



iDEX Innovations for Defence Excellence

PM Awardee

DEFENCE INNOVATION ORGANISATION
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Ministry of Defence, Government of India
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Summary of Defence India Start-up Challenge - 11
(DISC 11)
Problem Statements

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1	Indian Army	4
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Problem Statement – 1 (Indian Army)

Organization Name	Indian Army
Problem Statement/ Challenge title	Universal Fuze Hand Setter (UFH)
Challenge Domain	Accessories to Armament
Challenge brief/definition	<p>Arty Regts of Indian Army are equipped with various variants of equipment and different types of amn which require different tech inst to fire. Fuze Handsetter is one such inst which is used to set required settings for fz to fn.</p> <p>Presently two firms M/s ECIL & M/s BEL are supplying Fuze Hand Setters for 105 mm, 130mm and 155 mm fuzes. A single type make of fuze Handsetter mfr by M/s BEL can be used in all type of guns while firing BEL mfr fuzes (105mm Fd gun, 130mm/155mm gun sys). Similar is the case with M/s ECIL mfr Fuze Handsetter which can be used on all types of guns while firing ECIL mfr fuzes. However, M/s BEL mfr fuzes handsetters are not interchangeable with M/s ECIL mfr Fuze Handsetters or vice versa.</p> <p>Development of Universal Fuze Hand Setter (UFH) by various Indian firms incl M/s ECIL & BEL for all types of artillery fuzes to incl Point Detonation, Proximity & Time Based Fzs.</p>
Future Expectation from the prototype / Technology developed	Indigenisation & Import Substitution

Problem Statement – 2 (Indian Army)

Organization Name	Indian Army
Problem Statement/ Challenge title	Devp of MVI & MVR
Challenge domain	Accessories to Armament
Challenge brief/definition	The purpose of the Muzzle Velocity Radar (MVR)/ Muzzle Velocity Indicator (MVI) is to provide an accurate Muzzle Velocity (MV) reading for a projectile fired from a gun. This data is regularly reqd by the command post for improving the accuracy of the fire. Presently there is no indigenous sys held in the inventory of IA.
Future Expectation from the prototype / Technology developed	Indigenisation & import Substitution

Problem Statement – 3 (Indian Army)

Organization Name	Indian Army
Problem Statement/ Challenge title	Manually Operated Portable Desalination Plant for Army Patrols Operating in Island Territories
Challenge Domain	Survivability
Challenge brief/definition	<p>Army patrols are mandated to dominate own island territories like Andaman and Nicobar Islands, Lakshadweep islands and the coastal areas, by patrolling and setting up of temporary bases. Logistics of maintaining the troops on ground for the period of patrols (ptls) /Temporary Operating Bases (TOBs) therefore gain importance. The troops varying from 10-12 pers in a small patrol to 20-25 pers in a large patrol, have to be self- contained as there are no local resources that can be exploited. Potable water is one of the major issues which affects the endurance of such patrols/TOBs. There is abundance of sea water but potable water is almost non-existent on most of the islands and available only during rains and in very limited quantity.</p> <p>There is an urgent and important requirement of developing a manually operated, portable desalination plant that can be used by the ptls/TOBs. The development of the system will ease out the logistics in carrying water and will enhance the endurance/survival both on land and at sea.</p>
Future Expectation from the prototype / Technology developed	Miniaturisation of desalinations plant for troop comfort

Problem Statement – 4 (Indian Army)

