



Confederation of Indian Industry



SIDM
SOCIETY OF INDIAN DEFENCE MANUFACTURERS

DIRECTORATE GENERAL OF PERSPECTIVE PLANNING

ARMY DESIGN BUREAU



CONNECTING CAPABILITIES

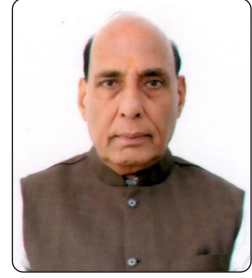
COMPENDIUM PROBLEM DEFINITION STATEMENTS 2020



राजनाथ सिंह
RAJNATH SINGH



रक्षा मंत्री
भारत
DEFENCE MINISTER
INDIA



MESSAGE

Technology has assumed a significant role in warfare and is today a major battle winning factor. This presents new challenges and opportunities which require flexible, creative and innovative mindsets. Technology driven war machines of tomorrow will be a decisive arbiter in future wars.

The Indian mind has always been at the forefront of developing world class technologies, as is evident from the large number of Indians figuring prominently in the hierarchy of some of the leading technology companies of the world. It is critical, therefore, that similar avenues are created to harvest the vast pool of Indian talent for indigenous development of cutting edge defence technologies. Accordingly, Government of India has placed the Defence Sector at the core of its flagship programme, 'Make in India'.

It is extremely encouraging to note that the Indian Army has been reaching out through the Compendium of Problem Definition Statements. The response to previous compendiums has been extremely heartening, setting in motion a unique process through which many young Indian minds are increasingly associating with the creation of defence technologies in India.

I am delighted to launch the fifth edition of the Compendium of Problem Definition Statements, which for the first time, is a comprehensive and overarching document.

I wish the Indian Army all the very best in its future endeavours.

'Jai Hind'

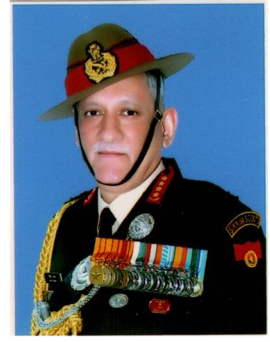
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(Rajnath Singh)

New Delhi
11th Dec 2019



MESSAGE



The 21st Century has seen a paradigm shift in warfare through rapidly evolving, dual-use, state of the art technologies. With advancements in the field of niche technologies, warfare is transiting to the Non-Contact domain, wherein technological ascendancy will be a critical factor in defining outcomes. Emerging technologies are also spawning entirely new concepts of war fighting.

The Indian Army is focused on harvesting indigenous technologies with a view to providing our Jawans with world class, cutting edge equipment. The Army Design Bureau (ADB), has in the last couple of years, catalysed innovations and created institutionalised mechanisms to mentor and hand-hold Academia and Industry to facilitate such endeavours.

The Fifth Volume of the Compendium of Problem Definition Statements, is a comprehensive compilation shaped by accumulated experience and wide interaction with all stakeholders.

We are sanguine that this document will become a useful reference point for initiating developing projects and enabling focused Research, Development and Production initiatives in the spirit of 'Make in India – Defence'.

'Jai Hind'

(Bipin Rawat)
General

डा. अजय कुमार
रक्षा सचिव
Dr. Ajay Kumar
Defence Secretary



भारत सरकार
रक्षा मंत्रालय
Government of India
Ministry of Defence



MESSAGE

The Ministry of Defence (MoD) supports Armed Forces in maintaining the battle-winning edge over our adversaries. In the present era of niche technological developments, strategic-military competition is increasingly being expressed through the medium of technology. Equally, as warfare turns mutli-domain in character, maintaining a technological advantage across key capability areas will be critical.

Our Government is continuously pursuing initiatives to achieve higher levels of indigenisation and self-reliance, by leveraging the capabilities of the Research & Development Establishments, Industry, Start-ups and Academia. The Army Design Bureau has been in the forefront in synergising the efforts of all stakeholders and nurturing home-grown technologies.

The publication of the fifth volume of the **Compendium of Problem Definition Statements** will be of great value to research and development establishments, industry, start-ups and academia in working towards developing 'Indian Solutions for Indian Needs'.

I am confident that the synergised efforts of both, 'the User and the Provider' will go a long way in enhancing self-reliance in the defence sector.

"Jai Hind"

(Ajay Kumar)

New Delhi,
December 12, 2019

DCOAS (P&S)



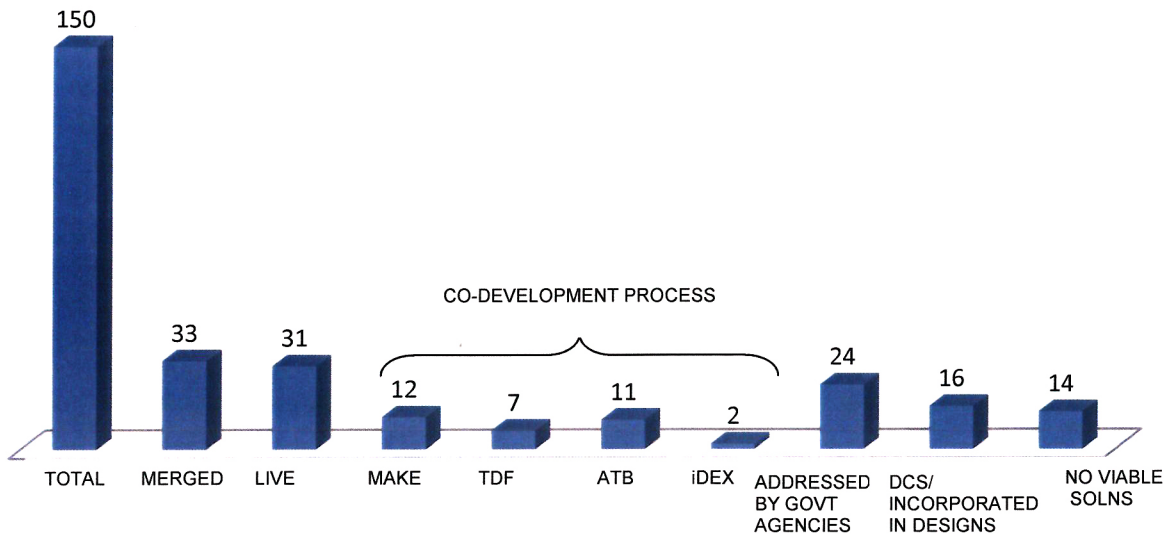
MESSAGE

The Army Design Bureau has successfully created a very effective interface with the academia and the defence industry. Army Design Bureau through the ARTECH seminar, a centrepiece event of the Indian Army, sets the agenda for all stakeholders to synergize their efforts and develop our capacities in defence technologies and equipment.

The Compendium of Problem Definition Statements, which has become synonymous to ARTECH seminar, is an initiative to seek tailor made solutions to our felt requirements. The response to the Problem Definition Statements in the past from both the academia and the industry has been overwhelming. It has facilitated the Indian Army in associating with young, vibrant and brilliant minds.

Out of a total of **150** Problems Definition Statements put out to seek solutions in the previous four compendiums, responses with viable solutions were received for **136** of them. **33** Problem Definition Statements have been merged taking into consideration the commonality of underlying technology effectively leaving us with a balance of **117** Problem Definition Statements. Of these, **32** Problem Definition Statements are being progressed under the co-development process via the Make-II/ TDF/ ATB/ iDEX route. Another **40** have been or are in the process of being taken into production as systems/ sub systems by

agencies such as DRDO, DOI etc or being fully mature products, these are being pursued through the Direct Commercial Sales route.



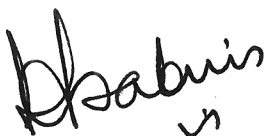
STATUS UPDATE ON EXISTING PROBLEM DEFINITION STATEMENTS
(COMPENDIUM NUMBER 1 TO 4)

This fifth edition of Problem Definition Statements is a comprehensive cumulative document which subsumes all previously unaddressed Problem Statements that are being pursued. It supersedes all the previous editions with an aim to bring in the relevance of time and focus. We now put across a total of **46** Problem Definitions for which solutions are sought. We look forward to a vibrant and stimulating engagement on these.

I am sanguine that the collective effort of key players will help us in fully realising our goal of self-reliance.

'Jai Hind'

New Delhi
 19 Dec 2019


 (SS Hasabnis)
 Lieutenant General



Message

As the Indian industry steadily moves towards capability and capacity building to indigenise Defence Sector, Ministry of Defence (MoD) has taken series of path breaking policy initiatives in the form of multiple waves of Business Process Restructuring towards ease of doing business in Defence. Several policy reforms have been undertaken to facilitate domestic manufacturing, foster faster absorption of technology and attract long term investment in defence manufacturing and ease exports. These amendments have already been incorporated in the Defence Procurement Procedures (DPP) 2016, and more are underway as the Ministry of Defence is midst of reviewing the Defence Procurement Procedure and the Defence Procurement Manual to ensure seamless flow from Capital Acquisition to Through life cycle support. The announcement of the Chief of Defence Staff (CDS) by the Hon'ble Prime Minister further reinstates the Government's commitment to bring in major reforms in this strategic sector and jointmanship among our Armed Forces.

It is said that Recognising, Accepting, Defining and Sharing Problems is more than half way to finding solutions. The Indian Army leadership can to be particularly complimented for boldly adopting this path to find indigenous solutions to the problems faced and formulating a 5th compendium of Problems. Army Design Bureau was created to provide an institutionalized interface towards building synergy between Start-ups, Incubators, R&D Organisations, Academia, Industry and the Indian Army to address unique problems faced by our front-line forces. The compilation of the 'Problem Definition Statements 2020' by the Indian Army is a continuing step towards capacity & capability building through indigenous solutions.

On behalf of Society of Indian Defence Manufacturers (SIDM), I compliment the Indian Army leadership for continued faith in exploring and adopting Indigenous Solutions to Problems faced towards way ahead to "Win Indian Wars with Indian Solutions".

'Jai Hind'

Jayant D Patil
President, SIDM



Confederation of Indian Industry



Message

Harnessing technology is crucial to achieve self-reliance and Indigenization. India's dependence on import content is relatively high compared with other leading economies in the world. Lack of ability to innovate, harness contemporary technology in design and development of new weapon systems, and remain ahead of the "technology curve" to give a capability edge to our Armed Forces makes the Services to source equipment and platforms from foreign sources.

As a part of the 'Make in India' programme, the Indian Army took the initiative to seek solutions from the Indian Industry to solve their operational and logistical problems. This initiative has paved the way for creation of a robust defence manufacturing ecosystem in the country and promote the entire spectrum of large, medium & small industries and provide unique and dynamic solutions to the rapidly evolving paradigm of our national security and defence readiness.

The compilation of the 'Problem Definition Statements 2020' by the Indian Army is a commendable effort to share its requirements with the Start-ups, Incubators, R&D Organisations, Academia and Industry for creating indigenous solutions.

On behalf of the Indian Industry, I would like to compliment the Indian Army for continuing in this pursuit of innovation and indigenisation.

Chandrajit Banerjee
Director General, CII

STATUS UPDATE : PROBLEM DEFINITION STATEMENTS

PS No	Statement	Remarks			
1	Identification of Friend or Foe (IFF) System for Armoured Fighting Vehicles	Scope being addressed as an iDEX challenge . Responses awaited. Problem Statement is live and included as New Problem Statement Number 7. http://idex.gov.in			
2	Buoyancy Enhancers for Tracked Vehicles	Based on responses received it was apparent that solution requires basic design changes. The feature has been incorporated in the future ICV design. Problem Statement is no longer being pursued.			
3	Solar Assisted Auxiliary Power Unit for Armoured Fighting Vehicles	Multiple solutions received. Has been successfully converted into an acquisition scheme under Make II. AoN granted for procurement of quantity 3257 Auxiliary Power Unit . https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/APU.pdf			
4	Body Armour	Based on multiple responses received, the Problem Statement is being successfully pursued as an acquisition scheme for Individual Protection System under Make II. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1			
5	Situational Awareness	Solutions received were analysed and the case is being funded for development as an Army Technology Board Project.			
6	Night Vision Device	All solutions received were for mature products to be procured through Direct Commercial Sales. Acquisition schemes are being launched accordingly.			
7	Foliage Penetration Radar Technical Integration with Night Vision / Surveillance Devices	Problem Statement is being pursued and included as New Problem Statement Number 8.			
8	Mobility of Guns in Mountains	Aspects of mobility have been incorporated in SQRs. Problem Statement is closed.			
9	Dispersion of Artillery Shells	Multiple solutions received. Indigenous Course Correction Fuze being pursued under TDF, prototype under development. https://drdo.gov.in			
10	Light Weight Alloy for Bridges in Field	Merged with Problem Statement Number 65.			
11	Camouflage in Field : The Invisible Man	Merged with Problem Statement Number 57. http://idex.gov.in			
12	Fuel Air Explosives for Minefield Breaching	Problem Statement is being pursued and included as New Problem Statement Number 1.			
Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions

PS No	Statement	Remarks			
13	Light Weight Material Permanent Defences	Merged with Problem Statement Number 128.			
14	High Assurance Testing for Hardware	Solutions under consideration and included as New Problem Statement Number 35.			
15	All- in - One Mobile Communication Handsets	Solutions under consideration and included as New Problem Statement Number 20.			
16	Long Term Evolution (LTE) : Air Interface Vulnerabilities	Problem Statement merged with Problem Statement Number 62. Solutions are being pursued as Make II Project. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/VUHF_SDR.pdf https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/Man_pack_HF_SDR.pdf			
17	Secure Communications for (COTS) Equipment / IT Equipment / Tele-Communication Equipment	Suo Moto proposals under consideration and included as New Problem Statement Number 21.			
18	Software Defined Radio (SDR) In Mobile Adhoc Network (MANET) Environment	Problem Statement merged with Problem Statement Number 62. Solutions are being pursued as Make II Project. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/VUHF_SDR.pdf https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/Man_pack_HF_SDR.pdf			
19	Software Based Encryption	Problem Statement merged with Problem Statement Number 62. Solutions are being pursued as Make II Project. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/VUHF_SDR.pdf https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/Man_pack_HF_SDR.pdf			
20	Indigenous Hardened Operating System	Solution received from C-DAC. Trial evaluation of Bharat Operating Software System (BOSS) underway in select Formations. DRDO rolling out Anurag WINDOWS & Anurag LINUX.			
21	Estimation of Trajectory of Ballistic Missiles	Based on solutions received, this aspect has been included in scope of Project AAD. Problem Statement no more being pursued in a stand alone mode.			
Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions

