



Confederation of Indian Industry

ARMY DESIGN BUREAU

COMPENDIUM OF PROBLEM DEFINITION STATEMENTS - VOLUME III (2018)





सत्यमेव जयते

रक्षा मंत्री
भारत
MINISTER OF DEFENCE
INDIA

D.O. No. 6419/RM/2017



MESSAGE

The Indian Army is rapidly transforming into a contemporary force to meet complex future challenges. Leveraging technological advantage remains central to all perspective plans undertaken for force modernisation. Consequently, the Army has launched a unique and inclusive effort through the Army Design Bureau to synergise the efforts of Academia, Industry and R&D establishments to nurture homegrown technologies. Our endeavours can only fructify if we invigorate contemporary war fighting concepts with niche and disruptive technologies developed indigenously.

In pursuant to these initiatives, the Indian Army has compiled the third volume of Problem Statement Compendium. Appreciate the untiring efforts for identifying such contemporary issues and also hopeful that these efforts would enable all stakeholders to focus on the 'real needs of Indian Army'.

'Jai Hind'

(Nirmala Sitharaman)

Date: 26th Dec, 2017
Place: New Delhi



MESSAGE

Leveraging technology is central to all our plans for force modernization and capability development. We need to harness the efforts of our strong academia and a reasonably well developed defence industrial base to create indigenous solutions and give us a decisive combat edge over the adversary.

Towards realizing the 'Make in India' initiative, the Indian Army established the Army Design Bureau(ADB) last year. The Bureau, has been able to establish close linkages and synergize the efforts of the industry, DRDO and academia in finding indigenous solutions to operational challenges being faced by the Indian Army.

The previous two volumes of Problem Statements have been received well by the Academia and Industry. I am confident that the third volume of Problem Definitions being released today would further catalyze the indigenous efforts of research, development and equipment induction into the Indian Army. Let us march together to enable world class solutions to build a robust and responsive defence industrial base.

'Jai Hind'

(Bipin Rawat)
General

संजय मित्रा
रक्षा सचिव
Sanjay Mitra
Defence Secretary



भारत सरकार
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Government of India
Ministry of Defence



MESSAGE

The 'Make in India' initiative aims to enhance the manufacturing base in the nation and provide greater employment opportunities. It will enable us to strengthen critical sectors which require infusion of technology. The indigenous defence industry and our armed forces are expected to benefit.

I am confident that close synergy between the users, the industry, the R&D establishments and the academia through the Army Design Bureau will lead to a better understanding of the operational needs and translate into viable, affordable and effective indigenous weapon systems and technologies. The publication of the third volume of 'Problem Definition Statements' will provide the academia, the R&D establishments and the industry with a clearer understanding of challenges faced by soldiers in the field. I hope that this will lead to implementable solutions in the very near future.

'Jai Hind'

Sanjay Mitra
(Sanjay Mitra)

***New Delhi,
December 28, 2017.***

डॉ. एस. क्रिस्टोफर
Dr. S. Christopher



अध्यक्ष, डीआरडीओ
व
सचिव, रक्षा अनुसंधान तथा विकास विभाग
Chairman, DRDO
&
Secretary, Department of Defence R&D



MESSAGE

The '**Make in India**' initiative of the government is focused towards self reliance and increasing the defence manufacturing base. This initiative will not only reduce the dependence of India on import of defence equipment but also act as an encouragement to the MSMEs and for ease in doing business etc.

The closer interaction between the Army and Industry through the Army Design Bureau will lead to great synergy. I am sure that this platform will provide opportunity to user and industries to identify and deliberate on problems leading to apt solutions.

'Jai Hind'

(Dr S Christopher)



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MESSAGE

Indian Army is marching towards greater modernisation in order to fulfil its role in the future battlefield milieu. **The Intent** is to have enhanced operational readiness to safeguard the nation's interest from external and internal threats, as well as to supplement national endeavour towards socio-economic growth.