Organization Name	Indian Army
Problem Statement/ Challenge title	Integrated (Robin) Functions & Actions Module
Challenge Domain	Machine Learning Predictions
Challenge brief/definition	<p>Modernization and Technology Infusion is a key facet of the "Year of Transformation" Initiative as enunciated by the COAS. Towards this, the use of Data inputs is emerging as the key agent for digital transformation of our legacy processes.</p> <p>The statutory role of the Corps of Military Police is derived from AA Section 107; responsible to preserve good order, discipline and to prevent breaches of the same by persons serving in or attached to the regular Army. All Military Police units maintain a desk room (Military Police Cont Room; MPCR) which is manned 24 hours and is provided with adequate stores and communications. A unit / individuals requiring any help can immediately ring up the MPCR to enable the Military Police unit to react earliest. A team of Military Police with necessary eqpt/stores is always on duty, ready to move at short notice to the site of incident/accident to render all possible help and Provost intervention as mandated in AO 6/S/2001/PM.</p>
Future Expectation from the prototype / Technology developed	Applying machine learning algorithm for enabling IA provost functioning

Problem Statement – 5 (Indian Navy)

Organization Name	Indian Navy
Problem Statement/ Challenge title	AI based - CBPM
Challenge brief/definition	Develop an AI-driven Condition-Based Predictive Maintenance (CBPM) tool by integrating performance metrics from both primary propulsion and auxiliary systems. Enhance the existing vibration data by incorporating additional pickup points as necessary, and include lubricating oil parameters from current datasets with the addition of an online lub oil analytical tool/ pickup point. Conduct an in-depth data analysis to refine and optimize maintenance strategies.

Problem Statement – 6 (Indian Navy)

Organization Name	Indian Navy
Problem Statement/ Challenge title	Online Power Quality (PQM) Modules
Challenge brief/definition	With advancement in technology, there is a need to modernize the existing DBs by incorporating customized & portable PQM modules which will constantly monitor PQ parameters and enable comprehensive critical fault protection right at the DB level (which are the Point of Common Coupling). The system will check/ monitor power quality parameters of input supply to sensitive equipment at their respective input DB using DB automated smart solutions.

Problem Statement – 7 (Indian Navy)

Organization Name	Indian Navy
Problem Statement/ Challenge title	Forecasting of defect / prediction of remaining useful life using Artificial Intelligence for critical machinery on-board naval platforms using historic defect data and real-time system parameters.
Challenge brief/definition	The module for forecasting of defect / prediction of useful life for critical machinery on-board naval platforms should be capable of using the historic defect data planned maintenance recorded in Defect and Repair Transaction (DART) table of Comprehensive Maintenance Management System (CMMS) and equipment running parameters. In addition, the software module should also be capable of utilizing the test parameters from trial agencies and reliability data from Naval Technical Group (NTG) to build a causal model with contemporary technology.

Problem Statement – 8 (Indian Navy)

Organization Name	Indian Navy
Problem Statement/ Challenge title	Hydraulic Dock Block
Challenge brief/definition	Presently, in order to undertake repairs/ maintenance of the areas under the dock blocks, the ship/ submarine has to be re-docked. While, a few dock blocks can be removed, removing of all dock blocks is not possible. As a result, there is a break in continuity of the work, which leads in prolonged refits. Therefore, development of Hydraulic Dock Block would not only preclude the necessarily of re- docking of version change, but also reduce dry dock/ refit periods.

Problem Statement – 9 (Indian Navy)

Organization Name	Indian Navy
Problem Statement/ Challenge title	'SAMVAAD.AI' – AI Based Interactive Knowledge Management Module
Challenge brief/definition	Using Artificial Intelligence (AI), particularly natural based language processing (NLP) models like ChatGPT and other large language models, as the backbone for creation of Interactive Chatbots can be a powerful way to enhance the learning experience. Accordingly, to leverage the potential of AI, INICAI is proposing the development of 'Samvaad.AI' (Interactive Knowledge Management Module) for assisting the IN personnel towards understanding and managing large knowledge database various documents and websites hosted on Naval Unified Domain (NUD) of knowledge base available with <i>IN</i> .

Problem Statement – 10 (Indian Air Force)

Organization Name	Indian Air Force
Problem Statement/ Challenge title	Drone Detection Capability based on 5G Base Stations and Receivers.
Challenge brief/definition	<p>At present IAF does not have adequate capability to use 5G base station and receivers to detect airborne objects including drones which are flying at low altitude.</p> <p><u>Innovation Required:</u> It is desired that Drone Detection Capability may be designed for low altitude drones based on 5G Low Altitude Target Detection Technology.</p>
Future Expectation from the prototype / Technology developed	The system should have capability for rapid mobility and quick deployment and should be upgradable and scalable to future advancements in technology.