PS No	Statement	Remarks
22	Compact And Ruggedized Power Supply	Merged with Problem Statement Number 126 due to common technology and solution. Solutions are being pursued as Make II Project. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
23	Beam Steering for Lasers	Problem Statement is being pursued and included as New Problem Statement Number 22.
24	Metallurgy for Helicopter Main Gear Box	Dealt with by HAL being design and development agency for ALH series in collaboration with the industry. All solutions received forwarded to HAL.
25	Magnetic Mapping of Advance Light Helicopter	Dealt with by HAL being design and development agency for ALH series in collaboration with the industry. All solutions received forwarded to HAL.
26	Satellite Based Tracking System	Suo-Moto received from one academic institution was found promising and has been forwarded to OEM as solution requires integration at OEM level. Being pursued by IA with HAL.
27	Obstacle Avoidance System (Wire Strike Protection System)	Dealt with by HAL being design and development agency in collaboration with the industry. All solutions received forwarded to HAL.
28	Mobile Aviation Support Vehicle	No viable solutions received. Problem Statement no more live.
29	Night Vision Device for Aircrew	Programme launched through Make II . Successful acquisition program in progress. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
30	Weather Radar	Solutions not workable due to operational constraints. Problem Statement not being pursued.
31	Microwave Landing System	Being successfully worked upon by LASTEC Laboratory of DRDO.
32	Load Carrying Robots	Being merged due to commonality of technology and solution with Problem Statement Number 117. https://drdo.gov.in
33	High Calorific Value Food	Solutions received for commercially available products. Same has been placed on GeM Portal and being regularly procured. Problem Statement no more live.
34	Wound Healing Fabric	Solutions received for commercially available products. Same has been placed on GeM Portal and promulgated in our system for local level procurement. Problem Statement no more live.
35	Modular Generators for High Altitude	Merged with Problem Statement Number 126 due to common technology and solution. Solutions are being pursued as Make II Project. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
36	Cold Climate Clothing	Merged with Problem Statement Number 122.
37	All Terrain Ground Vehicle	Merged with Problem Statement number 119.
38	Unattended Surveillance Camera	Robotic Surveillance Platform being progressed as an acquisition program under Make II. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/20191105_155637.pdf
39	Location Awareness System	Merged with Problem Statement Number 67.
40	Vehicle Log System for Maintenance and Accounting of Military Vehicles	Merged with Problem Statement Number 49 and being pursued as a TDF project. https://drdo.gov.in
41	Military Grade Power Bank	Merged with Problem Statement Number 126 due to common technology and solution. Being pursued as an active Make II Project. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
42	Power Banks for Communication Equipment	Merged with Problem Statement Number 126 due to common technology and solution. Being pursued as an active Make II Project. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
43	Ultra Light Recovery Vehicle	Based on solutions received, Ultra Light Recovery Vehicle for HAA has been developed through Army Technology Funds. Equipment is realised and currently under field evaluation.
44	Development of Snow Mobiles for Glaciated and Snow Bound Terrain	Two snow mobiles given to IIT Gandhinagar and 506 Army Base Workshop to examine the indigenisation of technology. Both institutes have successfully created designs for building prototypes. These are being evaluated and development activity being initiated.
45	Integrated Navigation Device	Multiple solutions exist as commercially available products (COTS). Problem Statement no more live.
46	Acclimatization for High Altitude Deployment	Solutions under consideration and included as New Problem Statement Number 36.
47	Smart Vest for Identification of Friend or Foe (IFF)	Merged with Problem Statement Number 1. http://idex.gov.in
48	Sniper Scope	Operational necessity no more exists as better technology options have emerged. Problem Statement no more live.

Live	Merged	ATB, TDF, Make-II & IDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
49	Automated Equipment Health Monitoring System (AEHMS) for Equipment and Vehicles	Pilot project launched through TDF for Tank T-72. Responses sought on TDF website. https://drdo.gov.in
50	Fuel, Oil and Lubricants (FOL) Storage in Operational Conditions	Merged with Problem Statement Number 77.
51	De-Rating of Engine at High Altitude Areas	1200-1500 HP Engine for T-90 Tanks being pursued as an acquisition scheme under Make II. https://www.makeinindia defence.gov.in/projects/projectlist/2/2
52	Improving Cooling Efficiency of T-90 Radiator	Solutions received have been forwarded to HVF, Avadi being the OEM and are being progressed by them.
53	Pre-Heater for Bridge Laying Tank T-72	No feasible solutions received. Problem Statement no more live.
54	Thermal Imager Detector Technology	Merged with Problem Statement Number 94.
55	Sensor Threat Warning Systems	Merged with Problem Statement Number 79. Launched as a Make II Project. https://www.makeinindia defence.gov.in/admin/writereaddata/upload/project/project_file/20191105_155704.pdf
56	Loss of Orientation	Multiple solutions received. iDEX Challenge on 'See Through Armour' very successfully addresses the issue. Three innovators funded to progress the innovations. http://idex.gov.in
57	Camouflage in Field: Armoured Fighting Vehicles (AFVs)	Scope being addressed through iDEX challenge on Stealth Camouflage for Infantry Soldier. http://idex.gov.in
58	Oil Leakage from Cylindrical Mast of 17 Meter Mobile Mast	Product specific solution being addressed by HVF Avadi. All solutions received were forwarded to the OEM.
59	Dead Zone Surveillance System	No solutions received. Problem Statement not being pursued.
60	Integrated Command Post Vehicle	Prototype developed by DRDO.
61	High Power Microwave Radiation System	Being worked upon by DRDO.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
62	Air- Ground Communication between Army Aviation Helicopters with Ground Troops and Enhanced Battle Field Transparency	Enough resonance and development in both civil and DRDO. SDR being pursued through Make II as well as DRDO. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/VUHF_SDR.pdf https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/Man_pack_HF_SDR.pdf
63	Power Management in High Altitude Areas in Sub Zero Temperature	Merged with Problem Statement Number 126 due to common technology and solution. Being pursued as a Make II Project. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
64	Sewage Disposal in High Altitude Regions	Multiple solutions received. Sewage Disposal at HAA has been sanctioned as a Research Project to IIT Gandhinagar by the Army Technology Board.
65	Bridging Challenges in Mountains and Improvised Equipments	Mountain Foot Bridge being progressed by DRDO in conjunction with private industry. Problem Statement successfully addressed.
66	Water Mobility Equipment in Creeks	Merged with Problem Statement Number 119.
67	Combat Zone Tracking System	AI based Command & Control System is being progressed as Army Technology Board Project to address the issue.
68	Emergency Training Simulator for Static Line Jump	Being progressed under Paragraph 27 of Chapter II of DPP-16 as an acquisition programme.
69	Virtual Reality Based Training Simulator for Room Intervention/ Urban Warfare	Being progressed under Paragraph 27 of Chapter II of DPP-16 as an acquisition programme.
70	Reduced Life of Hand Held Thermal Imager Battery	Merged with Problem Statement Number 126 due to common technology and solution. Being pursued as an acquisition scheme under Make II. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
71	Remotely Operated System for Inservice Weapons and Vehicles	No viable solutions received. Problem Statement no more live.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
72	Design and Development of Aerial Surveillance Platform Hexacopter / Quadcopter, Seeker and Shooter Combat Management System	Large solutions received from innovators . Multiple products exist in market and are being harnessed through acquisition programmes.
73	Long Range Optical Target Locator	Solutions under consideration and included as New Problem Statement Number 9.
74	Man Portable Radio Relay Frequency Equipment	Solutions received. Acquisition programme under Make II being progressed. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/Brief_MINT.pdf
75	Electronic Warfare System Working on Star Topology	Solutions received indicate high degree of maturity of technology in this field. Consequently, acquisition programmes for various EW systems being progressed.
76	Containerised Logistics Shelters	Operational requirement being addressed through alternate means. Solutions received are being incorporated in future programmes. Problem Statement no more live.
77	Fuel Oil Lubricants Storage in Operational Conditions	Solutions under evaluation and included as New Problem Statement Number 37.
78	Non-Skid Chain Accessories for Tyre Size 12.00 X 20	Chains/ fabric/ net based multiple solutions received. Demonstrations held. Based on evaluation, solutions forwarded to DoI.
79	Passive Protection System for Armoured Fighting Vehicles	AFV Protection and Counter Measure System being pursued as acquisition programme under Make II. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/20191105_155704.pdf
80	Inert Training Ammunition for Mechanised Forces	Being developed by DRDO.
81	Procurement of New Glow System for Bofors 155 mm Field Howitzer	Minor design issue, referred to OEM alongwith solutions received. Being incorporated in future production. Problem Statement no more live.
82	Development of Titanium Based Light Weight 120 mm Mortar	Solutions under consideration and included as New Problem Statement Number 2.

Live	Merged	ATB, TDF, Make-II & IDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
83	Range of Smart Munitions, Fuzes and Mines	Number of programmes launched through various routes. Terminally Guided Munitions being developed, Excalibur inducted. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1 https://drdo.gov.in
84	Programmable, Pre-Fragmented, Proximity (3P) Ammunition for 40 mm L/70 Gun	Pre Fragmented Programmable Proximity Fuzed Ammunition under Make II acquisition scheme being processed. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
85	Wheeled or Self Propelled System for ZU Gun	Acquisition scheme has since progressed. Problem Statement no more live.
86	Installation of IRNSS (NAVIK) Based GPS System in A & B Vehicles	Technology received from vendors. IRNSS Receiver Sets being developed by ISRO/ DRDO. Problem Statement no more live.
87	Surveillance of Passes through Helikite/ Mini Aerostats	Solutions under consideration and included as New Problem Statement Number 10.
88	Development of Drone/ Unmanned Aerial Vehicle Countermeasure Technology	Merged with Problem Statement Number 135.
89	Hostile Fire Detection and Positioning System	Solutions under consideration and included as New Problem Statement Number 23.
90	Development of Enhanced Unattended Ground Sensor System	Solutions under consideration and included as New Problem Statement Number 11.
91	Geo-Referencing of Inputs from UAV and Electro-Optical Devices	Problem Statement is being pursued and included as New Problem Statement Number 24.
92	Power Management at Observation Post	Merged with Problem Statement Number 126 due to common technology and solution. Being pursued as acquisition scheme under Make II. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1
93	Common Meteorological Probing Platform for Long Range Vectors	Upper Air Sounding System being progressed as acquisition scheme under Make II. Problem Statement stands addressed. https://www.makeinindiadefence.gov.in/projects/projectlist/2/1

Live	Merged	ATB, TDF, Make-II & IDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
94	Thermal Imager Integrated Observation Equipment (TIIOE)	Responses received for commercially available mature products. Being addressed through Direct Commercial Sales. Problem Statement no more live.
95	Need for Application Security	Problem Statement is being pursued and included as New Problem Statement Number 25.
96	Integration of Applications on Disparate Networks	No viable solutions received. Problem Statement is closed.
97	Digital Signature without Hardware Token and Central Public Key Infrastructure (PKI)	Problem Statement is being pursued and included as New Problem Statement Number 26.
98	Mechanism for Fast Prototyping Method for Developing Modular Applications	No viable solutions received. Problem Statement not being pursued.
99	Integrated Quartermaster Package (IQMP) Adopter Module	Merged with Problem Statement Number 102.
100	Commander's Module for Human Resource Management System (HRMS)	Merged with Problem Statement Number 102.
101	Human Resource Management System (HRMS) e-Mail Module	Merged with Problem Statement Number 102.
102	Automatic Synchronisation of Human Resource Management System (HRMS) and Integrated Quarter Master Package (IQMP) Databases	Number of developers have approached with multiple solutions, including own agencies/ individuals. Being developed in -house.
103	Android Version of One Module of Human Resource Management System (HRMS)	Merged with Problem Statement Number 102.
104	Enhancements to Central Utility of Human Resource Management System (HRMS)	Merged with Problem Statement Number 102.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
105	ERP for Management Information System (MIS).	Number of developers have approached with multiple solutions, including own agencies/ individuals. Being developed in-house.
106	Data Exchange between Dependant Applications	Number of developers have approached with multiple solutions, including own agencies/ individuals. Being developed in-house.
107	Integration of Applications with Disparate Security Profile	Number of developers have approached with multiple solutions, including own agencies/ individuals. Being developed in-house.
108	Specialised Decoding and De-Multiplexing Facility	Problem Statement is being pursued and included as New Problem Statement Number 27.
109	Development Auto Chinese Translator	English to Mandarin Translator being vigorously pursued under TDF. Multiple responses received. https://drdo.gov.in
110	Development of Video Compression Techniques to Transmit Videos/HD Images on Half Duplex VHF Band (30-88 MHz).	Problem Statement is being pursued and included as New Problem Statement Number 28.
111	Automatic Changeover from Primary Mode of Communication Media to Secondary Media in Case of Failure of Primary Media	Problem Statement is being pursued and included as New Problem Statement Number 29.
112	Secure Mobile Communication Architecture including Prophylactic Security with Geo-Fence Control-Smart Phones	Problem Statement is being pursued and included as New Problem Statement Number 30.
113	Test Equipment for Testing of Anti-Tank Guided Missile (ATGM) Launchers of BMP-II	STIK has been developed by DRDO. Problem Statement stands addressed.
114	Development of Augmented Reality Based Solutions for Carrying Out Preventive Maintenance and Fault Diagnosis of Various Equipment by the User	CBT based solution feasible. Problem being addressed under Paragraph 27 of DPP 2016.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
115	Test Equipment for Checking Barrel Wear of Artillery Guns	Multiple solutions received through in-house innovations, technology development and mature commercial products. Acquisition of product being addressed through Para 27 of DPP.
116	Development of Hybrid Vehicles for High Altitude Areas (HAA)	Merged with Problem Statement Number 149.
117	Precision Drones with Higher Payloads for Delivering Stores	Multiple solutions received. Development of Drones for carriage of stores in HAA being pursued as TDF project. https://drdo.gov.in
118	Hydraulic Armoured Fighting Vehicle (AFV) Lifting Device & Ramp	No solutions received. Problem Statement not being pursued.
119	Design & Development of Indigenous All Terrain Vehicle (ATV)	Acquisition scheme has been initiated. Problem Statement stands closed.
120	Engine Auto Shut Down Mechanism for 'A' Vehicles	Solutions received were analysed and aspect is being included in design parameters for new 'A' Vehicles.
121	Metal Composites & 3D Metal Printing for Production of Spares	Merged with Problem Statement Number 144.
122	Extreme Cold Climate (ECC) Clothing for Crew of Armoured Fighting Vehicle (AFV)	All solutions were for mature commercially available products (COTS). Being procured through various routes.
123	Poor Battery Life of LRF LH-30	Merged with Problem Statement Number 126 due to common technology and solution. Progressed as an acquisition scheme under Make II. https://www.makeinindia defence.gov.in/projects/projectlist/2/1
124	Composite Medical Diagnostic Equipment for Posts	Solution received for commercially available products, same have been placed on GeM Portal and being regularly procured. Problem Statement no more live.
125	Rapidly Deployable Mobile Operation Theatres	Problem Statement is closed.
126	Alternate Technologies for Power Management	Multiple solutions based on varied technologies received. Acquisition scheme under progress through Make II route. https://www.makeinindia defence.gov.in/projects/projectlist/2/1
127	Test Kits for Checking Quality of Meat	No viable solutions received. Problem Statement is no more being pursued.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
128	Design of Modular Reinforced Cement Concrete (RCC) Structures	Solutions received from three entities are under evaluation. Problem addressed partially. Problem Statement is live and included as New Problem Statement Number 38.
129	Heated Shelters	No of solutions received. Launched as a fully funded Army Technology Board Project. Prototype development is in progress.
130	Modular Habitat for High Altitude Area	No of solutions received. Launched as a fully funded Army Technology Board Project. Prototype development is in progress.
131	Smartisation of Anti Infiltration Obstacle System (AIOS)	Solutions received are partially addressing the problem. Being pursued as New Problem Statement Number 39.
132	Artificial Intelligence (AI) Monitor for Surveillance	Solutions received are partially addressing the problem. A project under TDF is being launched. Problem Statement is live and being pursued as New Problem Statement Number 12.
133	Unmanned Aerial Vehicles (UAV) for Target Acquisition Post Strike Damage Assessment (PSDA)	Multiple solutions received. Mature products available in the market and being pursued through acquisition programmes.
134	Development of Advance Electro Optical / Infra Red Sensors for Unmanned Aerial Vehicle (UAV)	Problem Statement is being pursued and included as New Problem Statement Number 13.
135	Counter UAV Rocket, Artillery & Mortar (C-URAM) System	Based on the nascent nature of technology, this problem is being pursued by the Army Technology Board through fully funded Research Programme.
136	Securing Communications using Quantum Key Distribution (QKD)	Problem Statement is being pursued and included as New Problem Statement Number 31.
137	Block Chain Technology: Military Usage	Problem Statement is being pursued and included as New Problem Statement Number 32.
138	Military Object Detection in Satellite Imagery Using Artificial Intelligence (AI)	Multiple solutions received. Automated Change Detection in Satellite Images for Surveillance being pursued under TDF. https://drdo.gov.in

