 29 (GIL)

Organization Name	**GIL**
Problem Statement/ Challenge title	Design & Development of Automatic Actuation Device (AAD) For Reserve Parachute System.
Challenge domain	Defence Aerospace/Recreational and Adventure sports
Challenge brief/definition	Parachuting is used by military personnel, paratroopers, wildfire-fighters, skydivers at sporting events of skydiving or air shows and others as a vital part of their profession/ hobby. Whatever the reason for parachuting, safety is a primary concern. In addition to a primary parachute, most parachutists equip themselves with a secondary or reserve parachute. If the primary parachute malfunctions, the parachutist deploys the reserve parachute in order to land safely. AAD is a safety device which is fitted with reserve parachute and initiate automatic opening of reserve parachute in case of free fall speed exceeds a prescribed limit below specified altitude. This unit is in three parts viz control unit, processing unit and cutter. **Design requirement of AAD System-** AAD system must consists of following: • It should be capable of self-calibration. • It should be electronic battery-operated tamper-proof system with battery life of more than four years. • Weight: It should not be more than 250 gms. • It should have provision for activation at preset altitude and free fall velocity.

	• The device should have a feature for setting activation altitude if aircraft take off location and the drop zone location are at different altitudes. • The device should be rugged and robust to withstand rigours of freefall jumps. • The device should have auto switch off facility after use. • Operating range for AAD should be 1500 to 40,000 feet. • Activation altitude should be between 1500 to 3000 ft. • It should have self-testing facility. • It should have service life not less than 10 years. • It should not get affected when exposed to salt /fresh water to a depth of 05 feet for duration of at least 10-15 minutes. • It should provide convenient information monitoring such as Total number of jumps, overall free fall time, last free fall time, max speed of the last free fall, number of saves, atmospheric pressure, temperature etc. • It should be lightweight and very robust device. • It should easily adapt to use in all weather conditions. • It should have Alpha numeric display for ease of use and communication. • It should be designed to generate alerts for periodic maintenance and the maintenance due date should be accessed from the display. • Overall cost of the AAD device should be competitive to the market cost. • It should be certified by some globally recognized standard body related with parachute industry.
Future Expectation from the prototype / Technology developed	The demand for this high-quality parachuting equipment i.e. AAD is expected to grow, driven by promotion of adventure sports and recreational activities in India. Indian Armed Forces, as well as the skydiving industry

	constantly seek for reliable AAD, which creates a substantial market opportunity for this item. This equipment will be helpful reliable device for promoting safe free fall parachuting/Aero Sports culture within India.

Problem Statement – 30 (GIL)

Organization Name	**GIL**
Problem Statement/ Challenge title	Design & Development of Inter personal radio for combat free fall parachuting operation.
Challenge domain	Defence Aerospace
Challenge brief/definition	The parachutist uses Interpersonal Radio for air-to-air or air-to-ground communications. He mounts the radio so that it also does not interfere with the manual activation of the main parachute or the performance of emergency procedures. **Design requirement of Interpersonal Radio-** The radio should work in the V/UHF band and should have following features: • Small form factor to fit into the jump suit of the free faller. • Compatible with the mission computer for transfer of data between jumpers post deployment of parachute. • Have ear phone and microphone compatible with the helmet for in-flight voice communication. • Should be shock proof and water resistant upto depth of 5 feet of water. • Built in encryption card for high end secrecy requirements.
Future Expectation from the prototype / Technology developed	The demand for this high-quality combat free fall parachuting equipment i.e. Interpersonal Radio is mainly driven by requirement of Indian Armed Forces. This equipment will be helpful reliable device for promoting safe and successful combat free fall parachuting for Indian Armed Forces. Once developed same item can be customized and exported as per requirement of foreign Armed forces.

Problem Statement – 31 (GIL)

Organization Name	**GIL**
Problem Statement/ Challenge title	Design & Development of Mission Computer with Navigation System for combat free fall parachuting operation.
Challenge domain	Defence Aerospace
Challenge brief/definition	The mission computer is used to improve jumpers situational awareness about the mission progress, improves safety and increases the effectiveness of military jumper by providing accurate navigation even for most demanding mission. Mission computer includes the following: • One Pilot Unit. • One Display Screen. • One support board or harness. • One compass. **Design requirement of Mission Computer with Navigation System:** 1. System should be specifically designed for the combat free fall mission using ruggedized modules and proven sensors/software. 2. There should be facility to configure display based on jumper's experience and mission requirement. 3. Types of information display available to the jumper should be: • Jumpmaster screen to be used on the plane to check the progress of the flight towards the release point. • Navigation screen to be used under canopy to guide the jumper towards the landing zone.