Problem Statement – 11 (Indian Air Force)

Organization Name	Indian Air Force
Problem Statement/ Challenge title	BP Jackets for Aircrew
Challenge brief/definition	<p>Helicopter Pilots are regularly operating in LWE/CI Ops areas of ANTF / J&K / NE region. The present BP Jacket is though of 6.5 Kg is fluffy and bulky and it is difficult for the aircrew to wear while flying. They are also wearing a separate TAC Vest over the BP Jacket to carry their ammunition. The following are the expected deliverables while flying.</p> <p>(a) The jacket should be smart fit and can be in two parts with an inner jacket and an outer jacket. An inner jacket can be worn during flying and an outer jacket can be worn during combat survival.</p> <p>(b) The jacket should be light in weight and maximum weight should not exceed 4 Kg during flying and 8 Kg during Combat Survival with a Level 3+ Ballistic protection with a combination of HAP and SAP.</p> <p>(c) The jackets should be available in 3 sizes covering 100 percentile of Heptr aircrew population.</p> <p>(d) The jacket should cover the upper torso completely and design should not hinder mobility of aircrew while flying.</p> <p>(e) The inner jacket must have the front HAP and side SAP (Half Part) while the Outer jacket must have the rear HAP, side SAP (Other half) and all required pockets to carry ammunitions. The inner and outer jacket should get superimposed in such a way that the weight distribution</p>

is done so that a lighter jacket is available while flying and after wearing both the jackets full protection is available for Combat Survival with adequate manoeuvrability. Any additional protection can be with Velcro and easily removable. The jackets should have the facility to take out the plates when required.

(f) The position of Velcro for name tab and ring for oxygen in the inner jacket should be as that in flying overall.

(g) The jacket should have flame retarding properties so as to complement the FR overall.

(h) The BP Jacket should be able to endure multiple shots, slash and stab attacks during Combat Survival. It should be able to protect the wearer from fragments of explosion as per BIS standards.

(i) SAP should be capable of providing protection from close combat/ bullets.

(j) HAP should be capable of providing protection at ranges of 25 m from 7.62 mm X 51 mm ball ammunition of SLR, 7.62 mm X 39 mm Hard Steel Core ammunition of AK-47 and 7.62mm X 39 mm Mild Steel Core Ammunition of AK-47.

(k) Shelf Life of BP Jacket is to be minimum 10 Years.

(l) BP Jacket should be comfortable to wear in Indian Flying Conditions.

(m) The colour of BP Jacket should be as per the existing guidelines of IAF regarding flying clothing.

(n) The Bullet Proof Jacket before procurement should be

	certified by DGAQA after necessary amendments to Aeromed 94.
Future Expectation from the prototype / Technology developed	Bullet Proof Jacket has to be as light as possible while flying with reasonable ballistic protection. The jacket can be a single jacket or a two piece jacket, inner jacket to be worn while flying and an outer jacket for Combat Survival.

Problem Statement – 12 (Indian Air Force)

Organization Name	Indian Air Force
Problem Statement/ Challenge title	Development of a system for accelerated/ complete acclimatization, prior to induction into high altitude, using nitrogen enriched atmosphere.
Challenge brief/definition	<p>Given the current security situation at the Northern border, this would greatly enhance the capability of the security forces for rapid deployment.</p> <p>Challenges: At present, induction to high altitude entails multiple stops at various altitudes for acclimatization, totaling 14 days. This delays troop induction and may make a significant difference to the response to a security threat. Pre-acclimatization will improve the response of Indian security forces.</p> <p>Development: The system will consist of a nitrogen generation system, which will nitrogen enrich the atmosphere of a designated room, and provide a partial pressure of oxygen between 16.6% and 16.0% (6000 ft to 7000 ft). Safety will be maintained using a quadruple redundancy and a separate hard-wired cutout, in order to prevent a common mode failure. Development of the acclimatization system will entail the following:</p> <ul style="list-style-type: none"> • Installation of a nitrogen generation system. • Installation of a controller and sensor system with quadruple redundancy, so as to ensure safety of humans. • Installation of a separate hard-wired cutout. • Installation of two such units, one at Adampur for operational reasons and one at No 1 Aeromedical Training Centre (1 AMTC), Hindan for research purposes. • Exposure of human participants to the partial