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
139	Use of AI / DI Towards Development of an AI Engine for Analysis of Monochromatic / Multi-Spectral Satellite Imagery / UAV Video. AI Engine will enable Military Object Detection, Classification, Pattern Recognition and Decision Support	Merged with Problem Statement Number 138. https://drdo.gov.in
140	Airborne Fire Control Radar for Attack Helicopters	Problem Statement is being pursued and included as New Problem Statement Number 14.
141	Cargo Sling Equipment and Rescue Hoist Equipment for Light Helicopters	No viable solutions received. Problem Statement is no more being pursued.
142	Gun Raising, Lowering & Levelling Mechanism for L-70 Gun	Programme is fully funded and development is being pursued under TDF. https://drdo.gov.in
143	Interface Mechanism for Transfer of Digital Data Directly from Flycatcher (FWCS) Radar to 'Upgraded' ('U') L-70 Gun	Based on solutions received the technology has been incorporated in future design. A comprehensive Army Technology Board Project has been initiated to fund Research and Development of this aspect.
144	Indigenisation of Critical Sub-Assembly of various Army Air Defence Equipment	Indigenisation of critical spares of AD Guns being pursued through a fully funded development programme under the Army Technology Board.
145	Development of Modular Powerpack for Armoured Fighting Vehicles	No viable solutions received. Problem Statement is no more being pursued.
146	Development of Indigenous Detector Dewar Cooler (DDC)	Problem Statement is being pursued and included as New Problem Statement Number 15.
147	Aerial Mine / Explosive Ordnance Detection System	Problem Statement is being pursued and included as New Problem Statement Number 16.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PS No	Statement	Remarks
148	Portable Helipad	Project being progressed as acquisition scheme under Make II. https://www.makeinindiadefence.gov.in/admin/writereaddata/upload/project/project_file/portable_hellipad_brief.pdf
149	Additive for Diesel at High Altitude Area (HAA)	Multiple responses received based on which technology development is being fully funded by the Army Technology Board. The programme is currently under R&D phase.
150	Fire Fighting System in High Altitude Area (HAA)	Solutions under consideration and included as New Problem Statement Number 40.

Live	Merged	ATB, TDF, Make-II & iDEX	Addressed by Government Agencies	DCS Route/ Incorporated in Future Technologies	No Viable Solutions
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PROBLEM DEFINITION STATEMENT – 1**FUEL AIR EXPLOSIVES FOR MINEFIELD BREACHING**

1. **Short Title.** Development of Fuel Air Explosives to breach minefields.
2. **User Directorate (s).** Combat Engineers Directorate.
3. **Type of Problem.** Technology Infusion.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Mines are employed by defender to create artificial obstacles to restrict mobility of attacker. The attacker needs to breach these minefields faster than the defender is able to regroup and reposition his resources. The current method of mechanical breaching of mine fields is time consuming besides equipment and manpower intensive. Fuel Air Explosive is a technology which needs to be developed for quick clearance of mine fields.
 - (b) **Evolution of the Problem.** Mobility in battlefield is restricted by employing mines to create minefields to delay, cause attrition, channelize, and create bottlenecks in the axis of advance of the forces. The advancing forces employ various manual and mechanical means to breach lanes through these minefields to ensure mobility of own forces. The time required to breach these lanes needs to be reduced to ensure speed, achievement of surprise and shock action during offensive operations.
 - (c) **How it is Being Overcome?**
 - (i) The current means include manual and mechanical breaching of vehicle safe lanes by employing specialist equipment and skilled manpower in plains and deserts.
 - (ii) Manual breaching is resorted to in mountains to create safe lanes for move of individuals and stores.
5. **Who has the Problem?** The problem is faced by offensive troops of the Army which are required to advance and capture enemy territory for decisive victory in war. It is faced in all terrains and by all formations.
6. **Why it is Important to Solve?**
 - (a) The current methods of breaching besides equipment and manpower intensive impose time penalty during operations and result in casualties.
 - (b) A quick explosive option using fuel air explosive will ensure saving of critical time besides equipment, manpower and casualties.
 - (c) It will provide a solution for breaching all types of mines laid in the minefield.

7. **Contemporary Solution by other Countries/ Organisations.** Bulk of the countries still follow mechanical breaching means but certain advance countries have developed breaching capability using Fuel Air explosives.

8. **Timelines.**

(a) Development of Fuel air explosive - 24 months.

(b) Development of method to spread fuel air explosive over designated area - 12 months.

(c) Trials - 12 months.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 2**DEVELOPMENT OF TITANIUM BASED LIGHT WEIGHT 120MM MORTAR**

1. **Short Title.** Development of Titanium Based Light Weight 120mm Mortar.
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** A possible reduction in the overall weight of the mortar will improve the overall deployability as well as lead to a possible reduction in the overall manpower employed. The basic solution that can be offered for the same is replacement of the construction material of major sub assemblies of the gun such as the mount and the base plate with titanium alloy.
 - (b) **Evolution of the Problem.** The requirement has evolved out of the need for carriage of effective firepower to the most inaccessible mountainous areas and the requirement for shifting of guns within a short period of time.
 - (c) **How it was Being Overcome?** Problem has not yet been overcome. It limits the areas as well as terrain over which the gun can be manually ferried. Also relocating the gun in rough terrain is both manpower as well as time intensive.
5. **Who has the Problem?** All troops that are deployed along the Northern as well as North-Eastern Borders.
6. **Why it is Important to Solve?** It is important to solve the problem so as to improve the deployability of the equipment in the most inaccessible areas as well as ensure quicker and easier re-deployability of the gun in inaccessible areas (Shoot and Scoot).
7. **Contemporary Solutions by Other Countries/ Organisations.** Use of titanium alloy in artillery gun system across the world is being experimented with and has been employed effectively in various artillery guns. The US made BAE Systems' Global Combat System M777 Howitzer has achieved a considerable reduction in weight just by employing Titanium alloy in most of its components/ sub-assemblies. It has also resulted in reduction of its gun crew from nine to five.
8. **Timelines.**
 - (a) Feasibility Study - Four/ Six months.
 - (b) Technology Solution - Eight months/ One year.

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PROBLEM DEFINITION STATEMENT – 3**TACTICAL UNMANNED GROUND VEHICLE (UGVs) FOR CLOSE QUARTERS SURVEILLANCE AND COMBAT**

1. **Short Title.** Tactical Unmanned Ground Vehicle (UGVs) for Close Quarters Surveillance and Combat.
2. **User Directorate (s).** Directorate General of Infantry.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Requirement of having a Tactical Unmanned Ground Vehicle for surveillance for accurate and real time inputs and obviating the inherent risks to soldiers during the conduct of Counter-Insurgency/ Counter-Terrorist (CI/ CT) operations.
 - (b) **Evolution of Problem.** During the conduct of CI/ CT operations like house intervention, building clearance, etc., accurate and real time inputs are critical for the success and to ensure minimal collateral damage.
 - (c) **How is it Being Overcome?** During the conduct of CI/ CT operations for the desired high degree of situational awareness and effect on targets, manual methods of surveillance and combat are being employed.
5. **Who has the Problem?** Infantry, RR and Special Forces Battalions employed in the conduct of CI/ CT operations.
6. **Why it is Important to Solve?**
 - (a) Increased technological threshold has manifested in more precise targeting, a very high degree of situational awareness and intense operations with minimal collateral damage. Present manual methods of surveillance and combat in CI/ CT operations result in collateral damage as well casualties of own soldiers.
 - (b) Tactical UGV can be employed to provide accurate, real time inputs and engaging the enemy/ terrorists during Hostage Rescue, Close Quarter Combat, etc during the conduct of CI/ CT operations. It will also obviate, the inherent risks to the soldiers during these operations.
7. **Contemporary Solutions by Other Countries/ Organizations.** DOGO (Mark II) by General Robotics.

8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 4**PRECISION GUIDED KIT FOR 81MM MORTAR AMMUNITION**

1. **Short Title.** Precision Guided Kit for 81mm Mortar Ammunition.
2. **User Directorate (s).** Directorate General of Infantry.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?** In the present battlefield environment, there is greater need for increased precision on target with reduced collateral damage. The existing 81mm Mortar is an area weapon and due to dispersion of the Mortar rounds at target end, it is very difficult to achieve first round hit probability. Further, engagement of targets with conventional HE ammunition requires more number/quantity of ammunition to achieve desired effect. Development of the same for 81mm caliber will vastly enhance the accuracy as well as quantitatively conserve the ammunition for Infantry during the employment of 81mm Mortar.
5. **Who has the Problem?** Infantry and RR Battalions.
6. **Why it is Important to Solve?** Precision Guided kit for 81mm Mortar shells will provide pinpoint accuracy to 10m Circular Error of Probability (CEP), thereby increasing first hit probability and minimising the requirement of ammunition. The guided kit will ensure in reduction of collateral damage and 81mm Mortar could effectively be employed in built up areas, High Altitude Areas (HAA), Mountains and Deserts with greater precision.
7. **Contemporary Solutions by Other Countries/ Organizations.**
 - (a) 81mm RCGM by M/s General Dynamics.
 - (b) 120mm Laser Guided GPS aided Mortar Kit by M/s Elbit system, Israel.
 - (c) 120mm Mortar Guidance kit by M/s Medha Servo Drives Private Ltd.
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PROBLEM DEFINITION STATEMENT – 5**UNIVERSAL ELECTRONIC FUZE (FZ) HAND SETTER FOR ELECTRONIC FUZES OF 105MM, 130MM AND 155MM ARTILLERY GUN AMMUNITION**

1. **Short Title.** Universal Electronic Fuze (fz) Hand Setter for Electronic Fzs of 105mm, 130mm and 155mm Artillery Gun Ammunition.
2. **User Directorate (s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** With 'Make in India' oriented procurement planned in the future, the number of variants of fzs may increase with more variants of compatible fz hand setter. There is a need to develop a common electronic fz hand setter to operate all variants of electronic fz.
 - (b) **How is it Being Overcome?** A universal electronic fz hand setter, which could be utilized for programming all kinds of electronic fzs is recommended to be designed to address the problem.
5. **Who has the Problem?** Artillery units.
6. **Why it is Important to Solve?** It is important to design/ develop a Universal Electronic Fz Hand Setter to standardise the equipment and avoid separate vendor specific setter for specific Fz variant. The same is required to simplify the equipment on user end for effective use in operational conditions.
7. **Contemporary Solutions by Other Countries/ Organizations.** The other countries use a particular brand/ vendor of fz and hand setter as per STANAG/ NATO/ International standards for that specific equipment. The electronic fz are required to confirm to these standards in order to be compatible with fz hand setters. However, BEL & ECIL are currently making these hand setters as per their IPR restricted protocols, which are not inter-compatible.
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PROBLEM DEFINITION STATEMENT – 6**MODIFICATION FOR NIGHT CO-ORDINATION OF RADAR FLYCATCHER WEAPON CONTROL SYSTEM AND OF 40MM L/70 GUN**

1. **Short Title.** Modification for Night Co-ordination of Radar Flycatcher Weapon Control System (FWCS) and of 40mm L/70 Gun.
2. **User Directorate (s).** Army Design Bureau.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?** For controlling the Gun Systems, the radar needs to be coordinated with each gun by filling in the parallax data of guns. The procedure of calculation of the parallax data is manual and requires visual laying of the radar antenna to the axis of the bore of the gun. The visual laying procedure has certain drawbacks. The coordination drill can be executed during day time under good visibility conditions and at shorter distances when the gun system is clearly visible from the radar.
5. **Who has the Problem?** Army Air Defence units
6. **Why it is Important to Solve?** To reduce the time and efforts required for coordination of radar system and gun system.
7. **Contemporary Solutions by Other Countries/ Organizations.** Not Known.
8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 7