The Indian Army needs to focus on long term capability development which is sustainable over decades. By progressing '**Make-in-India**' initiatives and promoting indigenization, in keeping with the operational requirements of the Army, we should be able to build a robust defence ecosystem in the country. In this **the Armed Forces, DRDO, Academia and Industry Partners** will together enable a common National Goal - **Building India's Hard & Soft Power**.

To effect this goal, the Indian Army has been projecting its operational requirements during interactions at various forums. To bring our needs into focus, the '**Compendium of Problem Statements-Vol III**' has been prepared and is being disseminated to the environment. It will assist all our stakeholders to synergise their efforts and develop our capacities in defence technologies and related equipment. This will thus propel the nation's defence on the path of true self reliance.

'Jai Hind'

(Sarath Chand)
Lieutenant General
Vice Chief of the Army Staff



MESSAGE

India is emerging as a new hub for defence production. With India's growing security needs, the defence manufacturing sector provides a great opportunity for investment.

Favourable government policies have in the recent past promoted self-reliance, indigenisation of technology, upgradation and increased economics of scale. DPP 2016 has created better opportunities for investment in the defence sector, particularly through the re-energised '**Make**' procedure. The strategic partnership model enunciated in the policy will further enable this vital sector.

Greater interaction of Army with Industry and Academia through the projection of problem statements and their solutions is a welcome step and will lead to better understanding between the stake holders.

'Jai Hind'

(Dr Ajay Kumar)

Secretary, Defence Production



Confederation of Indian Industry



MESSAGE

Modernisation and capability development through indigenous technology is an imperative for a nation's Army to meet its strategic expectations. This calls for a vibrant and responsive defence sector to keep pace with the needs of the Army.

The setting up of the Army Design Bureau has provided an institutionalized interface between the Army, Industry and Academia to share each other's requirements, capabilities and concerns. It will strengthen the efforts of the Army and Industry to achieve self-reliance in defence manufacturing, in sync with the 'Make in India' initiative.

The compilation of the third volume of 'Problem Statements' by the Indian Army is a commendable effort to share its requirements with the academia and the defence industrial base for creating indigenous solutions. It will facilitate a comprehensive insight into the challenges faced by the Army and the opportunities it offers to the Academia and Industry.

Confederation of Indian Industry is committed to supporting the "Make in India" program and welcomes this initiative. I would also like to compliment the Society of Indian Defence Manufacturers, for this first public endeavour since its formation, in partnership with the Indian Army.

A handwritten signature in blue ink, appearing to read 'Chandrajit Banerjee', written over a light blue grid background.

Chandrajit Banerjee
Director General, CII



MESSAGE

To march towards self-reliance in defence manufacturing and align with the 'Make in India' initiative of the Prime Minister of India, the Indian army has taken great strides in all strata of inclusive Capability development in the Country. It has exemplified its faith by launching the maximum number of 'Make' projects in recent years. It has also amply compiled the third "Compendium of Problem Statements" guiding the industry towards the need of the future for defence preparedness. The Indian Industry's strategic involvement will not only help in realizing the indigenization plans of the Indian Army and other services, but its inherent capabilities can also contribute towards building modern and best-in-class weapon systems, strengthening our forces.

The Army Design Bureau has an effective interface with the Academia, R&D agencies and the defence Industry, which is a major step towards operationalisation and execution of the commitment of 'Make in India' and self-reliance in Defence.

I must congratulate the Indian Army for putting together this 'Compendium of Problem Statements - Volume III' through the Army Design Bureau. On behalf of the Indian Industry and the Society of Indian Defence Manufacturers (SIDM), I would like to once again thank the Indian Army for their initiatives and assure the industry's continued support in realizing their goals of achieving self-reliance.

'Jai Hind'

A handwritten signature in black ink that reads 'Baba Kalyani'.

Baba Kalyani
President, SIDM



MESSAGE

Technology plays an important role in enhancing military capability. Formation of the Army Design Bureau last year is testimony to the Indian Army's efforts to achieve self-reliance by partnering with Academia and Industry in developing indigenous solutions for defence capability.