	• Map display of the area below the jumper during the flight under the canopy. The mission computer with parachute navigation system should have a facility of selecting one primary target and two alternative landing targets. A push button located on the mission computer can be activated with gloves to allow the jumper to rotate through screens and landing areas. The mission computer should come with mission planner software that provides mission planning for combat free fall jumps/missions. It allows the user to select mission parameters such as payload weight, canopy, aircraft type, release altitude, speed, heading, and IP location. The Mission Planner software should automatically download the wind data and plan the mission for optimum release point. • It should be wearable, using chest harness to be used for planning and execution of the free fall jump. Facility to calculate descent rate and time to target on deployment of parachute using onboard sensors should be provided. • It should be compatible with personal radios for data transfer between multiple units during execution of the free fall jump. • In built Satellite Navigation [NavIC (Navigation with Indian Constellation)] and map features for navigation to target during day and night both should be provided. • It should be shock proof and water resistant, at least IP 66 compliment or equivalent.
Future Expectation from the prototype / Technology developed	The demand for this high-quality combat free fall parachuting equipment i.e. Mission computer with navigation system is mainly driven by requirement of Indian Armed Forces. This equipment will be helpful

	reliable device for promoting safe and successful combat free fall parachuting for Indian Armed Forces. Once developed same item can be customized and exported as per requirement of foreign Armed forces.

Problem Statement – 32 (HAL)

Organization Name	**HAL**
Problem Statement/ Challenge title	Development of UHF and L Band Ground Sectoral Antenna.
Challenge domain	Avionics and Communication
Challenge brief/definition	• Antennas should work in UHF band and L band. • The antennas gain should be not less than 10 dBi in case of UHF antenna and the gain for L band antennas should be not less than 12 dBi. • The antenna Half Power beam width in Azimuth should be not less than 90 degrees. • The antennas should be vertically polarized. • The antenna shall be designed to withstand various environmental conditions, including temperature, humidity and wind stress load as per JSSS5555 or MIL-810-F/G.
Future Expectation from the prototype / Technology developed	It is expected to achieve optimum data communication ranges from the developed antennae for the data link systems under development at HAL.

Problem Statement – 33 (HAL)

Organization Name	**HAL**
Problem Statement/ Challenge title	Development of "Four phase dual coil stepper motor with resolver (feedback)".
Challenge domain	Aero Engine fuel metering system
Challenge brief/definition	India is still dependent on countries like France, Germany and US for the supply of stepper motors for the use in fuel metering system. Currently there is no firm in India which has developed an airworthy stepper motor for the above said use. The specification and qualification requirement of the component is specified below. • **Type:** Hybrid stepper motor • **Voltage:** 28V DC(Nominal), varying from 14 to 32 V • **Constant current control:** 1 A ± 10mA • **Stepping Angle:** 0.5°/1° (Half step / Full step) • **Dynamic torque**: 15 Oz-in (1080 gm-cm) min. • **Temperature range:** -40 °C to +70 °C • **Maximum stepping rate:** 500 Steps /sec • **Medium of cooling:** Air cooling • **Number of phases:** 4 Phases (A, B, C & D) • **Resolver Supply:** 5.5 to 10 VAC, 2500± 250 Hz • **Coil type:** Dual coil type • **Winding insulation:** Class H • **No. of Phase leads:** 6 • **Phase Lead requirement:** MIL-STD; 6 pin for each channel of stepper motor and for resolver.
Future Expectation from the prototype / Technology developed	The stepper motor so developed will be used on many of the engines that are being developed at AERDC-HAL.

Problem Statement – 34 (HAL)

Organization Name	**HAL**
Problem Statement/ Challenge title	Development, Implementation, Validation of Time Sensitive Network (TSN) Operation using Ethernet Communication for Aerospace Onboard Systems.
Challenge domain	Avionics and Communication
Challenge brief/definition	To validate the Time Sensitive Network (TSN) Operation, Innovator shall develop the following using Standard Hardware Evaluation Boards available in Market: • TSN Switch having minimum of 5 Nodes. • High Resolution Camera, which provides Live Audio and Video through TSN Ethernet. • High Resolution Monitor which can accept video over TSN Ethernet. • Stereo Audio Head Set which can accept Audio over TSN Ethernet. • Standard Ethernet Ports (Minimum 2 No's) from PC or Laptop. Innovator shall Design Time Sensitive Network (TSN) Switch and TSN Nodes as per IEEE 802.1DP (Draft) Protocol. TSN Switch shall also support integration with Non-TSN Ethernet (Standard Ethernet Ports). Suitable Converters/Adapters may be used while connecting TSN Nodes to Standard Ethernet if required. All TSN Nodes and Standard Ethernet Ports shall be connected to TSN Switch.