IDENTIFICATION OF FRIEND OR FOE (IFF) SYSTEM FOR ARMoured FIGHTING VEHICLES

1. **Short Title.** IFF System for Armoured Fighting Vehicles.
2. **User Directorate (s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Unresolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** To positively identify the opposing armoured vehicle prior to engagement.
 - (b) **Evolution of the Problem.** On battlefield, Armoured Fighting Vehicles would be required to engage enemy armoured fighting vehicles in time critical situations necessitating shortening of decision loop for engagement without positive identification of friend or foe which at times lead to fratricide by friendly fires. IFF system is a tool of Combat Identification, “the process of attaining an accurate characterization of detected objects in the operational environment sufficient to support an engagement decision”. It also contributes to the overall tactical decision making.
 - (c) **How it is Being Overcome?** By visual judgment of the commander of the Armoured Fighting Vehicle to engage the opposing armoured vehicle.
5. **Who has the Problem?** The problem is being faced by the crew of Armoured fighting vehicles on the battlefield.
6. **Why it is Important to Solve?** It is important to solve the problem to prevent fratricide on the battlefield leading to loss of men and equipment.
7. **Contemporary Solution by Other Countries/ Organisations.** The leading design manufacturers of Armoured fighting vehicles worldwide are working towards developing visual solutions duplicated by the electronic solutions for positive identification to obviate chances of fratricide during engagements on the battlefield.
8. **Timelines.**
 - (a) Development of a System -12 months.
 - (b) Prototype and Trials - 6 to 8 months.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 8**FOLIAGE PENETRATION RADAR TECHNICAL INTEGRATION WITH NIGHT VISION/ SURVEILLANCE DEVICES**

1. **Short Title.** Foliage penetration radar technical integration with night vision/ surveillance devices.
2. **User Directorate (s).** Directorate General of Infantry.
3. **Type of Problem.** Poorly solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** A huge proportion of our forces are deployed in Union Territory of Jammu, Kashmir, Ladakh and NE regions of the country. Vegetation cover in such areas is vast which facilitates the irregulars/ ANEs to close-in on own troops without being detected and launch surgical strikes. Though a large number of NVDs are held with the unit, foliage penetration remains a challenge. Presently, there is are limited solution to this problem with our armed forces.
 - (b) **Evolution of the Problem.** The NVDs are not effective due to the thick vegetation cover around own location. Vegetation cover, however, is essential to maintain camouflage and concealment, but its effect is double edged, upsetting own design of operations often.
 - (c) **How it was Being Overcome?** Local arrangements and innovations are being applied with meagre advantages thereby jeopardizing lives of own troops.
 - (d) **Any Innovations to Locally Overcome the Problem.** Innovative ideas and methods have been adopted to acquire EW signals either electronically or mechanically providing optimal reaction opportunities to own troops in case of certain eventualities.
5. **Who has the Problem?**
 - (a) **User (Skill Sets).** Own troops deployed in active field.
 - (b) **Operating Environment.** Troops deployed in Counter Insurgency/ Counter Terrorism and Line of Control / Anti Infiltration Obstacle System postures.
 - (c) **Periodicity of Exploitation.** Routinely on a daily basis.
6. **Why is it Important to Solve?** Operational blindness/ lack of surveillance renders the fighting ability of own troops and incapacitates the soldier with min/ no reaction capability. In-service equipment lack such technology and the innovative

solutions are not fool-proof.

7. **Contemporary Solution by Other Countries/ Organizations.** Foliage penetration radar technology is available with few countries like USA, France, etc. However, the technologies are mostly fitted on airborne devices. Major success has not been achieved in ground based equipments with absolute clarity to facilitate detection, identification and recognition of the target objective at suitable ranges thereby providing adequate reaction capabilities.

8. **Timelines.** At the earliest.

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PROBLEM DEFINITION STATEMENT – 9**LONG RANGE OPTICAL TARGET LOCATOR**

1. **Short Title.** Long Range Optical Target Locator.
2. **User Directorate(s).** Directorate General of Infantry.
3. **Type of Problem.** Technology infusion.
4. **What is the Problem (Need)?** Troops engaged in modern asymmetric warfare are often exposed to high risk threats including surprise attacks by well-planned and camouflaged ambushes involving automatic firing and sniping etc. To cope with such lethal traps, military forces must be equipped with necessary tools for surveillance, locating hostile forces and responding effectively and rapidly with minimum exposure to the threats. A device that provides a signature of the enemy's optical devices will augment the security / surveillance grid. The threat could be in terms of a sniper equipped with a day sight, any passive night vision device, or any other optical/ electro optical surveillance device, viz., binocular, surveillance cameras, laser range finders, designators etc.
 - (a) **Statement of Problem.** There is a requirement of a Long Range optical Target Locator capable of detecting and locating optical threats, which can facilitate Indian Army in detection of any planned offensive or border surveillance.
 - (b) **How is it Being Overcome?** Presently, the security and surveillance grid is based upon Radar and other optical instruments, which do not have capability to detect enemy optical devices.
5. **Who has the Problem?**
 - (a) **User (Skill Sets).** Troops should be able to handle the equipment with nominal training.
 - (b) **Operating Environment.** Border Areas.
 - (c) **Periodicity of Exploitation.** Daily.
6. **Why it is Important to Solve?** This equipment will provide an important tool for detection of commonly employed active or passive surveillance devices with minimum exposure to the threats.
7. **Timelines.** Research, manufacture of prototype and trials to be completed in eighteen months.

8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT NO – 10**SURVEILLANCE OF PASSES THROUGH HELIKITE/ MINI AEROSTATS**

1. **Short Title.** Surveillance of passes through Helikite/ Mini Aerostats.
2. **User Directorates(s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** There is a need to keep passes in High Altitude Areas under constant surveillance with aerial surveillance means being the best option. Both mini UAVs and Helikite/ Mini Aerostats capable of operating in High Altitude Areas are best suited for the task. There is thus a need to develop a Mini UAV (rotary type) or Helikites capable of operating in altitudes with day & night cameras, recording facilities and adequate loiter time & endurance.
 - (b) **Evolution of the Problem.** Constant surveillance of area of interest is an operational necessity which needs to be ensured. Information gained on enemy activities & build up defines the threat perception. However, without aerial surveillance means, the same is difficult to achieve.
5. **Who has the Problem?**
 - (a) **User (Skill Sets).** Units deployed in border areas.
 - (b) **Operating Environment.** High Altitude Area/ Field Areas.
6. **Contemporary Solutions by Other Countries/ Organisations.** UAVs, aerostats and Helikites are the solutions developed by most of the modern countries. A UAV or Helikite with parameters and requirements of Army in High Altitude Area may not be easily available as COTS and hence the need to develop the same.
7. **Timelines.**
 - (a) **Feasibility Study.** Three- Four months.
 - (b) **Technology Solution.** Six - Eight months.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 11**DEVELOPMENT OF ENHANCED UNATTENDED GROUND SENSOR SYSTEM**

1. **Short Title.** Development of Enhanced Unattended Ground Sensor System.
2. **User Directorate(s).** Directorate General of Infantry.
3. **Type of problem.** Partially solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The existing Unattended Ground Sensor (UGS) system in the Indian Army is an essential part of the intrusion detection framework deployed along the borders. The sensors deployed are based on older technology and possess inherent limitation in terms of detection range and capability. Thus there is a need to develop a sensor platform which overcomes these problems.
 - (b) **Evolution of the Problem.** A suggested architecture for development of the sensor platform is as under:-
 - (i) **Micro Controller.** This interfaced with the sensors either individually or collectively shall enable processing of signals detected from the sensors to avoid false triggering. In order to do so an algorithm to calibrate sensor readings shall be embedded in it. Latest microcontrollers like Arduino can be interfaced with sensors to develop independent platforms.
 - (ii) **Enhanced Sensor Suite.** This consists of a suite of sensors to include the latest type such as Radar enabled sensor which are less prone to false triggering. Another type of sensor is the ultrasonic sensor. The sensors used shall either be interfaced directly with the microcontroller or in wired manner.
 - (iii) **Low Power Consumption.** This requirement has to be met by enabling sensors and microcontroller to be designed in a manner as to consume minimal power. This shall enable the sys to function independently for long duration. The sensors so interfaced shall enable deployment as standalone modes or platforms with low power consumption to function for long duration independently.
5. **Who has the Problem?** Troops in Active Field Areas.
6. **Why is it Important to Solve?** It is important to solve the problem so as to reduce the number of false detections when employing the existing UGS in detection

7. **Contemporary Solution by Other Countries/ Organisations**. This problem has been solved to a great extent by systems existing in other countries like the US and Israel. Respective solutions are as described below:-

(a) **Remotely Monitored Battlefield System-II (REMBASS-II)**.

(i) This system is the US Army's Unattended Ground sensor system which consists of PIR, Seismic, and acoustic sensors interfaced with a radio capable of displaying LCD. It uses these basic sensor transducers and sophisticated signal processing to achieve a high probability of detection with a very low false alarm rate.

(ii) In addition, the option to interface with a PC/ laptop exists wherein sensor outputs can be monitored and programmed as well. The system can incorporate new sensors (e.g., chemical/biological, RF, meteorological) to enhance the detection platform. When used in conjunction with operator display software, the sensors can be used to determine the type of target, the number and direction of targets, and estimate their location and speed.

(b) **Expandable Unattended Ground Sensor Systems (ELTA ELI-6001)**.

This system is the Israel Army's Unattended Ground Sensor System which consists of sensor suite similar to the REMBASS-II. The sensors include the Seismic, Acoustic, Magnetic, Optic and Radar sensors. The sensors work in tandem to detect and identify probable targets in various scenarios.

8. **Timelines**.

(a) Feasibility Study - 8/10 Months.

(b) Technical Soln - 2/3 Years.

(c) Implementation - In CI/LC.

9. **Point of Contact**.

(a) **Primary Contact**.

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(b) **Secondary Contact**.

Directorate General of Infantry
Sena Bhawan

PROBLEM DEFINITION STATEMENT – 12**ARTIFICIAL INTELLIGENCE (AI) MONITOR FOR SURVEILLANCE**

1. **Short Title.** AI monitoring system is required to convert the legacy Surveillance camera inputs into smart inputs using AI.
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved and Technology infusion by innovative adaption.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** A plethora of surveillance devices are being utilized to achieve Battle Field Transparency, but being legacy systems they need to be continuously manned and monitored.
 - (b) **Evolution of Problem.** Commercially Off The Shelf (COTS) Surveillance devices are being utilized to achieve Battle Field Transparency.
5. **Who has the Problem?** Legacy Surveillance camera users.
6. **Why it is Important to Solve?** AI based monitor for surveillance will reduce the operators fatigue and free resources for other tasks.
7. **Contemporary Solution by Other Countries/ Organisations.** COTS low power, low cost and ultra-portable plug in solutions have been showcased in Defence seminars and exhibitions.
8. **Primary Point of Contact.**
 - (a) **Primary Contact.**

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 - (b) **Secondary Contact.**

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PROBLEM DEFINITION STATEMENT – 13**DEVELOPMENT OF ADVANCE ELECTRO OPTICAL/ INFRA RED SENSORS FOR UNMANNED AERIAL VEHICLE (UAV)**

1. **Name of Proposal.** Development of Advance Electro Optical/ Infra-Red sensors for UAV.
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Poor solution/ Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The current Electro Optical/ Infra-Red sensors for UAVs have limited resolution & impose weight penalty on aerial platform.
 - (b) **Evolution of Problem.** Existing UAV payload technology is not commensurate to the mission effort.
 - (c) **Any Innovations.** No
5. **Who has the Problem?**
 - (a) **User (Skill Sets).** Artillery Directorate.
 - (b) **Operating Environment.** Conventional and Counter Insurgency/ Counter Terrorist operation.
 - (c) **Periodicity of Exploitation.** Frequent.
6. **Why it is Important to Solve?**
 - (a) Multiple Camera in one sensor package with the sensors to detect multiple targets.
 - (b) Both day and night capability in single payload will obviate requirement of different configurations.
 - (c) It should have capability to go back in time and view individual images in terms of time and geo reference.
 - (d) Incorporation of target designation and engagement capability.
 - (e) All the above capabilities needs to be incorporated while still keeping it light weight implying inclusion/ development of futuristic cutting edge technologies.
 - (f) Capability for integration with AI system and Battle Field Surveillance System (BSS).

7. **Contemporary Solution by Other Countries/ Organisations.** Multi sensor camera payload with United State of America and Israel.