	<p>pressure of oxygen equivalent to 6000, 6500 and 7000 ft to establish the minimum altitude that would result in acclimatization, after an exposure of 3-6 months for 8h a day.</p> <ul style="list-style-type: none"> • Assessment of the extent of acclimatization. • Development of appropriate schedules for using such a chamber for acclimatization before induction.
<p>Future Expectation from the prototype / Technology developed</p>	<p>If the technology is successful, it would be a game changer for combat effectiveness of the Indian security forces, providing a definite military edge over the adversary.</p>

Problem Statement – 13 (Indian Air Force)

Organization Name	Indian Air Force
Problem Statement/ Challenge title	Tool tracking using modern technologies like BLE
Challenge brief/definition	<p>One of the problems faced by flying unit is error-free toll accounting. In spite of various SOPs in places, the incidents related to missing tools still occur regularly. An RFID based system was introduced in the IAF but it is employed mostly for tool accounting, rather than tracking.</p> <p>It is suggested to develop a system which involves usage of technologies like BLE or any other radio technology to accurately track the tools in the working areas like hangars, tarmac etc. without interfering with air operations. The beacon should have form factor to be fitted even on the smallest tool available. The system should be able to continuously monitor the location of each tool and display the same. It should also have facility to raise alarm if a tracked tool leaves the designated electronically fenced premises.</p>
Future Expectation from the prototype / Technology developed	If found successful in tool crib management, can be employed pan IAF.

Problem Statement – 14 (Indian Air Force)

Organization Name	Indian Air Force
Problem Statement/ Challenge title	To Develop a Machine Learning Assisted Pilot Debrief and Assessment System.
Challenge brief/definition	<p>Pilot debrief is based on memory of instructor and his ability to identify mistakes. Instructor takes assistance for tools like Flight Data Recorder (FDR), video playbacks and other tools for preparation of pilot debrief. This activity is time consuming and subjective. In the existing debriefing systems, human bias and personality traits which vary from instructor to instructor may transpire leading to loss of objectivity in pilot assessment.</p> <p>An automated system to understand policies, instructions and flight manoeuvres expectation and classifications based on comparison with actual pilot ideal missions to enable rapid analysis using machine learning and preparation of personalised debrief of individual pilots is required to be developed.</p>
Future Expectation from the prototype / Technology developed	<p>To develop a machine learning assisted pilot debrief and assessment system for debrief of Pilots by using Flight Data Recorder data for increased objectivity in performance assessment, improved efficiency and effectiveness of training along with enhanced safety.</p> <p>To develop techniques of fault analysis of an aircraft mission based on predefined rules, policies and instructions.</p> <p>To generate an objective mission debrief using advanced statistical data techniques.</p> <p>To prepare an application to enable flight instructors to provide tailored and personalized training to meet the needs of individual pilots.</p>