	Innovator shall demonstrate a TSN Network Operation with the following functions: • Display of Live Video from Camera on Monitor. • Playing of Live Audio from Camera on Stereo Audio Head Set. • Recording of Audio & Video from Camera on PC/Laptop. • Playing Video from PC/Laptop on Monitor. • Playing Video from PC/Laptop on Stereo Audio Head Set. • Data Exchange between Two PCs/Laptops.
Future Expectation from the prototype / Technology developed	TSN Switch will be used to connect TSN Ethernets in Future Aircrafts and Helicopters. Therefore, Innovator shall be ready to Design and Develop (in future) a Military Standard TSN Switch (Hardware & Software) with all Certifications from Certification Agencies. Innovator shall support the implementation of TSN Node in HAL Developed Hardware Boards. Innovator shall provide support during integration of TSN Ethernets wherever Innovator's Design is involved.

Problem Statement – 35 (HAL)

Organization Name	**HAL**
Problem Statement/ Challenge title	Development of "Spark type Ignitor box and ignitors".
Challenge domain	Aero Engine Ignition system
Challenge brief/definition	Ignition unit is required for ignition of fuel air mixture in the combustor of a gas turbine engine during engine start phase. This unit consists of a low voltage high-energy ignition box, high voltage leads (2 nos.) and spark plugs (2 nos.) **Specifications-** • **Input voltage:** 12 to 32 V DC • **Maximum Input current:** 2A • **Output signals:** 3 kV • **Frequency:** 1.5 to 3.5 Hz • **No. of output:** 2 Nos. • **Energy given by the output:** 0.40 to 0.70 Joules • **Minimum spark rate:** 3.3 Hz • **Discharge:** Unidirectional • **Temperature:** - 55 to +125 °C • **Weight:** 0.5 to 0.7 kg • **High voltage cable length:** 0.5 to 0.6 m
Future Expectation from the prototype / Technology developed	HAL needs qualified units of these ignitors and ignitor boxes.

Problem Statement – 36 (IOL)

Organization Name	**IOL**
Problem Statement/ Challenge title	Indigenization/development of Active Element of Laser Made of Yttrium Alumino Garnet (YAG) Activated Neodium, GS 4X65/55-D73 (Technical Specification: TY-6-09-4622-87) for MIB (T-90).
Challenge domain	Optical Fabrication of precise and critical Infrared Optics
Challenge brief/definition	Active Element of Laser made of Yttrium Alumino Garnet (YAG) Activated Neodium, GS-4X65/55-D73 (Technical Specification: TU-6-09-4622-87) for MB (T-90) is a specific type of very precise and accurate rhombus type laser accuracy of the order of X/10 or better. Being a specific type of CW (continuous wave) laser Rod, it is being used to generate laser to guide the Missile Fired.
Future Expectation from the prototype / Technology developed	As of now the laser Rod is not being manufactured in India.

Problem Statement – 37 (IOL)

Organization Name	**IOL**
Problem Statement/ Challenge title	Development of an Eye Safe Laser Range Finder.
Challenge domain	Electro optical domain
Challenge brief/definition	Laser Range Finder is an important module used in the multi sensor electro-optical systems for measuring the range of target. This module is also used as a standalone system also. All the fire control systems are equipped with laser range finder. In this challenge it is proposed to develop an eye safe laser range finder in miniaturized form for measuring the range of target. Prototype developed in the challenge should have its inbuilt electronics and processing electronics for measuring the range of target and then displaying electronically on a screen.
Future Expectation from the prototype / Technology developed	Having a good quality, ruggedized and miniaturized Eye Safe Laser Range Finder.

Problem Statement – 38 (IOL)

Organization Name	**IOL**
Problem Statement/ Challenge title	Development of an Image Processing algorithm for image quality enhancement and Non Uniformity Calibration for bad pixel-correction for Cooled Thermal Imagers.
Challenge domain	Electro optical domain
Challenge brief/definition	Thermal Imaging technology is latest technology for night imaging. Cooled thermal imaging technology uses a photon detector which is cooled by a cryogenic cooler for better signal. Non Uniformity is natural phenomenon associated with these imagers due to the multiple pixels in Focal Plane Array. These non-uniformity in pixels causes an uneven image. In this challenge it is proposed to develop an algorithm for image quality enhancement, non-uniformity calibration and incorporation of various reticles by taking the raw data from the proximity electronics of the detector and processing this raw data in Video Processing board for good image.
Future Expectation from the prototype / Technology developed	Having a good algorithm for image processing will enhance the performance of thermal imager.