8. **Point of Contact.**

(a) **Primary Contact.**

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(b) **Secondary Contact.**

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PROBLEM DEFINITION STATEMENT – 14**AIRBORNE FIRE CONTROL RADAR FOR ATTACK HELICOPTERS**

1. **Short Title.** Airborne Fire Control Radar for Attack Helicopters.
2. **User Directorate(s).** Directorate General of Army Aviation.
3. **Type of Problem.** Technology Infusion.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** As of now Attack Helicopter pilots have only EO/ IR pod for detection of targets with limited operation capability in deteriorated visibility conditions.
 - (b) **Evolution of the Problem.** Human and equipment restrictions of detecting and tracking multiple targets in battle zone as also in deteriorated visibility conditions significantly reduces the effective employment of Attack Helicopters.
 - (c) **How it was Being Overcome?** Pilots have to manually track the target using the EO/ IR pod.
 - (d) **Any Innovations to Locally Overcome the Problem.** Nil.
5. **Who has the Problem?** Attack Helicopter pilots.
6. **Why is it Important to Solve?** In order to enhance the strike capability of Attack Helicopters and increase their survivability.
7. **Contemporary Solution by other Countries/ Organisations.** Proprietary Airborne Fire Control Radars.
8. **Point of Contact.**
 - (a) **Primary Contact.**

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 - (b) **Secondary.**

Directorate General of Army Aviation
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PROBLEM DEFINITION STATEMENT – 15**DEVELOPMENT OF INDIGENOUS DETECTOR DEWAR COOLER (DDC)**

1. **Title.** Development of Indigenous Detector Dewar Cooler (DDC).
2. **User Directorate.** Directorate General of Electronics and Mechanical Engineers.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?** Detector Dewar Cooler (DDC) is the heart of all Thermal Imaging devices. However, the same are being imported from countries like Israel and France.
5. **Who has the Problem?** Indian Army.
6. **Why it is Important to Solve?** Impetus for night enablement of Indian Army has exponentially increased the number of Thermal Imaging Devices, over a period of time. It is imperative that an indigenous DDC is available with the Indian Army to ensure self-reliance and continuous sustenance of night operations capability.
7. **Contemporary Solutions by Other Countries/ Organization.** Development of Indigenous Detector Dewar Cooler (DDC).
8. **Point of Contact.**
 - (a) **Primary Contact.**

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 - (b) **Secondary Contact.**

Directorate General of Electronics and Mechanical Engineers

PROBLEM DEFINITION STATEMENT – 16**AERIAL MINE/ EXPLOSIVE ORDNANCE DETECTION SYSTEM**

1. **Short Title.** Aerial Mine/ Explosive Ordnance Detection System.
2. **User Directorate(s).** Combat Engineers Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** There is a need for developing an aerial mine/ explosive ordnance detection system to enable remote and accurate detection of mines and hazardous explosives in a speedy and safe manner.
 - (b) **Evolution of Problem.** A variety of sub surface and surface explosive devices like land mines, unexploded ordnance, improvised explosive devices etc are likely to be encountered during conflict. These devices have the potential to cause delay and / or damage to own forces. There is a need to find a means to enable remote and accurate detection of these mines and other hazardous explosives in a speedy and safe manner.
 - (c) **How it was Being Overcome?** Mines/ explosives ordnance are primarily being detected by in service equipment that include mine detectors, Explosive Vapour Detectors, Non Linear Junction Detector, Sniffer Dogs, Remotely Operated Vehicles etc all of which are ground based. No solution exists for aerial detection of mines/ordnance explosives.
 - (d) **Any Innovations to Locally Overcome the Problem.** Nil
5. **Who has the Problem?** The challenge is faced by all who are present in the vicinity of such explosive devices and therefore this problem is faced by the entire ground forces.
6. **Why is it Important to Solve?** It is important to solve as detection of the explosive device will not just enable speedy movement which is essential but also ensure minimizing of casualties due to these explosive devices.
7. **Contemporary Solution by Other Countries/ Organisations.** Existing technology/ solutions do not provide means to detect these explosive devices in a totally safe, fool proof and speedy manner. Most of the detection equipment currently available are ground based and require the operator and / or the equipment to come in close proximity of the explosive device, which endangers the operator and/ or the equipment. Further, the process is time and resource intensive. An aerial system will overcome the present challenges, thereby providing a significant advantage.

8. **Point of Contact.**

(a) **Primary Contact.**

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PROBLEM DEFINITION STATEMENT – 17**MICRO CHANNEL PLATE (MCP) FOR IMAGE INTENSIFIER (II) TUBES**

1. **Short Title.** Micro Channel Plate (MCP) for Image Intensifier (II) Tube.
2. **User Directorate (s).** Directorate General of Infantry.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** MCP is a critical component of latest generation of II Tubes used in state of art Night Vision Devices (NVDs). Presently no indigenous source of MCP exists and compels dependence on foreign OEMs for the technology.
 - (b) **Evolution of Problem.** The In-service NVDs are based on vintage II tube technology and suffer from limitations.
 - (c) **How is it Being Overcome?** By importing MCP.
5. **Who has the Problem?** Troops employed in conduct of various night operations and surveillance duties.
6. **Why it is Important to Solve?**
 - (a) Night fighting capability has been a challenge for the Indian Army due to availability of equipment with vintage technology for NVDs. Most night operations are launched preferably under starlit conditions. Therefore, it is imperative to have indigenous capability to develop NVDs which can facilitate execution of operational tasks under extremely low ambient light conditions.
 - (b) With proliferation of technology, our adversaries have already undertaken R&D in this field and are equipping their forces with contemporary NVDs. Therefore to neutralize their military technology revolution in Night Enablement, the Indian Army must attain self-reliance in field of development and manufacture of NVDs and its critical components.
7. **Contemporary Solutions by Other Countries/ Organizations.** Multiple firms in North America, Europe, and East Asia are manufacturing and exporting II based NVDs. However, the II Tubes including MCPs are primarily being manufactured by limited firms in USA, Germany, France, Israel, Russia and perhaps China.

8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 18**UNCOOLED THERMAL IMAGING SENSOR**

1. **Short Title.** Uncooled Thermal Imaging (TI) Sensor.
2. **User Directorate (s).** Directorate General of Infantry.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Uncooled TI sensor is the critical component of latest generation TI based surveillance and target acquisition devices. Presently, no indigenous source of the TI sensor exists, compelling dependence on foreign OEMs for the component.
 - (b) **Evolution of Problem.** Indian Army in its endeavour to enhance night fighting capabilities is equipping the soldiers with uncooled TI based weapon sights and surveillance devices. All vendors manufacturing these devices are importing TI sensor from foreign OEMs.
 - (c) **How is it Being Overcome?** By importing uncooled TI sensors.
5. **Who has the Problem?** Troops employed in conduct of various night operations.
6. **Why it is Important to Solve?**
 - (a) Night fighting capability has been a challenge for the Indian Army due to availability of equipment with vintage technology for NVDs. Most night operations are launched preferably under starlit conditions. Therefore, it is imperative to have indigenous capability to develop NVDs which can facilitate execution of operational tasks under extremely low ambient light conditions.
 - (b) With proliferation of technology, our adversaries have already undertaken R&D in this field and are equipping their forces with contemporary NVDs. Therefore to neutralize their military technology revolution in Night Enablement, the Indian Army must attain self-reliance in field of development and manufacture of NVDs and its critical components.
7. **Contemporary Solutions by Other Countries/ Organizations.** Multiple firms in North America, Europe, and East Asia are manufacturing and exporting TI based target acquisition and surveillance devices. However, Uncooled TI sensors are being manufactured by limited firms in USA, France, Israel and perhaps China.

8. **Point of Contact.**

(a) **Primary Contact.**

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PROBLEM DEFINITION STATEMENT – 19**MINIATURE AIRBORNE JAMMER SYSTEM**

1. **Short Title.** Miniature Airborne Jammer System.
2. **User Directorate (s).** Directorate General of Army Air Defence.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The present day warfare is characterized by intense Electronic Warfare environment. The survivability of the aerial platforms has increased manifold using electronic warfare means.
 - (b) **Evolution of Problem.** Advancements in Electronic Warfare capabilities the world over and increased employment of airborne Electronic Warfare assets.
5. **Who has the Problem?** Army Air Defence units.
6. **Why it is Important to Solve?** To ensure a high standard and realistic training of all Air Defence Radar operators to work through intense Electronic Warfare environment.
7. **Contemporary Solutions by Other Countries/ Organizations.** With advent in technology various countries are developing Miniature Airborne Jammers on board drones. A few examples are as under:-
 - (a) ADM-160 “MALD-J” by Raytheon.
 - (b) Bat Unmanned Aircraft System by Northrop Grumman.
 - (c) Gremlin by DARPA (Defence Advanced Research Projects Agency) of United States Department of Defense.
8. **Point of Contact.**
 - (a) **Primary Contact.**

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PROBLEM DEFINITION STATEMENT – 20**ALL - IN - ONE MOBILE COMMUNICATION HANDSETS**

1. **Short Title.** All - in - one Mobile Communication Handsets.
2. **User Directorate (s).** Directorate General of Signals.
3. **Type of Problem.** Poorly Solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of the Problem.** Today, there are different mobile handsets for different technologies i.e. CDMA, 4G (LTE), Sat Com Terminals, Combat Net Radios. Therefore, a soldier in the TBA will need to carry and handle different sets at one time which are cumbersome and difficult to manage which reduces the efficiency of the soldier. With the advancement of ICT technology, the subscriber devices form factors have reduced greatly in size. There is a need to have a subscriber device supporting multiple mobile communication technologies.
 - (b) **Evolution of the Problem.** Besides CNR a large number of wireless communication media is now available. However this results in multiple user devices being carried.
 - (c) **How it was Being Overcome?** Different sets are being used for different purposes.
 - (d) **Any Innovations to Locally Overcome the Problem.** Nil
5. **Who has the Problem?** The communication devices are being used by all personnel irrespective of arms/ services.
6. **Why it is Important to Solve.** It is important to have All - in - One mobile communication handsets to mitigate the need to carry multiple handsets, simplify the use of various communication devices and increase the fighting capability of the user soldier.
7. **Contemporary Solution by other Countries/ Organisations.** Data not available.
8. **Timelines.** The problem can be resolved in a phase wise manner.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 21**SECURE COMMUNICATIONS FOR (COTS) EQUIPMENT /
IT EQUIPMENT/ TELE-COMMUNICATION EQUIPMENT**

1. **Short Title.** Secure communication for COTS equipment/ IT equipment/ Tel-communication equipment.
2. **User Directorate(s).** Directorate General of Signals.
3. **Type of Problem.** Poorly Solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of the Problem.** There is a large number of Secrecy Equipment being handled by units. Each secrecy equipment functions with live keys which are changed periodically as per policy in vogue. Maintenance of varied equipment profile and respective key management is challenging and effort intensive as these secrecy devices are deployed at various field locations which are inaccessible during winters. There is a need to have a single indigenously development secrecy on COTS, IT and Telecommunication Equipment/ Platforms.
 - (b) **Evolution of Problem.** With large number of secrecy devices, their management is becoming an issue. Large manpower is utilized in physical move to ensure key management of secrecy device which can be minimized by using a single device.
 - (c) **How it was Being Overcome?** The problem is presently overcome by physically replacing keys and for carrying out repair of any faulty secrecy equipment.
 - (d) **Any Innovation to Locally Overcome the Problem.** Separate secrecy devices are being used for each type of system.
5. **Who has the Problem?** The secrecy devices are deployed at all hierarchical levels with communication equipment.
6. **Why it is Important to Solve?** It is important to solve the problem of secrecy over COTS/ ITI telecommunication equipment for following:-
 - (a) Unified secrecy solution across equipment/ platform.
 - (b) Minimize key management issues.
 - (c) Reduce nuances of operating multiple secrecy devices under the same roof.
7. **Contemporary Solution by other Countries/ Organizations.** Data not available.

8. **Timelines.** The problem can be resolved in a phase wise manner.

9. **Point of Contact.**

(a) **Primary Contact.**

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(b) **Secondary Contact.**

Directorate General of Signals
Telephone Number: 011-23018915

PROBLEM DEFINITION STATEMENT – 22**BEAM STEERING FOR LASERS**

1. **Short Title.** Image processing and fine pointing and tracking of laser beam on to the target.
2. **User Directorate(s).** Director General of Army Air Defence.
3. **Type of Problem.** Tech infusion.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The critical requirement is to aim and maintain the laser beam on the vulnerable spot on the target until a kill is achieved.
 - (b) **Evolution of the Problem.** The high precision beam pointing and tracking system is responsible for fine pointing of laser beam on to the target. The major sources of error in achieving the high precision pointing and tracking besides the dynamic target are platform vibrations, beam jitter produced by atmospheric propagation effects, bore sight error and other manufacturing electronics and thermal effect errors.
5. **Who has the Problem?** The problem pertains to equipment design and configuration.
6. **Why it is Important to Solve?** A high accuracy beam pointing system having a pointing accuracy of few micro radians is an essential component of a laser based Directed Energy Weapon system for engagement of fast moving and manoeuvring aerial targets.
7. **Contemporary Solution by other Countries/ Organisations.**
 - (a) HELMD Program of USA.
 - (b) 40 KW Laser Gun by MBDA, Germany.
8. **Point of Contact.**
 - (a) **Primary Contact.**

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 - (b) **Secondary Contact.**

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PROBLEM DEFINITION STATEMENT – 23**HOSTILE FIRE DETECTION AND POSITIONING SYSTEM**

1. **Short Title.** Development of Hostile Fire Detection and Positioning System.
2. **User Directorate(s).** Directorate General of Infantry.
3. **Type of Problem.** Partially solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Hostile fire is very common on military convoys/ patrols in Counter Insurgency/ Counter Terrorism Operations. Identification of direction and pin pointing of the location of the firer is a problem and gets even more difficult in built up areas.
 - (b) **Evolution of the Problem.** The requirement evolved out of standoff/ hostile fire on Army Convoys/ Patrols operating in Counter Terrorism/ Insurgency especially in built up areas by insurgents. Identification of direction and location of firer being a challenge, a solution is required to minimize own casualties and for rapid reaction.
 - (c) **How was it Being Overcome?** The problem is being overcome with experience and intuition of soldiers on ground.
5. **Who has the Problem?**
 - (a) **User.** All troops deployed in Counter Insurgency/ Terrorism.
 - (b) **Operating Environment.** Highways/ Roads in Counter Insurgency Area.
6. **Why is it Important to Solve?** To quickly identify the location of the hostile firer will enable pinning down of the insurgent and reduces the chances of own casualties and collateral damage. This solution will improve situational understanding and awareness to large extent.
7. **Contemporary Solution by Other Countries/ Organisations.** This technology is being used extensively in Iraq and Afghanistan by US Forces and also by Israeli Army.
 - (a) **Boomerang.** It is an acoustic shooter detection system which is installed on vehicles, but the recent enhancements include static installation kit and portable system. It provides immediate indication of hostile fire and localizes shooters position allowing rapid, informed and coordinated response.
 - (b) **War Fighter Wearable Gunshot & Sniper Detection.** QinetiQ developed 'man-mounted' sensor, placed on the soldier's shoulder. A single sensor covers 360° which accurately locates hostile fire within less than a second of firing a

single shot, when the soldier is standing, walking or moving in a vehicle.

(c) **Israel.** Acoustic processing is not the only solution for hostile fire detection. Its signature can be identified, located and processed even faster using electro optical means. Two Israeli systems are providing such capabilities- Rafael's Spotlight and IAI/ Elta's Short-Wave Infrared (SWIR) are sensor based and transient event detection systems. They are designed to cover a wide area, triggering instant alarm and threat when a single shot is fired.