Problem Statement – 15 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	To develop ultra-capacitor for cranking engine in extreme cold conditions (-500 C).
Challenge domain	Electrical & Electronics Technology
Challenge brief/definition	<p>With respect to sustenance of ‘A’ vehicles in High Altitude Areas (HAA), it is found that under extreme cold climatic conditions, the battery of Armoured Fighting Vehicle (AFV) does not hold charge and do not perform optimally. During extreme cold climate conditions of Eastern Ladakh, Pre Heater assembly generally takes 20-30 minutes to pre heat the engine. Due to this prolonged duration, it puts heavy strain on batteries, in majority instances batteries are not capable to withstand for this duration.</p> <p>Ultra capacitors are primarily intended for backing up electronic system during Voltage dips of duration. While starting of engine in harsh weather conditions (under sub-zero temperature), Ultra Capacitors can provide desirable/ optimum solution.</p> <p>The 24V storage batteries are connected parallely in the tank in AFV, the 12V storage lead acid batteries are connected in series and parallel in pairs. During starting the engine by the starter, the storage batteries are changeover to voltage of 48V by starter generator relay. To develop robust Ultra Capacitor to be fitted inside the tank to charge the above batteries without effecting the functioning and positioning of existing system fitted in the tank.</p>

**Future Expectation
from the
prototype /
Technology
developed**

High Mean Time Between Failures (MTBF) and low Mean Time Taken to Repair(MTTR). Connector Shall be MIL/LCSO qualified, circular, and with protective cover. All electrical and electronic system/ sub-system/assemblies of the system shall comply with JSS:55555, revision No.2 (class L2J), EMI/EMC, etc. as applicable.

Other components shall be of Military-Grade Standards (MIL-STD) to ensure the reliability and ruggedness of the components.

Problem Statement – 16 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	Anti-Drone system for armoured vehicle - a solution to integrate with the existing platforms such as T-72, T-90 BMP & Arjun Tanks to detect RF transmission from enemy drones without altering.
Challenge domain	Electronics and communication Engineering/Technology
Challenge brief/definition	To develop anti-drone system that can detect, identify / classify, track and neutralization of the threat through jamming/disruption of various drones. The minimum Range shall be 5 Kms. The system shall be able to integrate on the battle tanks like T-90, T-72, etc.
Future Expectation from the prototype / Technology developed	Prototype should be rugged, made up of latest MIL grade Standards, test as per JSS:55555, and comply to EMI/ EMC evaluations.

Problem Statement – 17 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	Starter-Generator CF-18-1C for T-90 Tanks
Challenge brief/definition	<p>Starter-Generator CF-18-1C is a DC electric machine used to start T-90 Tanks and functions as Generator as well. The starter-generator is parallel-excited when it runs as a generator and develops 18KW electrical power and compound-excited when it runs as a starter.</p> <p>Technical Description:</p> <p>Power : 18 KW Motor RPM : 3500 – 6500 rpm Generator : 28.5 V Used on : Hull Electricals of T-90 Tanks</p>

Problem Statement – 18 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	Starter-Generator CF-10-1C for T-72 Tanks
Challenge brief/definition	<p>Starter-Generator CF-10-1C is a DC electric machine used to start T-72 Tanks and functions as Generator as well. The starter-generator is parallel-excited when it runs as a generator and develops 10KW electrical power and compound-excited when it runs as a starter.</p> <p>Technical Description:</p> <p>Power : 10 KW Motor RPM : 3500 – 5750 rpm Generator : 28.5 V Used on : Hull Electricals of T-72 Tanks</p>

Problem Statement – 19 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	Design and Development of Synchro Resolver of Specification “Rotary Conveyor 2.5BT 0.1” which is being used in Hatch door position sending unit. Reduction Gear Unit assembly of code-94, of T-90 Tank.
Challenge domain	Armoured Vehicle / T-90 Tank Technology
Challenge brief/definition	<p>Synchro Resolver is used in Hatch Door Position Sending Unit Reduction Gear Units of Code-94 Assembly of T-90 Tank. It will synchronise the precise movement of Turret Rotation unit with the cabin position of the commander.</p> <p>MTPF is manufacturing Hatch door position sending unit reduction gear Assembly of T-90 Tank by using imported Synchro Resolve 2.5 BT/0.1/nw.3.010.399. Due to the on-going Russia - Ukraine conflict, there are extreme delays in the import of Synchro Resolver / Rotary Transformer.</p> <p>Hence, production of Hatch door position sending Unit reduction gear Assembly is hampering.</p> <p>Technical Specification is as below:</p> <ul style="list-style-type: none"> • Nominal Excitation Voltage: 27V. • Operating Voltage Range above: 0 to 27V. • Nominal Frequency of excitation Voltage: 400 Hz. • Input impedance at no-load: 1600 Ohms. • Nominal ratio of conversion: 1.00 ± 0.05. • Transformation sine dependence error % should not exceed ± 0.1. • Axial Clearance of Rotor at alternate load 0.75-0.80 Kgf, applicable to shaft end 0.002 – 0.012 mm. • Radial run out of shaft taper end should not exceed 0.012 mm (during rotation in combination with Bearings).