Problem Statement – 39 (BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	Read Out Integrated Circuit for Imaging Sensors (Low Light CMOS, IR Sensors etc.)
Challenge domain	Silicon Semiconductor recipe Design, Device Processing & Fabrication at 40 nm Node.
Challenge brief/definition	Si semiconductor design of the ROIC with the following specs: • **Material:** Si • **Format:** 1280 x 1024 • **Pixel Size:** 4/ 10um • **Pitch:** 4/ 10um • **ADC:** 13 /14 bits • **Modes of operation:** IWR, ITR • **Integration time:** 1 to 10 ms Variable • **Frame Rate:** 200 Hz • **Flip Chip Bond:** Indium Bumped
Future Expectation from the prototype / Technology developed	ROIC shall be flip chip bonded with a Thermal Detector or Low Light CMOS Sensor of the same format to make an FPA (Focal Plane Array) which is the sensor for imaging solutions.

Problem Statement – 40 (BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	To develop Proximity Sensor of Aerial Bomb Fuze for activating Fuze firing circuit.
Challenge domain	Proximity Sensors
Challenge brief/definition	The Proximity Sensor should function correctly when the Fuze is subjected to the following carriage envelop: • **Max Altitude:** 18 km or more • **Mach Number:** 1.5 or more • **'G' Loading:** -4g to +7.5g • **Ambient Operating temp:** -50°C to +71°C **The Proximity sensor:** • Should be mountable inside existing Aerial Bomb Fuze. • Should activate Fuze firing circuit at height of 9±3m from target at all weather conditions and terrain. • Should be immune to external RF noise. • Should have no maintenance through its entire life cycle. • Reliability ≥ 95% • Shelf Life: Minimum 15-years with the required reliability. • The Proximity sensor is to be assembled inside plastic (Noryl, GFN2) enclosure (Radome) and potted with polyurethane potting material.
Future Expectation from the prototype / Technology developed	Indigenous source.

Problem Statement – 41 (BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	To develop Proximity Sensor of Naval Artillery Fuze for activating Fuze firing circuit.
Challenge domain	Proximity Sensors
Challenge brief/definition	The Proximity Sensor shall function on proximity against fast moving high performance aerial targets and sea skimming missiles where the characteristics of the target are within the following envelope: • **Speed of the Target:** Upto 1.5 Mach. • **Minimum Attack Height:** > 5m above the peak of waves. • **Minimum Target Dia:** 0.3 metres. • **Height of Function:** 0.5m to 30m above the target. • **Range of Functioning:** 500m from muzzle to Max. Gun range. **The Proximity Sensor:** • Should be mountable inside existing Artillery Proximity Fuze cone. • Should comprise of RF antenna working on FMCW principle with characteristics of beam pattern such that the sensitivity at the front is zero and maximum at 30-50° w.r.t. fore and aft axis. • Should survive the Naval SRGM Artillery Gun firing acceleration of Up to 20,000 g and 20,000 rpm. • Should provide Sea clutter rejection. • Should be immune to external RF noise. • Should have no maintenance through its entire life cycle. • Reliability ≥ 95%

	• Shelf Life: Minimum 10-years with the required reliability. • Operating conditions of -20°C to +55°C with Humidity of +95% • The Proximity sensor is to be assembled inside plastic (Noryl, GFN2) enclosure (Radome) and potted with polyurethane potting material.
Future Expectation from the prototype / Technology developed	Indigenous source.

Problem Statement – 42 (BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	To develop Proximity Sensor of Artillery Fuzes for activating Fuze firing circuit at height of 10±6M from target.
Challenge domain	Proximity Sensors
Challenge brief/definition	**The Proximity sensor:** • Should be mountable inside existing Artillery Proximity Fuze cone. • Should be preferably based on FMCW technology. • Should activate Fuze firing circuit at height of 10±6M from target at all weather conditions and terrain. • Should survive the Artillery Gun firing acceleration of Up to 20,000 g and 20,000 rpm. • Should be immune to external RF noise. • Should have no maintenance through its entire life cycle. • Reliability ≥ 95% • Shelf Life: Minimum 15-years with the required reliability. • Operating conditions of -30°C to +55°C upto Altitude of 6000 M above MSL. • The Proximity sensor is to be assembled inside plastic (Noryl, GFN2) enclosure (Radome) and potted with polyurethane potting material.
Future Expectation from the prototype / Technology developed	Cost Reduction along with Indigenisation.

Problem Statement – 43 (BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	Si Semiconductor device for proximity Fuze.
Challenge domain	Silicon Semiconductor recipe Design, Device Processing & Fabrication at 40 nm Node
Challenge brief/definition	Si semiconductor design of the semiconductor device (Laser Diode) for proximity fuze with the following specs: • Material: Si / InGaAs. • Laser Diode. • Power: 4 Watts.
Future Expectation from the prototype / Technology developed	This Laser diode along with a receiver shall be used as a proximity fuze.