8. **Timelines.**

- (a) Feasibility Study - One Year.
- (b) Tech Solution - 2/3 Years.
- (c) Implementation - In Counter Insurgency/ Terrorism.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 24**GEO-REFERENCING OF INPUTS FROM UAV AND ELECTRO-OPTICAL DEVICES**

1. **Short Title.** Geo-referencing of Inputs from UAV and Electro-optical Devices.
2. **User Directorate (s).** Directorate General of Artillery and Battlefield Surveillance System (BSS).
3. **Type of Challenge.** Unsolved.
4. **Nature of Challenge.** Application developed integrates the inputs received from UAV and other electro-optical devices. The inputs are in analog form and hence cannot be geo-referenced on the GIS map. For geo-referencing of UAV inputs, digital data with Key Length Value (KLV) tags are required. Similarly for still images and freeze frames from electro-optical devices, the coordinates of four corners of the target are required for geo-referencing the inputs. Hence, there is requirement to develop software/technique to extract above mentioned data from the interface and transmit the fully geo-referenced feed for proper analysis at desired end. No in-service equipment is required to be provided for development/ testing of software.
5. **Statement of the Challenge.** The UAV is a very potent source for surveillance of depth areas in the battle field thereby giving a clear picture of en mob, build up and move of strategic assets. The live streaming of the UAV feeds upto the Ground Control Station(GCS) is geo-referenced, however once these videos/ snapshots are taken out of the GCS they are in analog form and cannot be geo-referenced on the GIS platform.
6. **Why it is Important to Solve?** The software so developed will be able to give digital (video) output with Key Length Value (KLV) tags and four coordinates of still images so that these outputs can be geo-referenced on the GIS map of the commander. The digital video with KLV tags would enable real time monitoring and tracking of targets and hence enhanced battle field transparency.
7. **Contemporary Solution by Other Countries.** At present, the Israel Aerospace Industries (IAI), Malat has effectively developed the system for Israel Army.
8. **Timelines.**
 - (a) Product Conceptualization - 12 months.
 - (b) Research and Design - 6 months.
 - (c) Manufacturing of Prototype - 6 months.
 - (d) Field trials/ User Trials - 6 months.

9. **Point of Contact.**

(a) **Primary Contact.**

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PROBLEM DEFINITION STATEMENT – 25**NEED FOR APPLICATION SECURITY**

1. **Title.** Non availability of application layer security algorithms for Army owned Software products.
2. **User Directorate (s).** All Arms.
3. **Type of Problem.** Unsolved Problem
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Application layer security algorithms are not available/ developed for providing application level security for use in Indian Army military software system and application. Encryption is carried out at physical level thereby restricting proliferation of software application. Moreover non availability of application layer security is negatively impinging upon software security needs and proliferation of application software on Army Data Network.
 - (b) **Evaluation of the Problem.** Software solutions in Indian Army are lagging behind compared to business applications. Indigenous development and secure algorithms are not available to move towards cloud computing and distributed computing.
 - (c) **How it was Being Overcome?** Using physical layer security.
5. **Why is it Important to Solve?** For bringing software application into a distributed model rather than the centralized model being followed.
6. **Contemporary Solutions by Other Countries/ Organisations.** US Army has presently specific algorithms for use on their own defence Networks.
7. **Timelines.**
 - (a) Feasibility Study - Two/ three months.
 - (b) Technology Solution - One year.
 - (c) Implementation in Field - One year.
8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 26**DIGITAL SIGNATURE WITHOUT HARDWARE TOKEN AND CENTRAL PUBLIC KEY INFRASTRUCTURE**

1. **Short Title.** Digital Signature without Hardware Token and Central Public Key Infrastructure (PKI).
2. **User Directorate (s).** Deputy Director General of Information Technology (DDGIT).
3. **Type of Problem.** Software/ Technology Infusion.
4. **Nature of Problem.**
 - (a) **Statement of the Problem.** Digital signature ensures the authentication of files/ documents, it is required to have a technical solution for digitally signing a document without hardware token and implementation of digital signature without central Certifying Authority (CA).
 - (b) **Evolution of the Problem.**
 - (i) Office automation is a central feature of all automation efforts. It involves management of dak management procedures, workflow management and user mail system. The criticality of all electronic information sharing systems is the capability of a system to implement the following aspects as demanded by Information Technology (IT) Act:-
 - (aa) Authentication.
 - (ab) Non-repudiation.
 - (ac) Integrity.
 - (ii) The recommended means of implementing the above aspects through Digital Signatures is to implement PKI through a Central CA and hardware based digital signature tokens. In absence of Central CA this scheme fails and cannot be implemented under the present circumstances. Moreover to obviate the security issues related to hardware tokens and to cater for digital signing of documents on the go, a technical solution for digitally signing a document without hardware token is reqd.
 - (c) **How is it Being Overcome?** Not yet overcome.
 - (d) **Army Innovation to Locally Overcome the Problems.** The issue of digital signature without hardware token can be resolved by using software token. The details of which are as given below:-
 - (i) **Software Token**

(aa) A software token is a type of two-factor authentication security device that may be used to authorize the use of computer services. Software tokens are stored on a general-purpose electronic device such as a desktop computer, laptop, PDA or mobile phone and can be duplicated. Contrast hardware tokens, where the credentials are stored on a dedicated hardware device and therefore cannot be duplicated (except by physical invasion of the device).

(ab) Software tokens are something one does not physically possess, they are exposed to unique threats based on duplication of the underlying cryptographic material - for example, computer viruses and software attacks. Both hardware and software tokens are vulnerable to bot-based man-in-the-middle attacks, or to simple phishing attacks in which the one-time password provided by the token is solicited and then supplied to the genuine website in a timely manner. Software tokens do have benefits there is no physical token to carry, they do not contain batteries that will run out, and they are cheaper than hardware tokens.

(ii) **Security Architecture.**

(aa) There are two primary architectures for software tokens i.e. shared secret and public-key cryptography.

(ab) For a shared secret, an administrator will typically generate a configuration file for each end-user. The file will contain a username, a personal identification number and the secret. This configuration file is given to the user.

(ac) The shared secret architecture is potentially vulnerable in a number of areas. The configuration file can be compromised if it is stolen and the token is copied. With time-based software tokens, it is possible to borrow an individual's PDA or laptop, set the clock forward and generate codes that will be valid in the future. Any software token that uses shared secrets and stores the PIN alongside the shared secret in a software client can be stolen and subjected to offline attacks. Shared secret tokens are difficult to distribute, since each token is essentially a different piece of software. Each user must receive a copy of the secret, which can create time constraints.

(ad) Some newer software tokens rely on public-key cryptography or asymmetric cryptography. This architecture eliminates some of the traditional weaknesses of software tokens, but does not affect their primary weakness (ability to duplicate). A PIN can be stored on a remote authentication server instead of with the token client, making a stolen software token no good unless the PIN is known as well. However, in the case of a virus

infection the cryptographic material can be duplicated and then the PIN can be captured (via key logging or similar) the next time the user authenticated. If there are attempts made guess the PIN, it can be detected and logged on the authentication server, which can disable the token. Using asymmetric cryptography also simplifies implementation, since the token client can generate its own key pair and exchange public keys with the server. There is a need to implement a digital signature scheme without the use of Central CA using a distributed ledger which caters to the three requirements of Information Technology (IT) Act of authentication, non-repudiation and integrity. Also, the need for having a physical token is also to be done away with and alternate means such as biometric signature be used. In case biometric signature is to be used, adequate security measures to be built into the solution to ensure biometric data is not stolen or is misused and violates the rules issued by the government in this regard.

5. **Why it is Important to Solve?** To ensure the personalized authentication of files/ documents, overcoming the drawbacks of hardware tokens and also ensuring that the shared electronic information meets the demands of IT Act without the use of hardware based digital signature and the absence of a Central CA.

6. **Contemporary Solution by other Countries.** Not known

7. **Timelines.**

- (a) Product Conceptualization - 3 months.
- (b) Research and Design - 3 months.
- (c) Development of Prototype - 3 months.
- (d) Field Trials/ User Trials - 4-6 months.

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PROBLEM DEFINITION STATEMENT – 27**SPECIALISED DECODING AND DE-MULTIPLEXING FACILITY**

1. **Short Title.** Specialised Decoding and De-multiplexing Facility.
2. **User Directorate(s).** Corps of Signals.
3. **Type of problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** In most cases, hostile transmission intercepted are encoded and/ or multiplexed and therefore extracting enemy information/ intelligence is difficult and time consuming.
 - (b) **Evolution of Problem.** There is a need for creation of a specialized facility to decode and de-multiplex hostile intercepts. This facility should be able to accept the transmissions recorded in the field and customize the sequence for their de-coding and/ or de-multiplexing. The sequence of actions thus taken can thereafter be updated in field areas on the available network. This will drastically reduce the time for availability of information in the acceptable tactical time frames.
 - (c) **How is it Being Overcome?** By using existing Decoding and De-Multiplexing facility.
5. **Who has the Problem?** The problem is being faced by ESM detachments.
6. **Why is it Important to Solve?** Availability of Specialized Decoding and De-Multiplexing Facility will enhance the speed of extracting crucial intelligence.
7. **Timelines.** Two to three years.
8. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT – 28**DEVELOPMENT OF VIDEO COMPRESSION TECHNIQUES TO TRANSMIT VIDEOS/ HD IMAGES ON HALF DUPLEX VHF BAND**

1. **Short Title.** Development of Video Compression Techniques to Transmit Videos/ HD Images on Half Duplex VHF Band (30-88 MHz).
2. **User Directorate(s).** Directorate General of Information System.
3. **Type of Problem.** Unsolved.
4. **What is the Problem?**
 - (a) **Statement of the Problem.** Development of Video Compression Techniques to Transmit Videos/ HD Images on Half Duplex VHF Band (30-88 MHz).
 - (b) **Evolution of the Problem.** VHF band is being used as Secondary Media for Communications. There is a requirement to transmit captured images/ videos over VHF band (30-88 MHz). The limitations of available VHF band communication channel are in terms of low data rate (less than 5 kbps) and being in half duplex mode. Moreover, good quality images/ video are of few MBs in size. Presently, it is not possible to transmit such media files over desired VHF band within acceptable time frame.
5. **Who has the Problem?** All users using VHF communication devices.
6. **Why it is Important to Solve?** Compression of videos/ HD images are required for passing large amount of data over restricted bandwidth. Hence, it is essential to compress data to the maximum limit so that same can be faithfully transmitted over the half duplex VHF band and reproduced effectively at the receiving end. The testing of the compression software to be developed may be done under laboratory conditions and no in-service VHF Radio set is required to be provided for the same.
7. **Expected Solution.** Compression to ratio of 1:50 may be achieved to faithfully transmit images in 4-5 sec over radio channel of 9.6 kbps. Effective progressive image transfer technique can also be used.
8. **Timelines.**
 - (a) Product Conceptualization - 1 month.
 - (b) Research and Design - 1 month.
 - (c) Manufacturing of Prototype - 1 month.
 - (d) Field trials/ User Trials - 1 month.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 29**AUTOMATIC CHANGEOVER FROM PRIMARY MODE OF COMMUNICATION MEDIA TO SECONDARY MEDIA IN CASE OF FAILURE OF PRIMARY MEDIA**

1. **Short Title.** Automatic Changeover from Primary Mode of Communication Media to Secondary Media in Case of Failure of Primary Media.
2. **User Directorate(s).** Directorate General of Information System.
3. **Type of Problem.** Unsolved.
4. **What is the Problem?**
 - (a) **Statement of the Challenge.** Automatic Changeover from Primary Mode of Communication Media to Secondary Media in case of Failure of Primary Media.
 - (b) **Evolution of the Challenge.** Radio communication is based on two radios (working as primary and secondary media) on different bands i.e. UHF & VHF. When primary media fails then secondary media (working in low freq band) is used to pass the data from remote site to the receiving end. However, no provision/ technique/ software solution exists for automatic switching/ changeover from primary to secondary media in case of a failure.
 - (c) **How is it Being Overcome?** Presently only, manual changeover is being carried out.
5. **Why it is Important to Solve?** There is a requirement to develop technique to trigger automatic changeover between these two media for seamless transmission of data, without any manual intervention. The testing of auto switching software may be done under lab conditions and no in-service UHF or VHF radio-sets are required to be provided for the same.
6. **Expected Solution.** Signal to be drawn from system on failure of primary media to trigger the changeover to Secondary media and automated changeover in software to route the traffic on secondary media in affected links only.
7. **Timelines.**
 - (a) Software Conceptualization - 1 month.
 - (b) Research and Design - 1 month.
 - (c) Manufacturing of Prototype - 1 month.
 - (d) Field Trials/ User Trials - 1 month.

8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 30**SECURE MOBILE COMMUNICATION ARCHITECTURE INCLUDING
PROPHYLACTIC SECURITY WITH GEO-FENCE CONTROL-SMART PHONES**

1. **Short Title.** Secure Mobile Communication Architecture including Prophylactic Security with Geo-Fence Control-Smart Phones.
2. **User Directorate (s).** Deputy Director General of Information Technology (DDGIT).
3. **Type of Problem.** Unsolved/ Technology Infusion.
4. **What is the Problem (Need)?**
 - (a) **Statement of the Problem.**
 - (i) To implement secure mobile architecture for voice and SMS using generic mobile devices operating on Android/ iOS with Internet connectivity. The architecture should be tamper-proof and prevent bypassing of the user.
 - (ii) Ensuring information security in unit/ HQ premises by proactively controlling the smart phones, without depriving the end-user of technological benefits being harnessed for organization and personal benefits.
 - (iii) Implementation of geo-fencing on a personal mobile.
 - (b) **Evolution of the Problem.** Evolution of the challenges are as under:-
 - (i) With the enhanced usage and coverage of mobile network, mobiles are extensively utilized for communication. However, the security of info remains a concern.
 - (ii) As an information security measure, smart phones are banned in unit/ HQ premises.
 - (iii) Security concerns due to persons leaving sensitive zones with mobiles.
 - (c) **How is it Being Overcome?** Not yet overcome.
 - (d) **Suggested Innovation.** Each mobile device will be configured with an application, through which voice, SMS and file exchange will be requested. The application, through Internet accesses a Central Server providing PKI cover and initiate a secure communication. However, the following options are recommended:-
 - (i) These applications may interact with Access Machines kept in all

entry/ exit points, upon entering/ leaving. The access machines may enable or disable mobile services that are centrally controlled through the application any unregistered mobile device entering the premise may either be disabled totally or raise alarm automatically or

(ii) Application may use GPS tracker to set geo-fence and follow location once the target device leaves safety zones or enter restricted areas, geo-fence reminders notify the Commanders instantly for comprehensive security.

5. **Why it is Important to Solve?**

(a) Having secure mobile communication architecture will make our communication more dynamic.

(b) Ensuring information security without deprivation of technology.

(c) To ensure safety and security in a virtual boundary (Geo-Fence) set on a real life location to know presence/ absence whenever they enter/ leave a Geo-Fence.