The Compendium of Problem Statements Volume III is another outstanding effort of the Indian Army wherein live issues have been compiled for Scientists and Engineers to take up the challenge and find indigenous solutions.

On behalf of SIDM, I would like to affirm our commitment to the initiatives of the Ministry of Defence and the Indian Army. I firmly believe that with collaborative effort of the Users, Policy Makers, Industry and Academia, 'We will Win India's Wars with Indian Solutions'.

'Jai Hind'

A handwritten signature in blue ink, consisting of a stylized 'S' followed by 'aha' and a long horizontal stroke.

Lt Gen Subrata Saha, PVSM, UYSM, YSM, VSM(Retd)**
Director General, SIDM and Principal Adviser, CII

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PROBLEM DEFINITION STATEMENT - 79

PASSIVE PROTECTION SYSTEM FOR ARMoured FIGHTING VEHICLES

1. **Short Title.** Passive Protection System for Armoured Fighting Vehicles.
2. **User Directorate(s) / Establishment.** Mechanised Forces Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** The present Armoured Fighting Vehicle protection system is based on integral armour, ERA panel and smoke dischargers, which are obsolete and require upgradation. There is a need to develop passive protection system for Armoured Fighting Vehicles based on reduction of thermal/ electronic signature and EW sensors.
 - (b) **Evolution of Problem.** The modern Armoured Fighting Vehicles have superior armour protection based on advanced armour concept. However, proliferation of new generation Anti-Tank Guided Missiles (ATGMs) and the wide use of hand held anti – tank rifle grenade such as Rocket Propelled Grenade (RPG) pose threat to even heaviest protected vehicle, as attacks are carried out at close range from all direction. Protection all around by armour alone becomes too heavy even for the heaviest tanks. Hence, the current operational scenario mandates continuous modernisation of tanks to compete with the enemy Mechanised Forces and to have passive protection against ATGMs/RPG. The current Armoured Fighting Vehicles protection system is obsolete and requires to be supplemented by passive protection system based on EW sensors capability of defeating guidance system of modern Anti-tank weapon systems.
 - (c) **How is it being Overcome.** By use of integral armour, ERA panels and smoke dischargers which are obsolete.
 - (d) **Any Innovations to Locally Overcome the Problem.** Nil.
5. **Who has the Problem.** Mechanised Forces of Indian Army.
6. **Why it is important to solve?** The present Armoured Fighting Vehicle protection system is based on integral armour, ERA panels and smoke dischargers, which are obsolete keeping in view the modern Anti-tank weapon system. Development of passive protection system based on EW sensors capable of defeating guidance sys of modern Anti-tank weapon system is thus essential. Passive system is a low cost option as compared to active protection system.
7. **Contemporary Solution by Other Countries/ Orgs.** Modern Armies of the world are progressing on to Active Protection system which is an expensive proposition.
8. **Timelines.** Mid Term project (5-10 years).