Problem Statement – 44 (BEL)

Organization Name	**BEL**
Problem Statement/ Challenge title	Technology development, to detect the bullet location in the target plane for the subsonic weapons, which has bullet/ammunition velocity less than 450 m/sec at the target.
Challenge domain	Operator Training Simulator
Challenge brief/definition	Acoustic sensor based solutions are available to detect the bullet locations, for the supersonic weapons, which has bullet/ammunition velocity 450 m/sec or more at the target. Acoustic sensors are unable to detect the shock waves generated by bullets of subsonic weapons due to low signal strength, as bullet velocity of such ammunition is less than 450 m/sec at the target. **Required technology needs to be developed to resolve the above challenge, with following key specifications:** • **Accuracy:** 5mm or less within a radius of 8 cm (from target centre) and up to 10 mm anywhere on the target at wind speed less than 1.5 m/sec. • **Detection Zone:** 80 cm left and right from the target centre and 180 cm from the target bottom. • **Max Rate of Fire:** 18 rounds/second. • Suitable for stationary target, pop-up target, turning or rotation target, as well as for moving target exercises.
Future Expectation from the prototype / Technology developed	1. The technology developed shall be integrated with Location Of Miss And Hit System (LOMAH) system, to automate the existing training methodology of weapons training at the existing firing ranges. 2. It is aimed to reduce the training duration by training more firers in a specified period of time, manpower requirement for the conduct of firing and provide immediate feedback of the hit as well as miss bullets.

Problem Statement – 45 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	Indigenization of Bearing Time Device (BTD) which is currently imported.
Challenge domain	1) Design and Development of the technology for Bearing Time Device (BTD). 2) Development of Prototype for Land Based Trials.
Challenge brief/definition	• Bearing Time device (BTD) is a 19" touchscreen and its Graphical User Interface (GUI) running at Combat/Weapon Control system and is used to display Bearing time for Combat/Weapon Control and Sonar Operators. BTD is getting plotting commands from both Combat/Weapon Control and Sonar Operators through dedicated LAN Network. • To indigenously design and develop the Bearing Time Device (BTD) for the submarines with minimum 50 % indigenized content and should be of latest manufacture, conform to the current production standard and should have 100% of the defined life at the time of delivery. • This indigenized Bearing Time Device (BTD) will be fitted on-board on successful completion of Land based trials for submarine environment.
Future Expectation from the prototype / Technology developed	The indigenized Bearing Time Device (BTD) to be used on board Indian Naval Submarines.

Problem Statement – 46 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	To develop/manufacture CATALYTIC BURNER which should be of latest manufacture, conform to the current production standard and should have 100% of the defined life at the time of delivery. May be fitted on-board on successful completion of Land based trials for submarine environment. CATALYTIC BURNER is intended to be used in Submarine.
Challenge domain	CATALYTIC BURNER
Challenge brief/definition	Catalytic burners are required in submarine to maintain desirable levels of contaminants through pollution control application. It executes oxygen generation, CO2 removal and burning of contaminants such as carbon monoxide and hydrocarbons.
Future Expectation from the prototype / Technology developed	1. Development of the product including procurement, fabrication, assembly & integration. 2. Finalization of Exploitation Documents viz Technical & Operating Instruction Manual, Maintenance Manual, Installation Testing Manual. 3. Final Acceptance and Trial Protocols.

Problem Statement – 47 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	To develop/manufacture Prototype Flare Launcher Basket with Protective Cover. The product should be of latest manufacture, conform to the current production standard and should have 100% of the defined life at the time of delivery. The product may be fitted on-board on successful completion of land based trials for submarine environment. Most diesel submarines have 3 baskets with 6 flares. In a submarine with diesel-electric propulsion, basket launches the flares outside submarine with the help of high pressure air. These Flare launcher baskets can be operated at both Surface and Snorkel conditions as per the submarine requirement.
Challenge Domain	Flare Launcher Basket With Protective Cover
Challenge brief/definition	The flare launcher baskets (FLB) are parallelepipeds, the dimensions of which are: • Width: 488 mm • Height: 652 mm • Depth: 388 mm The FLBs each weigh 68 kg when unloaded.
Future Expectation from the prototype / Technology developed	1. Design and development of the technology for Flare Launcher Basket with Protective Cover for submarines. 2. Completion and Validation of Design. 3. Development of Prototype for Land Based Trials. 4. Acceptance Test Protocols for the Flare Launcher Basket with Protective Cover for submarines. 5. Study report on retro fitment on-board conventional submarines and final delivery of the product.