6. **Contemporary Solution by other Countries.** Not Known.

7. **Timelines.**

(a) Product conceptualization - 2 months.

(b) Research and Design - 2 months.

(c) Development of Prototype - 2 months.

(d) Field Trials/ User Trials - 3-6 months.

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PROBLEM DEFINITION STATEMENT – 31**SECURING COMMUNICATIONS USING QUANTUM KEY DISTRIBUTION (QKD)**

1. **Short Title.** Securing Communications using Quantum Key Distribution (QKD).
2. **User Directorate(s).** Directorate General of Signals.
3. **Type of Problem.** Poorly solved problem and adaptation.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.**
 - (i) Many important aspects of security in our current information technology rely on encryption. Confidentiality is achieved by symmetric and asymmetric encryption techniques. Both the encryption techniques are based in turn on mathematical algorithms that are considered to be very difficult to be broken by computers based on classical physics. Most of the current algorithms with suitable key lengths (for example AES-128 & RSA-2048) are secured even when subjected to brute force attack for centuries using massive computing power.
 - (ii) Computers based on quantum physics can implement unique algorithms (for example Shor's algorithm) which will enable an exponential increase in capability and thus reduction in the time taken to break the algorithms being used currently. Asymmetric algorithms like Rivest, Adi Shamir and Leonard Adleman and Elliptic Curve Digital Signature Algorithm will be rendered useless once we have a quantum computer of sizeable quantum bits (qubits).
 - (b) **Evolution of the Problem.** An n-qubit quantum computer can simultaneously access 2^n possible configuration of key of length n. Therefore a quantum algorithm of n-bit string with simultaneous operation can in principle lead to a constructive interference towards the key that we want to break. A sizeable quantum computer will break nearly every practical application of cryptography which is in use today in days which otherwise would have taken centuries to be broken by computers based on classical physics.
 - (c) **How was it Being Overcome?** Problem not yet resolved.
 - (d) **Any innovation to Locally Overcome the Problem.** Nil
5. **Who has the Problem?**
 - (a) **Users.** Indian Army
 - (b) **Operating Environment.** Pan India operating environment both during war and peace for secure transmission of triple play services within the armed forces.

(c) **Periodicity of Exploitation.** Periodicity of exploitation is round the clock i.e. 24 X 7 X 365 days.

6. **Why it is Important to Solve?**

(a) In last few years there has been tremendous development in the field of quantum computing across the world and practical quantum computers with few qubits have already been reported due to which present encryption techniques might become useless in few years.

(b) Only way to secure communication from attacks using quantum computers is to use quantum keys. Quantum keys are generated making use of intrinsic features of the quantum science. This quantum key will have origin from the quantum mechanics with key principles like entanglement, superposition and tunnelling and will be protected by the laws of nature unlike the current keys which have mathematical origin.

(c) Developing a simple Quantum Key Distribution System (QKDS) is a first step towards securing our keys and information from attack by adversaries.

7. **Contemporary Solution by Other Country/ Organizations.**

(a) **International.** Currently China has demonstrated secured quantum communication over long distance (around 400km) with the help of quantum satellite. Though early initiatives have been from Europe, Canada, Japan, and USA, Chinese academia and military have taken up quantum technologies as their key to establish prominence in the world. They are currently way ahead of USA or Europe where initial efforts began.

(b) **National.** Department of Science and Technology (DST) has promised support to individual projects on quantum sciences and technology in the country. This will largely be in the direction of developing man power required in the country to handle future quantum technological advancements. ANURAG, a Defence Research and Development Organisation Lab has also started work in the field of QKD in a limited manner.

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PROBLEM DEFINITION STATEMENT – 32**BLOCK CHAIN TECHNOLOGY : MILITARY USAGE**

1. **Short Title.** Block Chain Technology: Military Usage.
2. **User Directorate(s).** Directorate General of Signals.
3. **Type of Problem.** Technology Infusion
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Human Resource Management in Armed Forces, personal documents/ records using Secure Data Storage.
 - (b) **Evolution of Problem.** From the day an individual joins the Armed Forces, all type of documents related to the individual are maintained viz persons file, part II orders, posting profile, career courses, Annual Confidential Report, medical documents, financial documents (payslips, Army Forces Personal Provident Fund/ Defence Service Officers Provident Fund) etc. However, various agencies maintain documents about the same individual separately with updates to these also handled separately. The same could be made better, by use of block chain technology with an underlying Secure Data Storage.
 - (c) **How it was Being Overcome?** As on date, this problem is being faced by multiple agencies and all have different ways of addressing it. Almost all have separate automated customised solutions. The problem however can have a better solution based on block chain technology.
 - (d) **Any Innovations to Locally Overcome the Problem.** There are multiple agencies dealing with types of documents pertaining to an individual.
5. **Who has the Problems?** All directorates have this problem as it pertains to documents for all individuals of the Armed Forces i.e. Officers, Junior Commissioned Officers and Other Ranks.
 - (a) **User (Skill Set).** The user base maintaining the documents are fairly trained and experienced and have the required skill set.
 - (b) **Operating Environment.** The operational environment is spread across the Army Data Network (ADN) and is controlled centrally in almost all the cases by respective administrators like record offices/ directorates.
 - (c) **Periodicity of Exploitation.** The periodicity of the problem is frequent, as the documents are pertaining to all the individuals and resolution is required for errors/ omissions on a daily basis.
6. **Why is it Important to Solve.** The documents are related to all important areas of an individual like, financial, medical, Annual Confidential Reports, leave, part II, field conduct sheet, sheet roll etc. These documents are important for the individual and

most decisions by the organisation are taken based on these documents. An improved record keeping will therefore, improve overall functioning.

7. **Contemporary Solutions by Other Countries/ Organisation**. Militaries of Russia, China and USA have invested into research on block chain technology to be used in various aspects of the military.

8. **Point of Contact**.

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- (ii) Army Headquarters Computer Centre

PROBLEM DEFINITION STATEMENT – 33**ARTIFICIAL INTELLIGENCE (AI) IN INVENTORY MANAGEMENT**

1. **Short Title.** Artificial Intelligence (AI) in Inventory Management.
2. **User Directorate (s).** Ordnance Services Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** AI in inventory management as a future enabler.
 - (b) **Evolution of Problem.** The inventory range of Indian Army varies from armament, clothing, general stores and technical stores. The Enterprise Resource Planning (ERP) being implemented by Ordnance Corps shall solve the problem of asset visibility and inventory management. However, the quantum of inventory held at each echelon and warehousing still requires manual intervention which increases the inventory carrying cost, inventory management time and causes procedural delay.
 - (c) **How is it Being Overcome?** Enabling by AI in inventory management shall reduce the timelines thereby ensuring the correct inventory to be placed at appropriate theatre in the correct time frame.
 - (d) **Any Innovations to Locally Overcome Problem.** ERP solution being implemented in a phased manner by Ordnance Services Directorate shall enable resolution of the problem. However, an AI based solution will integrate the inventory management process to the end user.
5. **Who has the Problem?** The problem of inventory management is being faced by Ordnance echelons, thereby having direct impact on Field Army.
6. **Why it is Important to Solve?**
 - (a) Reduce timelines for inventory management.
 - (b) Enhance user satisfaction.
 - (c) Theaterisation of inventory based on actual consumption.
 - (d) Reduce manual intervention.
 - (e) Huge saving to state.
 - (f) Avoids over provision.

7. **Contemporary Solutions by Other Countries/ Organizations.**

- (a) RFID enabled.
- (b) Live tracking.
- (c) Enhanced sit awareness.

8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 34**SOFTWARE BASED TERRAIN DATA UPDATION SYSTEM**

1. **Short Title.** Software based Terrain Data Updation System.
2. **User Directorate (s).** Army Design Bureau.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?** Terrain attributes especially in forward areas of Lines of Actual Control are poorly mapped. With increasing accuracy of digital maps, there is need to update existing terrain details in digital maps. This being done by physically collecting the details and feeding the data on PCs. There is a need to adopt existing technology to enable troops patrolling forward areas to use portable devices to update the terrain and topographic details. These updates can thereafter be collected at a server at unit and formation level for future use and also be used to update GIS applications.
5. **Who has the Problem?** Terrain data is required by the forward units & formations as well as military planners and decision makers.
6. **Why it is Important to Solve?** The topographic details updation is required for patrolling, movement and targeting.
7. **Contemporary Solutions by Other Countries/ Organizations.** Such technologies are widely available with armies of advanced nations. Within our country, commercial software having these capabilities are in use. However, these would require adoption of software and hardware for use by us.
8. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 35**HIGH ASSURANCE TESTING FOR HARDWARE**

1. **Short title.** High Assurance Testing for Hardware.
2. **User Directorate (s).** Director General of Signals.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Military equipment has variety of electronic hardware procured from manufacturers and suppliers from around the world. To ensure security, it is essential to ascertain that the imported hardware is free of embedded malware, backdoor and hidden processes and can be relied upon to operate in hostile cyber environment. There is a need to have “High Assurance Test” capability to test all electronic hardware for embedded malware, backdoor and hidden processes.
 - (b) **Evolution of Problem.** With increasing level of miniaturisation and complexity of the equipment, besides the dependency of Indian Armed Forces on imported equipment, there is an increasing threat to communication equipment from embedded malware. This has been compounded by the fact that origin of large amount of electronic circuitry being used in communication equipment is of Chinese origin.
 - (c) **How it was Being Overcome?** At present vendor certification is being used to preclude infection of communication equipment with embedded malware.
5. **Who has the Problem?** All branches of the Army with communication equipment.
6. **Why it Important to Solve?** The threat of embedded malware can infest during operations causing disruption/ degradation in communication/ IT equipment. The embedded malware may also leak out vital information without the knowledge of user even in peacetime.
7. **Contemporary Solutions by other Countries/ Organisations.** Most advanced nations have their national laboratories certifying that the communication/ IT equipment is malware free before employing these with Armed Forces.
8. **Timelines.**
 - (a) Design and Devp - 12 Months.
 - (b) Fielding - 12 months.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 36**ACCLIMATIZATION FOR HIGH ALTITUDE DEPLOYMENT**

1. **Short Title.** Acclimatization of Troops for High Altitude Deployment at Lower Altitude.
2. **User Directorate(s).** Infantry Directorate.
3. **Type of Problems.** Poorly solved.
4. **What is the Problem (Need)?** Indian Army is deployed in high altitude areas in Northern and Eastern borders. Some unit have dual roles in such areas whereas the current deployment of these units is at lower altitude, but in case of urgent operational requirements these units would be required to deploy in high altitude with minimal delay. For achieving this state of readiness it is imperative that the troops remain acclimatised at all time.
 - (a) **Statement of Problem.** The present acclimatization process involves three stages of acclimatization. The process is time consuming and requires adequate infrastructure and open areas for troops. Hence, there is a need wherein the troops are acclimatized on regular basis at low altitudes or at area of their current deployment.
 - (b) **How is it Being Overcome?** The problem is being overcome by undergoing acclimatization by physically staying at prescribed altitude for fixed duration of time.
 - (c) **Any Innovations to Locally Overcome the Problem.** No.
5. **Who has the Problem?** The problem is faced by all soldiers, who are going to operate in high altitude areas and presently deployed in the plains or at lower altitudes.
6. **Why it is Important to Solve?** To improve the operational preparedness and to react to any emergency requirement in shortest time frame.
7. **Contemporary Solution by Other Countries/ Organizations.** Presently, few countries are using technology wherein the troops deployed in low altitude are acclimatised at all times for high altitude deployment. The technology is based on 'Live Low Train High' concept, where in there Altitude Simulation Tent/ Altitude Simulation Room or Mask based Hypoxicator system. These Simulation Tents/ Simulation Room have similar barometric pressure as well as reduced oxygen content as found in high altitude areas. The troop are made to undergo training in this simulated environment thus making them acclimatised for high altitude deployment.
8. **Timelines.** One to two years for designing of prototype and testing.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 37

FUEL, OIL AND LUBRICANTS STORAGE IN OPERATIONAL CONDITIONS

1. **Short Title.** Storage of Fuel, Oil and Lubricants in Operational Conditions.
2. **User Directorate(s).** Directorate General of Supply and Transport.
3. **Type of Problem.** Storage of fuel, oil and lubricants.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The Army provides bulk petroleum to all land based forces in a theater of operations and most of the fuel, oil and lubricant units in field are required to establish a Petroleum Point for this purpose. Depending on the size of the operation, this may mean that several thousand litres of fuel must be received and stored each day, which is susceptible to enemy shelling and terrorist action. To accomplish this task, petroleum units have to quickly establish large, fire resistant fuel storage and dispensing systems. Presently this is being done by using barrels and jerricans which have limited storage capacity and are also vulnerable to fire.
 - (b) **Evolution of the Problem.** Old vintage barrels and jerricans being used for storage and transportation of fuel, oil and lubricants in operational conditions are susceptible to enemy artillery shelling and terrorist actions.
 - (c) **How is it Being Overcome?** Army has been using small containers like jerricans, barrels and containers for lubes and greases for storage of fuel, oil and lubricant products.
 - (d) **Any Innovations to Locally Overcome the Problem.** Nil.
5. **Who has the Problem?** Army Supply Corps deployed in operational areas.
6. **Why it is Important to Solve?** The collapsible fabric petroleum tanks are the best alternative. Technological advances in materials and fabrication techniques led to the manufacture of larger and lighter fabric tanks made from thinner thermoplastic urethanes, which are fire resistant. The new technology permitted development, manufacture and fielding of collapsible tanks with a capacity of over 50,000 litres. These tanks can be deployed rapidly and recovered using fewer personnel and equipment. Collapsible Storage Tanks are constructed from heavy duty, reinforced fabric that allows them to be rolled into compact, transportable units. Once deployed, they are simply unrolled filled on site. The quantity and the mode of transport will depend on the operational terrain and must be capable of being dropped with or without parachute.
7. **Contemporary Solution by Other Countries/ Organisations.**
 - (a) **Pillow Tanks.** These are inexpensive temporary containers utilized for a variety of fuels by NATO forces.

(b) **American Marine Pillow Tanks.** These are collapsible storage containers that provide temporary, as well as, long term liquid storage. They are versatile in usage, both for land based and air drop operations.

(c) **Quick Tanks-Open Top Aluminium Frame.** Quick Tank has a robust aluminium frame that supports the open top liner. A choice of fabrics and sizes make the Quick Tank an affordable solution for storage needs. The Quick Tank is a complete portable storage solution developed for rapid deployment and storage of liquids under extreme temperature conditions.