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT-80

INERT TRAINING AMMUNITION FOR MECHANISED FORCES

1. **Short Title.** Inert training ammunition for mechanised forces.
2. **User Directorate(s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need).** Evolution of AFV weaponry and allied system has ensured greater First Round Hit Probability (FRHP) at longer ranges with much greater lethality. However, to optimize the equipment capability, there is a need to train the man behind the machine. It is therefore imperative that gunners get continuous practice, which is not feasible in the present scenario due to various reasons.
 - (a) **Statement of Problem.** Presently, AFV gunners firing practice is limited to only once a year. Even in such a scenario, to negate the shortage of live training ammunition for firing practice, gunners must be facilitated firing practice using inert ammunition.
 - (b) **Evolution of the Problem.** To increase FRHP, it is important that a seamless combination of modern Fire Control System with exceptionally high gunnery skills is ensured. While modern gun system facilitate gunners in achieving better results, the human factor is and will always remain the deciding element. Hence, AFV gunners need to continuously practice on gunnery skills.
 - (c) **How it was Being Overcome.** Mechanised Forces are practicing gunners through Simulated Fire, Field Miniature Range (FMR) training and simulators. These serve as an alternate to live ammunition firing practice but fall short of desired training objectives under battlefield conditions.
 - (d) **Any Innovations to Locally Overcome the Problem.** At present, there are no innovations to overcome the problem. Simulated Fire, FMR and simulators are institutionalized means to provide gunnery practice, however these only achieve limited training objectives in view of lack of element of realism.
5. **Who has the Problem.**
 - (a) **User.** An AFV crew comprises of commander, gunner and driver. While the driver is concerned with the movement/manoeuvre of the AFV, the gunner operates the weapon system to bring about maximum damage/destruction of the enemy. The AFV commander is the crew commander & commands both driver & gunner to achieve the tactical objectives/aims. Training/practice under battlefield conditions will lead to achievement of laid down training objectives.
 - (b) **Operating Environment.** Requirement of inert ammunition by Mechanised Forces spreads across all kinds of terrain i.e. High Altitude Area, Obstacle Ridden Terrain and deserts. It shall be needed across the entire spectrum of conflict like conventional, sub conventional & irregular Warfare.
 - (c) **Periodicity of Use.** Most modern weapon system are safe to dry fire, but there are some notable exceptions. However, modern metallurgy has enabled inert ammunition firing with out risk of damage to the weapon system. The inert ammunition is proposed to be used in all training cycles to include field firing and tactical training, if permissible

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

- (a) **Natural Progression to Simulator Training.** Simulator training has long served as a cheap and effective alternate to live ammunition firing training. However, it suffers from a few inherent drawbacks such as requirement of dedicated power source, conditioned environment and regular maintenance etc. The major drawback of simulator training is lack of realism in training. Hence, use of inert ammunition as an alternate means to live firing enhances the proficiency level of gunners and is thus a natural progression to simulator training.
- (b) **Firing Practice for Gunners.** Inert ammunition is an ideal modern training aid which is very useful to impart near realistic training. It is ideally suited to provide firing practice to tanks/ICV gunners with out actually firing live ammunition
- (c) **Saving of Ammunition.** As an alternate to training ammunition of various calibre, especially in respect of 125mm APFSDS rounds, inert ammunition of the same calibre and specifications can be utilized to provide realistic training practice to gunners. The inert ammunition would provide gunners with element of realism akin to live firing. It would thus entail saving of training ammunition by being a low cost alternative to use of live ammunition.
- (d) **Weapon Function Check.** Inert ammunition can serve as an ideal means to check functioning of weapon platform. Development of inert ammunition with similar weight and dimensional characteristics of live ammunition may be used to check the components of the armament accessories.
- (e) **Crew Training.** Training in respect of belting (ICVs), loading and dry firing practice can be provided to tank/ICV crews without use of live ammunition which may sustain damage owing to continued use/practice. Besides this, fault finding training can also be imparted to the crew using inert ammunition where the crew can get training on removing routine faults development while firing of the armament.
- (f) **Training Aid.** Besides training value, inert ammunition also lends itself to purpose of demo and has ease of availability/access/ storage. The ammunition due to its inert nature doesn't need any specialized storage environment. It can easily be issued, used and reused for purposes of demonstration/training for a class. Apart from this, it can also be used to train crew in ammunition identification.

7. **Contemporary Solutions by Other Countries/Organisations.** The following inert ammunition is in vogue in various countries for training of AFV gunners:-

- (a) US – Dummy round 120mm APFSDS-T
- (b) US – Dummy round CTG 120mm HEAT-MP-T
- (c) UK – Dummy round 30mm Vulcan, GAU-8 with inert yellow/red filling.
- (d) UK – Dummy round 30mm L21A1 RARDEN practice ammunition.
- (e) Israel – Dummy round 60mm IMI APFSDS-T ammunition.

8. **Timelines.**

- (a) **Product Conceptualization.** 6 months.
- (b) **Research & Development.** 6 months.

- (c) **Prototype Manufacture.** 6 months.
- (d) **User Trials.** 6 months.