	<ul style="list-style-type: none"> • Torque of tightening screws M1.6 should not exceed 0.012 N.M (0.25 Kgf cm). • Misalignment of transformer shaft coupling with drive should not exceed 0.01 mm. • Mass 0.105 Kg. (Synchro Resolver) & with coupling Assembly 0.127 kg.
<p>Future Expectation from the prototype / Technology developed</p>	<p>T-90 Tank is being continuously manufactured hence demand will be existing in the future.</p>

Problem Statement – 20 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	To develop Reserve Battery 18V
Challenge domain	To develop reserve battery of smaller size is challenging.
Challenge brief/definition	To develop reserve battery indigenously having parameters of nominal voltage 18V, Current 15mA, Operating Time: 12 sec. and of Size: dia 16.4x8.8 mm ht. Weight: 3.6 gm. Activation time: less than 200 ms. and shelf Life of the battery should be 15-20 Yrs.
Future Expectation from the prototype / Technology developed	If developed, can be useful for Production of Electronic Fuze.

Problem Statement – 21 (AVNL)

Organization Name	Armoured Vehicles Nigam Limited
Problem Statement/ Challenge title	To develop a Reserve Battery 36V
Challenge domain	To develop reserve battery of smaller size is challenging.
Challenge brief/definition	To develop Reserve Battery indigenously having parameters of nominal voltage 36V, Current 100mA, Operating Time: 190 sec. and of size: dia 32x23 mm ht. Activation time: less than 250 ms. Life of the battery should be 15-20 Yrs.
Future Expectation from the prototype / Technology developed	If developed, can be useful for Production of Electronic Fuze.

Problem Statement – 22 (HSL)

Organization Name	Hindustan Shipyard Limited
Problem Statement/ Challenge title	Class approved Polymer bearing for use in Ship building
Challenge domain	Water Lubricated Polymer bearing for propulsion shafting.
Challenge brief/definition	<p>Research in Hydro-Dynamic Lubrication efficiency of a ships propeller shaft bearing has found that the use of seawater-lubricated elastomeric polymer bearings reduces fuel consumption and enhances inter docking inspection intervals.</p> <p>The “Polymer Bearing” suitable for sea water cooled shaft lines must be able to withstand shock loading and vibration. Bearing should be capable to absorb impact loads making it much more resistant to damage from pounding during operation in heavy seas than stiffer materials such as phenolic laminates. The bearing is to be developed with non-ferrous aluminum bronze liner and assembly ready to fit on A-Bracket, Middle Bracket, Fwd & Stern Tube Brackets. It can also be fitted on Fin stabilizers and Steering Rudder.</p> <p>The bearing must be physically restrained against axial movement – this is typically by internal shoulder and retaining ring.</p> <p>Type Testing of Polymer bearing by any IACS Class.</p> <p>The indicative standards and QAP for the Polymer bearing to be submitted. Relevant standards applicable for the bearing to be followed.</p> <p>Presently the stern tube shaft bearing is being imported. Development of this technology will enable Indian Naval</p>

	ships to be self-reliant.
Future Expectation from the prototype / Technology developed	There is a huge potential for seawater-lubricated elastomeric polymer bearings. This is a dual use technology for both defence and commercial applications such as shore based power generation plants