8. **Timelines.** Research, manufacture of prototype and trials to be completed in one year.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT – 38**DESIGN OF MODULAR REINFORCED CEMENT CONCRETE (RCC) STRUCTURES**

1. **Short Title.** Design of modular Reinforced Cement Concrete Structures.
2. **User Directorate(s).** Directorate General of Combat Engineers.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Engineers have to construct underground structures at High Altitude between 9000 to 13000 feet. The rarified atmosphere makes the transportation of stores to such locations is difficult. In addition construction at such altitudes is time consuming considering that framework and other materials have to be carried to the site. A number of such structures have to be completed within the working season and consequently the teams keep on moving from locale to locale repeating the process. The same can be simplified if modular structures are created, transported and joined at the site. Issues of strength of Reinforced Cement Concrete Structures and seepage also need to be addressed as the structures will finally be put together employing a jigsaw approach.
 - (b) **Evolution of the Problem.** Recurring issue when carrying out construction of large number of Reinforced Cement Concrete Structures in High Altitude Area.
 - (c) **How it was Being Overcome?** The cumbersome approach of transporting men and material to each site is being undertaken.
5. **Who has the Problem?**
 - (a) **User (Skill Sets).** Problem is being faced by Engineers.
 - (b) **Operating Environment.** High Altitude Areas.
6. **Why it is Important to Solve.** High Altitude Areas have limited routes and approaches. In many places transportation of stores is difficult. The problem is further exacerbated by the limited working season available, inadequate curing period and the vagaries of weather. A modular approach where Reinforced Cement Concrete structures are constructed, cured and then transported to locales may solve some of the issues.
7. **Contemporary Solutions by Other Countries/ Organisations.**
 - (a) Construction of flyovers where structures are precast and brought to site.

- (b) Pre-cast structures airlifted to sites.

8. **Timelines.**

- (a) Feasibility Study - Two months.
- (b) Technology Solution - Three months.
- (c) Implementation - Based on success achieved.

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PROBLEM DEFINITION STATEMENT – 39**SMARTISATION OF ANTI INFILTRATION OBSTACLE SYSTEM (AIOS)**

1. **Short Title.** Smartisation of Anti Infiltration Obstacle System (AIOS).
2. **User Directorate(s).** Infantry.
3. **Type of Problem.** Partially Solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The existing AIOS was erected in 2003-05 along the Line of Control (LC) to prevent terrorist infiltration. It is essentially a physical barrier, the entire stretch of which has to be physically manned by our soldiers 24x7, to achieve the desired results which in terms of human resource and capability is extremely demanding. The smartisation of the AIOS as per new technology including cameras & sensors incorporating better surveillance features and Artificial Intelligence, suitably integrated to provide a coherent picture will contribute immensely in further enhancing the effectiveness of the AIOS.
 - (b) **Evolution of Problem.** Preventing trans-border infiltration is essential for eradicating terrorism. Accordingly, an AIOS was conceived and entire stretch has to be physically dominated to enhance its efficacy requiring large numbers of human resources. Smartisation of the AIOS will enable overcoming this challenge as well as enhance its efficacy.
 - (c) **How is it Being Overcome?** Presently, the existing LC Fence (AIOS) is dominated physically by troops with employment of surveillance devices available with units. To establish surveillance grid or integration of the existing resources to provide a coherent picture is a challenge.
 - (d) **Any Innovations to Locally Overcome Problem.** By employment of surveillance devices/ resources available with the Units and may vary from sector to sector.
5. **Who has the Problem?**
 - (a) **User (Skill Sets).** Infantry.
 - (b) **Operational Environment.** A combination of Hill Sector, Jungles and undulating terrain interspersed with nallahs and High Altitude Area. Project to be implemented in a phased manner based on priority of sectors and ground requirements.
 - (c) **Periodicity of Exploitation.** Throughout the year.

6. **Why it is Important to Solve.** Preventing infiltration by exploiting the new surveillance technologies is essential to effectively counter terrorism.

7. **Contemporary Solutions by Other Countries/ Organizations.** Few of the projects being implemented world over are Smart Fence by Israel and Border Fence between United States and Mexico.

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PROBLEM DEFINITION STATEMENT – 40**FIRE FIGHTING SYSTEM IN HIGH ALTITUDE AREA (HAA)**

1. **Short Title.** Requirement of Fire Fighting Measures in HAA.
2. **User Directorate(s).** Ordnance Services Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** The provision of fire fighting in the ammunition echelons located in HAA is based on the existing Static Water Tanks (SWTs). The water from these SWTs is pumped using portable fire pumps, however, due to the inclement weather and extreme cold climate, the water freezes and a layer of ice is formed above the water of thickness upto 500mm.
 - (b) **How it was Being Overcome?** To obviate the problem, anti-freeze solutions are used. However, the same have not been successful due to large volume of water involved.
 - (c) **Any Innovations to Locally Overcome the Problem.** Nil.
5. **Who has the Problem?** Units in HAA.
6. **Why is it Important to Solve?** Ammunition Points hold ammunition in large quantities. In order to contain the fire hazard, it is essential that immediate Fire Fighting actions are taken, however due to the freezing of the stored water, breaking of the top layer of ice is cumbersome and entails delay. Local arrangements and modifications attempted in the past in conjunction with CFEES and MES to resolve the problem have not been successful.
7. **Contemporary Solution by Other Countries/ Organisations.** Not known.
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PROBLEM DEFINITION STATEMENT – 41**SMART AIR DEFENCE OBSERVATION POST (ADOP)**

1. **Short Title.** Smart Air Defence Observation Post (ADOP).
2. **User Directorate (s).** Directorate General of Army Air Defence.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Without an integral radar system with the Strela, early warning by ADOP is a crucial factor in target engagement. Presently, there is need for parallax corrected early warning and robust, hand held means of communication, incapacitate the ADOP to a major extent.
 - (b) **Evolution of Problem.** With the fast advancement in battle field technology, the ADOPs need to cope with the advanced air threat. Visual acquisition by limited range ordnance issued binoculars need to be evolved with thermal imager enabled sighting equipment with optical zoom and range finding capability. Helmet mounted communication system which is secure and encoded would enhance operational efficiency of ADOPs. Light weight line dispenser with hand held terminal equipment needs to be incorporated to reduce overall load of ADOP. A smart OP necessitates a parallax corrected early warning to be passed at weapon end. Therefore, a GPS enabled Personnel Digital Assistant (PDA) with auto updation at weapon end is also required.
 - (c) **How is it Being Overcome?** The importance of a smart ADOP has increased with the emergence of asymmetric threat platforms (drones, micro light aircrafts, hand gliders balloons etc). Presently, the ADOP with limited capability are being employed for the said task.
5. **Who has the Problem?** Army Air Defence units
6. **Why it is Important to Solve?**
 - (a) Improve reaction capability.
 - (b) Real time transmission of early warning.
 - (c) Improved Communication.
7. **Contemporary Solutions by Other Countries/ Organizations.** Not Known.

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PROBLEM DEFINITION STATEMENT – 42**FLIGHT PROCEDURE TRAINER USING VIRTUAL REALITY (VR)**

1. **Short Title.** Flight Procedure Trainer using Virtual Reality (VR).
2. **User Directorate (s).** Directorate General of Army Aviation.
3. **Type of Problem.** Poorly solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Virtual Reality technology should be employed to train aviators in flight procedures on ground.
 - (b) **Evolution of Problem.** Army helicopter pilots need regular training in various procedures related to actual flying. Use of flight simulators can meet their training requirements. However, with the prohibitive cost of actual flying and very limited access to flight simulators, there is a need for a cost effective means to train the pilots.
 - (c) **How is it Being Overcome?** Presently, aviators are trained on flight procedures by practising these procedures in a serviceable aircraft on ground.
5. **Who has the Problem?** Aviators need to practice flight procedures on ground to optimise the learning value of the live sortie missions flown by them. While practicing the flight procedures on a serviceable aircraft on ground solves the problem to a certain extent employment of Virtual Reality technology will surely enhance the level of preparedness prior to undertaking a live sortie mission. Virtual reality technology can also be employed for simulating bad weather conditions as well as for practicing emergency situations which cannot be simulated in live sorties.
6. **Why it is Important to Solve?** In the absence of a simulator, it is important to solve the problem as aviators are graduating to live sortie missions with inadequate training in flight procedures on ground. Solution of this problem will enhance proficiency of pilots and enhance safety in flying operations.
7. **Contemporary Solutions by Other Countries/ Organizations.** Virtual Reality Simulators of commercial/ training aircrafts are available in the open market. A virtual reality Simulator to meet the requirements of service aircraft needs to be developed indigenously.

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PROBLEM DEFINITION STATEMENT – 43**RUBBERISED TRACKS FOR ARMOURED FIGHTING VEHICLES (AFVs)**

1. **Short Title.** Rubberised Tracks for Armoured Fighting Vehicles (AFVs).
2. **User Directorate (s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Unsolved problem.
4. **What is the Problem (Need)?** Steel tracks on current fleet of AFVs are heavy and prone to noise and vibration leading to crew fatigue. They also cause damage to roads/tracks affecting the move of follow up / logistic echelons.
5. **Who has the Problem?** Mechanised forces and all other arms & services using AFVs.
6. **Why it is Important to Solve?** Replacement of steel tracks by rubberised tracks will accrue the following advantages:-
 - (a) Reduction of noise and vibration leading to reduced crew fatigue.
 - (b) Increased speed and fuel economy.
 - (c) Life cycle cost.
 - (d) No damage to roads/tracks.
7. **Contemporary Solutions by Other Countries/ Organizations.** Rubberised tracks are being utilised by the Danish and Norwegian army on AFVs upto 20 Ton class (M-113 & CV-90) operating in Afghanistan. Trials have also been carried out on a Leopard-1 chassis in Canada with rubberised tracks._
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PROBLEM DEFINITION STATEMENT – 44**TRACKED SNOW REMOVER**

1. **Short Title.** Tracked Snow Remover.
2. **User Directorate (s).** Army Design Bureau.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)?** High Altitude Areas (HAA) receive heavy snowfall during winter months which adversely affects move of vehicles and troops. In order to keep the lines of surface communication open, engineer plant effort is employed towards removal of snow. Presently, two types of equipment are available with Border Roads Organisation (BRO)/ Formation Engineers for removal of snow from roads/operational tracks, namely Snow Remover Blower (for removal of soft snow) and Dozer (for removal of both soft and solidified snow). Both these equipment though effective, have major limitation once the snow solidifies. It is therefore, felt that a Tracked Snow Remover be designed and developed which should be able to break the solidified snow on the road surface and blow it away on the sides thereafter
5. **Who has the Problem?** Engineer/ BRO detachments deployed in HAA.
6. **Why it is Important to Solve?** Induction of Tracked Snow Remover will enhance own mobility during inclement weather. Since the proposed equipment will be able to remove both loose and solidified snow from the roads/ operational tracks, it will also result in economy of effort besides causing minimum damage to the surface of the roads/ operational tracks. Availability of the proposed equipment will provide impetus to formation efforts in keeping the roads/ operational tracks open by faster clearance of snow thus facilitating move of vehicles and troops even in inclement weather conditions.
7. **Contemporary Solutions by Other Countries/ Organizations.** Not Known.
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PROBLEM DEFINITION STATEMENT – 45**CHEMICAL SOIL STABILISATION**

1. **Short Title.** Chemical Soil Stabilisation.
2. **User Directorate (s).** Combat Engineers Directorate.
3. **Type of Problem.** Poorly Solved.
4. **What is the Problem (Need)?**
 - (a) **Statement of Problem.** Stabilisation is a key challenge for executing operational tasks such as track laying, construction of helipads, air strips/ landing areas etc in operationally critical time ranges in varied terrain conditions.
 - (b) **Evolution of Problem.** Construction of operational tracks in the deserts for movement of logistics is the key to success in any operation in the deserts. Also important is the construction of helipads/ air strips under varied terrain conditions including in the deserts and stabilization of landing areas on banks and beaches of water bodies. These tasks are required to be executed in operationally challenging timelines. For these and certain other miscellaneous important tasks effective soil stabilization is the gateway to timely execution.
 - (c) **How is it Being Overcome?** With no effective chemical mechanism available, soil stabilization is for extremely limited duration using water/ used engine oil, and the varied equipment are employed for execution of tasks above.
 - (d) **Any Innovation to Locally Overcome Problem.** Usage of used oil or lubricants to achieve efficacy on a very small scale.
5. **Who has the Problem?** The problem is being faced by the Corps of Engineers both in peace and war while undertaking tasks described at Para 4 (a) above.
6. **Why it is Important to Solve?** Successful chemical soil stabilization would go a long way to substantially reduce timings for execution of above tasks including under operational conditions and immense savings in respect of cost, manpower and effort.
7. **Contemporary Solutions by Other Countries/ Organizations.** Solutions to some limited extent have been developed using chemicals such as Lime, Calcium Chloride, Sodium Silicate etc.

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PROBLEM DEFINITION STATEMENT – 46**LAND SLIDE ARRESTER**

1. **Short Title.** Land Slide Arrester.
2. **User Directorate (s).** Army Design Bureau.
3. **Type of Problem.** Poorly Solved.
4. **What is the Problem (Need)?** High Altitude Areas (HAA) have limited lines of surface communication. The terrain is rugged and has loose soil. The area of responsibility witnesses heavy rain and snowfall in monsoon and winter months respectively. These factors coupled with lack of vegetation in the higher reaches, leads to frequent landslides resulting in blockage of roads and operational tracks. The present methodology of construction of retaining walls with cement/ RCC or by chain link cages/ Hescobastion Bags provide protection to the unstable soil with height ranging from two to four meter. The unstable soil above the height of four meter needs to be stabilized using some innovative method. Therefore, there is an urgent need to design a Land Slide Arrester which will be able to hold the unstable soil/ rocks thus preventing landslides.
5. **Who has the Problem?** Troops deployed in HAA.
6. **Why it is Important to Solve?** Availability of Land Slide Arresters will contribute significantly towards long term stabilization of landslide prone areas leading to prevention/ reduction of landslides thus resulting in enhancement of operational efficiency due to hindrance free move of vehicles, troops and stores in HAA.
7. **Contemporary Solutions by Other Countries/ Organizations.** The Land Arrester comprises of cross bars, wire mesh, specialised grass & chemical spray.
8. **Point of Contact.**

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