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PROBLEM DEFINITION STATEMENT- 81

PROCUREMENT OF NEW GLOW SYSTEM FOR BOFORS 155 MILLIMETER FIELD HOWITZER 77 B 02

1. **Short Title.** Procurement of new glow system for 155/39 calibre Bofors Gun
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** The Bofors gun system has served the nation for over three decades and during this period, the gun system was used extensively in conventional operations in High Altitude Areas. However, the glow system of the gun which is used for starting it in extreme cold climates works on a power supply of 24V. This is provided by two 12 V batteries in the gun. During low temperatures the efficiency of these batteries drops and starting the gun becomes a major problem. Hence, a new glow system which works on a lesser power supply will resolve the problem.
 - (b) **Evolution of the Problem.** As the original batteries were used in the beginning there was no problem initially. After the original batteries were replaced by the ones purchased locally, the problem surfaced in all Bofors units deployed in high altitude area.
 - (c) **How it was Being Overcome.** It was being overcome by keeping the batteries of the gun in bunkers where the temperature was more than that outside. Whenever the gun was to be started the batteries were taken to the guns and the glow system was used to start the gun.
5. **Who has the Problem.**
 - (a) **User (Skill Sets).** Units holding the equipment.
 - (b) **Operating Environment.** Both in the Northern & Eastern Sectors of the country.
6. **Why it is Important to Solve.** It is important to solve because in operations, guns are required to move to alternate gun areas at extremely short notice. If the engine of the gun has problems in starting then it would affect the speed of moving to alternate gun areas thus exposing the gun to enemy counter bombardment.
7. **Contemporary Solutions by Other Countries/Organisations.** The Bofors gun system uses an older generation of engines in which the operator did not simply key the gun to start position but first flips a switch to activate a glow plug. Modern engines use a glow plug as an integral part of the ignition system (not only for cold start) which is more reliable than a glow plug used only for ignition as in Bofors gun system.
8. **Timelines.**
 - (a) Development of System - 06 months.
 - (b) Prototype & Trials - One Year.

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PROBLEM DEFINITION STATEMENT - 82

DEVELOPMENT OF TITANIUM BASED LIGHT WEIGHT 120 MM MORTAR

1. **Short Title.** Development of Titanium Based light weight 120 mm Mortar. Certain modifications to the existing 120 mm Mortar manufactured by Ordnance Factory Board would be required to be made such as manufacturing of the Base Plate and Mount from titanium alloy.
2. **User Directorate(s).** Directorate General of Artillery
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** 120 mm Mortar is being employed extensively in mountains to provide artillery support especially in areas those are inaccessible by Field (Towed) Artillery. Presently the complete weight of the gun along with its sight and accessories is 421 Kgs. To be carried manually the gun is to be dismantled into three parts and requires a detachment of five personnel to ferry the equipment. Thus the weight to be ferried by each person is still too high especially since the same will be resorted to in mountains having very rough terrain. A possible reduction in the overall weight of the gun will improve the overall deployability of the gun 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 (presently weighing 86 kgs) and the base plate (presently weighing 80 Kgs) 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.**
 - (a) **User.** All troops that are deployed along the Northern as well as North-Eastern Borders.
 - (b) **Operating Environment.** Conventional/ Hot War Deployment.
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.
- (c) Implementation - In Conventional/ Hot War deployment

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PROBLEM DEFINITION STATEMENT - 83