Problem Statement – 48 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	Indigenisation of Noise Generators for submarines which is currently imported.
Challenge domain	To indigenously design and develop the Noise generators for the submarines with minimum 50 % indigenized content.
Challenge brief/definition	• Design and development of Internal Noise Generator System which is used to modify the acoustic signature of a submarine during entering and leaving harbour of the foreign port. • Design and development of External Acoustic Generator system which is used to validate the various Sonar sensors fitted onboard Scorpene Submarines.
Future Expectation from the prototype / Technology developed	1. Internal Noise Generator System can be used in all the submarines. 2. External Acoustic Generator system can be used as sonar test and trial tools for all the submarines.

Problem Statement – 49 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	Indigenization of Sonar Beacon for submarines which is currently imported.
Challenge domain	To indigenously design and develop the Sonar Beacon for the submarines with minimum 50 % indigenized content.
Challenge brief/definition	Design and development of Sonar Beacon System which is used to send distress signal/SOS during distress of a submarine while at Sea.
Future Expectation from the prototype / Technology developed	1. Two set of Sonar Beacon System can be used in all the submarines. 2. Sonar Beacon System to be designed in NATO frequency so that it can be used for all the submarines.

Problem Statement – 50 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	Design and Development Of Windlass, Capstan and Chain Stopper for Submarine.
Challenge domain	Towing, Mooring and Anchoring System
Challenge brief/definition	The Windlass, Capstan and Chain stopper is designed for following function: • To pull the submarine by means of synthetic ropes (mooring lines) so that submarine can be berth at one position to enable the crew to move in a safe way on the casing for work like maintenance etc. • Anchoring the submarine in a static position by means of an anchor and an anchoring line.
Future Expectation from the prototype / Technology developed	Successful completion of Land based trials for submarine environment. The system is intended to be used in Submarine.

Problem Statement – 51 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	To develop/manufacture VLF BUOYANT ANTENNA SYSTEM which should be of latest manufacture, conform to the current production standard and should have 100% of the defined life at the time of delivery. May be fitted on-board on successful completion of Land based trials for submarine environment. VLF BUOYANT ANTENNA SYSTEM is intended to be used in Submarine.
Challenge domain	Communication system (Weapon Electronics)
Challenge brief/definition	**Buoyant cable antenna for HF/VLF Reception.** • A VLF/LF/HF buoyant wire antenna system authorizes the deployment and retrieval of a buoyant wire antenna up to the surface where radio signals can be picked up whilst the submarine remains well under periscope depth. • VLF/LF/HF broadcast reception is possible only with a stable and straight course route according to a keel depth / speed ratio. The Submarine can stay still and quiet and save energy whilst remaining in communication with the shore and/or ships and aircraft at any time; but only in reception. • VLF system is used for VLF (Very Low Frequency & High frequency) reception. It consists of a towed buoyant wire antenna (diameter: 16-18 mm; length: 625-650 m), which is a single core cable terminated by an electrode and reinforced by a Kevlar structure providing towing resistance.
Future Expectation from the prototype / Technology developed	Successful completion of Land based trials for submarine environment. VLF BUOYANT ANTENNA SYSTEM is intended to be used in Submarine.

Problem Statement – 52 (MDL)

Organization Name	**MDL**
Problem Statement/ Challenge title	Indigenization of ventilation fans on submarines. • Responsible for intake of fresh air, discharge of foul air and air-circulation though out the compartments. • Indigenized version should cater to uninterrupted functioning of the entire ventilation system.
Challenge domain	To indigenously design and develop the ventilation fans for the submarines with minimum 50 % indigenized content.
Challenge brief/definition	Design and development of Ventilation fan which is used in submarines. Indigenized ventilation fan should be compliant to following specific tests concerned with the submarine environment along with other generic tests applicable: • Acoustic discretion. • Shock test. • Vibration test. • Balancing test. • Operation in specific submarine environmental conditions.
Future Expectation from the prototype / Technology developed	1. Less reliability on foreign firms. 2. No operational/performance deviation from submarine specifications. 3. Reduced dimensions. 4. Enhanced performance and monitoring system.

Problem Statement – 53 (BDL)

Organization Name	**BDL**
Problem Statement/ Challenge title	Indigenization Of Monolithic/Hybrid MWIR Jt Focal Plane Array (MWIT FPA).
Challenge domain	Format 384 x 288 pixels with variable integration time
Challenge brief/definition	• Signal integrity/fidelity/compact ROIC. • Small form factor /Power to Weight ratio. • Thermal stability. • Cooling efficiency.
Future Expectation from the prototype / Technology developed	Huge & continuous requirement in automatic target detection and recognition systems/Passive imaging systems in Missiles.