RANGE OF SMART MUNITIONS, FUZES AND MINES

1. **Short Title.** Range of Smart Munitions, Fuzes and Mines.
2. **User Directorate(s).** Artillery and Engineer Directorates.
3. **Type of Problem.** Poorly Solved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Dumb ammunition being used with artillery guns are not consistent with the ever evolving modern battle field due to their incapability to achieve accuracy and precision at the target end. The mentioned problem has been in existence since long and needs urgent solution to allow precise engagement of targets and also facilitation of operational logistics. Hence, there is a requirement to develop Precision Guided Munition (PGM) and SMART fuses for 155 mm Howitzers and 120mm Mortar. Actuation of Smart Fuses should be based on time / temperature / remote sensor control. There is also a requirement to design and develop Smart Mines to cater for modern warfare.
 - (b) **Evolution of the Problem.**
 - (i) A Precision Guided Munitions (PGM) is intended to precisely hit a specific target and thus enhance the payoffs at the target end due to its accuracy. In the context of Indian Army, equipment/ weapon on the inventory of Regiment of Artillery mainly uses unguided/ dumb ammunition with the exception of guided munitions such as KRASNOPOL with 155 mm FH-77B and 120mm Mortar. Non availability of guided munitions with the majority of the weapons poses serious constraint not only towards achievement of accuracy, consistency, desired damage at the target end but also for the Operation logistics as inaccurate engagement of the target leads to pounding of the enemy with larger quantum of ammunition which leads to incorporation of larger scales of ammunition to be catered and supplied to the gun position. Since the modernisation plan of Indian Artillery envisages 155mm and 120mm as the basic calibre of the equipment on its inventory, there may be a case for developing or procurement of PGMs for 155mm Howitzers and 120mm Mortar so that a minimum of 70% of the scaling of ammunition be made up of the same. Having universal PGMs would also facilitate in production, storage and holding of ammunition at various levels.
 - (ii) The existing anti-personnel mine and anti-tank mines held with the Indian Army are obsolete and do not meet the requirement of modern warfare. Development of Smart Mines (anti-personnel and anti-tank) catering for various requirement of modern warfare such as self – actuation, self – deactivation after a conflict and self re-deployed on detonation of neighbouring mines.
 - (c) **How is it Being Overcome.**
 - (i) The problem is being overcome by using guns having high rate of fire, ballistic computers, modern equipment to find allowances for non-standard met and other such methods to reduce the inaccuracies in engagement of targets. However, the above mentioned methods, though critical, cannot substitute the requirement of PGMs (Smart Munitions).

- (ii) By using existing anti-personnel mine and anti-tank mines held with the Indian Army.
 - (d) **Any Innovations to Locally Overcome the Problems.** KRASNOPOL ammunition has been auth on 155mm FH77B, however, the scaling of the ammunition for substantial effect at the tactical level needs review.
5. **Who has the Problem.**
- (a) **User.** Non achievement of the desired capability to neutralise/ destroy at the target end may lead to non-accomplishment of the mandated aim. Moreover, it will cause fatigue and affect the morale of the crew at the gun end due to prolonged engagement of target necessitated due to inaccurate fire.
 - (b) **Operating Environment.** Non availability of PGMs will lead to wastage of ammunition which in turn will have a corresponding adverse effect upon the operational logistics. Non achievement of the aim/ objective of commanders at tactical/ operational level cannot be over emphasised.
 - (c) **Periodicity of Exploitation.** Extensive.
6. **Why it is Important to Solve.**
- (a) The stated problem requires urgent solution to make the ammunition consistent with the proposed development philosophy of Indian Army, wherein, 155mm will be the basic calibre as also to give a qualitative edge to Regiment of Artillery by enhancing the accuracy and consistency of engagement by it.
 - (b) The existing anti-personnel mine and anti-tank mines held with the Indian Army need to be upgraded to meet the requirement of modern warfare.
7. **Contemporary Solution by Other Countries/Organisations.**
- (a) **M982 Excalibur.**
 - (i) **Developed by.** BAE System Bofors and Raytheon.
 - (ii) **Calibre.** 155mm.
 - (iii) **CEP.** 5m.
 - (iv) **Range.** 37-40 Kms.
 - (b) **Volcano Family of PGMs.**
 - (i) **Developed By.** Ota Melara (Italy).
 - (ii) **Calibre.** 155mm.
 - (iii) **Range.** 50 Kms.
 - (c) **GP-1 & GP-6.**
 - (i) **Developed By.** Norinco (China)
 - (ii) **Calibre.** 155mm.
 - (iii) **Hit Probability.** 90%.
 - (iv) **Range.** 20 Kms (GP-1) and 25 Kms (GP-6).
 - (d) **BONUS PGM.**
 - (i) **Developed By.** BAE Bofors.
 - (ii) **Calibre.** 155mm.

(iii) **Role.** Anti-Tank Munition.

(iv) **Range.** 35 Kms.

(e) **SMART.**

(i) **Developed By.** GLWS mbh (German).

(ii) **Calibre.** 155mm.

(iii) **Role.** Anti-Tank Munition.

(iv) **Range.** 27.5 Kms.

(f) Smart Mines being used by United States Army (designed and developed by AMDS programme).

8. **Timelines.**

(a) **Product Conceptualisation.** Twenty four months.

(b) **Research and Design.** Thirty six months.

(c) **Manufacturing of prototype.** Twelve months.

(d) **Field/ User Trials.** Twelve months.

(e) **Manufacturing.** Twelve months.

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PROBLEM DEFINITION STATEMENT - 84

PROGRAMMABLE, PRE-FRAGMENTED, PROXIMITY (3P) AMMUNITION FOR 40MM L/70 GUN

1. **Short Title.** Programmable, Pre-fragmented, Proximity (3P) Ammunition for 40 MM L/70 Gun.
2. **User Directorate (s).** Directorate General of Army Air Defence.
3. **Type of Problems.** Partially solved.
4. **What is the Problem (Need).**
 - (a) Statement of Problem. With the increase in air threat envelope and multiplicity of air threat platforms, there is a requirement to enhance the lethality and accuracy of the ammunition of L/70 Gun System. The ammunition should have multi target handling capability along with capabilities of air burst, proximity detonations, point detonation and variable and programmable provisions.
 - (b) Evolution of Problem. The evolution in quantity, quality and types of air threat from fixed and rotary wing aircrafts to stealth aircrafts, UAVs, rockets & mortars, the current ammunition of L/70 guns has been rendered inadequate.
 - (c) How it Was Being Overcome? It was partially being overcome by use of Pre-fragmented full charge (PFFC) ammunition.
5. **Who has the Problem.** Army Air Defence units holding 40mm L/70 guns.
6. **Why it is Important to Solve.** To counter various and completely different types of air threat, pre fragmented ammunition which can be programmed and also works on proximity is required to be developed for L/70 guns.
7. **Contemporary Solution by other Countries/ Organisations.** Following companies have manufacture of programmable ammunition worldwide:-
 - (a) ORKA 57mm: BAE Systems.
 - (b) AHEAD 35mm OERLIKON: Rheinmetall.
 - (c) 3P 40mm: Bofors.
8. **Timelines.** 24 Months
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 85

WHEELED OR SELF PROPELLED SYSTEM FOR ZU GUN

1. **Short Title.** Wheeled or Self Propelled System for ZU Gun.
2. **User Directorate(s).** Directorate General of Army Air Defence.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).** Mobility of the weapon system:-
 - (a) As the ZU Gun is towed from one place to other, its mobility becomes a problem in a terrain where driving conditions are not good.
 - (b) It is also time consuming due to which its operational effectiveness is affected.
 - (c) With increase in the mobility of the gun it would make it difficult for the enemy to spot the correct location of the gun if it shifts its position after small intervals of time.
 - (d) Another important aspect of war is achieving surprise which can be gained through increasing the mobility of the gun sys.
5. **Who has the Problem.** Air Defence units.
6. Why it is Important to Solve.
 - (a) To provide mobility to the weapon system so that it can be deployed at different terrains in a shorter interval of time.
 - (b) Improve operating efficiency of the weapon system
7. **Contemporary Solutions by Other Countries/Organisations.** Most of the Air Defence weapon system in different countries are self-propelled due to which they achieve high rate of mobility
8. **Timelines.** 12 Months.
9. **Point of Contact.**
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PROBLEM STATEMENT NO - 86