Problem Statement – 54 (BDL)

Organization Name	**BDL**
Problem Statement/ Challenge title	Indigenous development of Night Vision Goggle Compatible Display Pane.
Challenge domain	Photonics/Applied Optics
Challenge brief/definition	Integrated Night Vision Goggle compatible Display Panel consists: • Display front Panel (Mechanical) • Optical filter window • Illumination PCB with LEDs **Brief Technical specifications of Night Vision Goggle compatible Display Panel:** • **Filter substrate:** Polymethyl Methacrylate Sheet (colorless sheet), 1.7 mm thickness. • **Surface Quality (Scratch–Dig):** 80-50. • Filter windows with optical filter transmitting the source radiation between 660 nm-950 nm. • NVIS compatible ring filter for LEDs. • The illumination display (electronic displays of monochromatic) should have radiance not greater than 0.5 foot-lamberts as per MIL STD-3009. • Background of the front face of the display is to be finished with black matt lacquer to be applied over complete panel in accordance with AS7786. • Integral illumination should meet the class A Night Vision Imaging System NVIS compatible lighting requirements of MIL-L-85762 green A. • The overlay has a recessed PCB with NVS filtered filament lamp/LEDs, with flying leads for the power supply • **Input supply voltage:** 5V AC, 400Hz or 5V DC, 1A.

	• **Applicable standards:** MIL-STD-3009 , MIL-STD-810 F, MIL-L-85762, SAE AS7788,TYPE V, Class 1, NVIS Green A.
Future Expectation from the prototype / Technology developed	The prototype developed will be used in BDL's product for the current and future requirement which is recurring in nature.

Problem Statement – 55 (BEML)

Organization Name	**BEML**
Problem Statement/ Challenge title	Indigenous design and development of Obstacle Deflection and Derailment Detection device (ODD).
Challenge domain	Sensor integration to mechanical structure, fail safe and communication to TCMS
Challenge brief/definition	**Background:** Functional Requirement- • ODD shall detect obstacles of specific condition on the track. • ODD shall remove small obstacles from track. • In the case of derailment of Train, ODD shall detect the derailment. • ODD shall provide distinct signal to TCMS for obstacle and derailment detection. **Challenge:** • Using link structure, rectangle-shaped rotating pivot will pass sensing area of non-contact detecting sensors by rotating of detection bar. • Non-contact detecting sensors installed in the detecting sensor box will be activated by sensing movement of the pivot. • ODD system is working on mechanical principle. Using SIL level 2 certified fail-safe inductive sensor, reliability of system has to be ensured and system failure by malfunction of sensors is excluded. • Detection bar shall be V-shaped to remove the obstacles to the outside of track.

Future Expectation from the prototype / Technology developed	The existing and upcoming UTO (Driverless trains) projects are seeking ODD as a mandatory requirement. With BEML experience and capabilities, it is proposed to take up design and development of Obstacle deflection and derailment detection device as a R&D project.

Problem Statement – 56 (BEML)

Organization Name	**BEML**
Problem Statement/ Challenge title	Design of multi axle and multi-mode steering system for HMV 8x8 and HMV 12x12 vehicle.
Challenge domain	Vehicle Dynamics, Design steering components and CAE Simulation for performance & stability
Challenge brief/definition	**Background:** HMV 8x8 and HMV 12x12 vehicles are used for transporting large and sensitive payloads on various terrains where trailers cannot be used. Being a very long vehicle, for good manoeuvrability these kind of vehicles require multi axles steering capabilities including the rear axle steering systems with multiple models like front 2 and rear two axle steering, crab steering and all wheel steering. **Challenge:** • Preliminary design calculation to arrive at the steering geometry and kinematic design. • Determine Front and rear wheel cut angles achievable. • Ensure design meets the steering effort and dynamic performance requirements. • Determine and finalise the hydraulic circuit and electronic control circuit required for meeting the system requirements. • Carry out ADAMS, AMESim, FEA simulations based on design methodology required for design verification. • Sizing and optimising of linkage components.
Future Expectation from the prototype / Technology developed	The proto of proposed design shall be developed and engineered on the vehicle for performance monitoring and proto evaluation. After design completion and proto validation of the design, the same will be extended for BEML HMV 8x8 and 12x12 vehicles.

Problem Statement – 57 (GRSE)

Organization Name	**GRSE**
Problem Statement/ Challenge title	Heavy Duty Non-Slip Epoxy Wearing Surface For Modular Steel Bridge Decks.
Challenge domain	Wearing Coat / Anti-Skid Surface / Non-Slip Epoxy Coating
Challenge brief/definition	Application of Non-Slip Epoxy Surface on top surface of Steel Decks to achieve antiskid decks instead of chequered plate which wears-out after sometime due to cyclic loading and is very difficult to replace / maintenance of same. In view of further increase of deck life and easy maintenance of decks surface alternate solution may be proposed by vendor. **In this respect following features may be discussed with vendor:** • GRSE requires heavy performance anti-skid surface on top of the galvanized / OG painted chequered plate which is to be designed with non-slip epoxy surface using course gravel or pebble finish with epoxy glue for min 40 years life, to create positive grip system and reduce slippage on metallic surfaces against vehicle loading condition. • Epoxy to be done on top of galvanized / OG chequered plate of decks for Modular Steel Bridges before dispatch to customer site. Also, it should be feasible for maintenance at site. • Non-Slip Skid proofer High Performance Epoxy Coating as should be 100% Solids with less weight effect on bridge and Heavy Duty Non-Slip Coating should provide a very aggressive surface for applications in heavy raining / wet / slippery / ice fall areas to prevent slips from heavy vehicle.

	• Product should be used for heavy road traffic like 100 MT Truck and incorporates Epoxy Resins to provide Toughness, excellent Chemical resistance, Wear, Corrosion resistance with excellent Anti-Slip resistant performance recommended for Skid proofing vehicle road areas.
Future Expectation from the prototype / Technology developed	Technology development for Modular Steel Bridges.

Problem Statement – 58 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	Imagery data fusion for Optical and Radar data sources.
Challenge brief/definition	As a component of DISC-8 **Challenge 4: "Integration of Optical and Radar Sensors into a network with AI based Analytics"**, It is proposed to develop a multi format imagery data fusion platform along with AI analytical tool which is capable of integrating the data received from multiple optical and radar sensors into a unified data set. The AI tool will analyse this unified data set to provide reliable space situational awareness.

Problem Statement – 59 (Defence Space Agency)

Organization Name	**Defence Space Agency**
Problem Statement/ Challenge title	Geo-spatial Artificial Intelligence based Multi-Sensor (Optical/Radar) Siting Simulator.
Challenge brief/definition	As a component of DISC-8 **Challenge 4: "Integration of Optical and Radar Sensors into a network with AI based Analytics"**, a sensor Equipment Siting Simulator is proposed to be developed which uses Geo-AI tool for easy and efficient siting of optical and radar equipment in our areas of operations. This would greatly assist in faster deployment of future sensors for optimal equipment performance.

Problem Statement – 60 (BRO)

Problem Statement	Recce & Survey Drone to provide a soft strata heat map of the different sediment types and bedrock along with likely slide-prone zones to enable more accurate survey and planning of road alignments.
Challenge Domain	Drone based geological survey
Challenge Brief	BRO is involved in construction of roads on green field alignments. During initial survey in thick vegetation, it is difficult to identify the rock strata and slide-prone area. A drone based application to ascertain geological data and slide-prone areas will enable more accurate assessment of the requirement at the DPR stage.
Future Expectation from the Prototype/ Technology Developed	Drone based geological survey will become an inherent part of the DPR process and will be used extensively during selection of alignment and avoiding hard rock & slide-prone stretches to enable faster construction.

Problem Statement – 61 (BRO)

Problem Statement	Concreting in extreme low temperatures.
Challenge Domain	Road construction
Challenge Brief	Concreting is not recommended to be carried out in ambient temperatures below 10° C in order to ensure predictable concrete behaviour. In extremely cold region like Ladakh, the ambient temperature during the day are above 10° C only from Apr to Oct. Thus working season is curtailed and as a result infrastructure projects take double the time to be executed. These restrictions not only enhance the overall cost of work but also delay time bound execution of infrastructure projects in border areas.
Future Expectation from the Prototype/ Technology Developed	Undertake concreting work in sub zero temperatures.

Problem Statement – 62 (BRO)

Problem Statement	Develop a self healing/ repairing road for areas affected by heavy rainfall/ slow.
Challenge Domain	Road construction
Challenge Brief	BRO constructs roads in remote areas of the country. These provide connectivity not only to the Indian Armed Forces, but also to locals and tourists in the region. Most of these remote areas either receives heavy snow (in Northern States) or heavy rains (Eastern States). The excessive snow/ rains tend to damage the surface of the roads much earlier than their design lifecycle. Further, speedy repair of all roads at all times becomes a challenge with limited resources available on ground. Hence, there is a need to develop a material of road construction with which the roads would self heal themselves, when small cracks appear, well before they develop into pot holes.
Future Expectation from the Prototype/ Technology Developed	Undertake concreting work in sub zero temperatures.

Problem Statement – 63 (BRO)

Problem Statement	Design a route guidance and navigation system for recognition of alignment of road in valley side by leading dozers in regions with heavy snowfall and snow depth of 3 m to 4 m above roads surface.
Challenge Domain	Snow clearance on mountain passes
Challenge Brief	Difficulty in ascertaining the correct road alignment during the snow clearance operations on snow covered mountain passes with steep cross slopes.
Future Expectation from the Prototype/ Technology Developed	Technology developed should also be utilized for formation cutting on green field alignments to maintain correct gradient, cross slopes camber and super elevation using three dimensional coordinates.