INSTALLATION OF IRNSS (NAVIK) BASED GPS SYSTEM IN A & B VEHICLES

1. **Short Title.** Installation of IRNSS (NAVIK) based GPS system in A & B Vehicles.
2. **User Directorate.** All Arms & Services.
3. **Type of Problem.** Unsolved problem.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** There is a requirement of installing navigation system in A & B Vehicles fleet of the Indian Army. With successful launch of IRNSS, it is felt that installation of IRNSS (NAVIK) capable receiver in A & B Vehicles will facilitate better navigation and command & control as well as real time tracking of various vehicles at all times. This would also reduce the reliance on foreign based technology.
 - (b) **Evolution of Problem.** Operational requirement considering the availability of military grade version of IRNSS.
 - (c) **How was it Being Overcome.**
 - (i) Training and rehearsals during formation exercises.
 - (ii) Extensive and detailed day time reconnaissance of operational area during daylight.
 - (iii) Dependence on maps, GIS and satellite imagery.
5. **Who has the Problem.**
 - (a) **User.** Common to all arms and services.
 - (b) **Operating Environment.** All across India. Peace time utilization also envisaged.
6. **Why is it Important to Solve.**
 - (a) Non-availability of GPS during operations/ reliability of foreign based technology during operations is not assured.
 - (b) Need to harness indigenous technology for navigation of A & B Vehicles.
 - (c) Better convoy management through real time situational awareness during mobilisation & conduct of operations.
7. **Contemporary Solution by Other Countries/Organisations.** China, US, NATO, France & UK have their own satellite based positioning system.
8. **Timelines.**
 - (a) **Obtaining Prototype Receiver Terminal from ISRO.** Six months.
 - (b) **Installation in one Armoured Brigade Group including B Vehicles.** Six months.
 - (c) **Trials and Validation.** One year.
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PROBLEM DEFINITION STATEMENT NO - 87

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.
 - (c) **How it was Being Overcome.** There is an effort to mitigate the problem by regular patrols in summer and helicopter sorties.
5. **Who has the Problem.**
 - (a) **User (Skill Sets).** Formations deployed in High Altitude Area/ Field Area.
 - (b) **Operating Environment.** High Altitude Area.
6. **Why it is Important to Solve.** It is important to solve the problem due to the following reasons:-
 - (a) Passes are vulnerable to transgression/ occupation on short notice by enemy.
 - (b) Developed communication network by opposing forces upto or in close proximity to passes.
 - (c) Weather and terrain affect the patrolling schedule.
7. **Contemporary Solutions by Other Countries/Organisations.** UAVs, aerostats & helikites are the solutions developed by most of the modern countries. A UAV or helikite with parameters & requirements of Army in High Altitude Area may not be easily available as COTS & hence the need to develop the same.
8. **Timelines.**
 - (a) Feasibility Study. Three- Four months.
 - (b) Technology Solution. Six - Eight months.

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PROBLEM DEFINITION STATEMENT - 88

DEVELOPMENT OF DRONE/ UNMANNED AERIAL VEHICLE COUNTERMEASURE TECHNOLOGY

1. **Short Title.** Development of Drone/Unmanned Aerial Vehicle Counter Measure Technology.
2. **User Directorate(s).** Directorate of Army Air Defence.
3. **Type of Problem.** Unsolved.
4. **What is Problem (Need).**
 - (a) **Statement of Problem.** With the proliferation of commercially available drones, Quadcopters and unmanned aerial vehicles in the field Armies, the same are being widely used by the forces to spy on each other and gather information regarding deployment and movement. Along the Line of Control, the adversary is continuously trying to get information about own troops deployed at various posts. Our adversaries have acquired combat unmanned aerial vehicle systems which would make it easier for him to do undetected surveillance over our deployment. Presently, human sentries at the posts detect aerial violation by the enemy based on sound and blinking lights which doesn't give out presence and the type of equipment flying in our air space. Hence, to detect, identify & counter the aerial attempts by the enemy towards our defences along Line of Control, there is a need to develop countermeasures for these aerial spies.
 - (b) **Evolution of the Problem.** The requirement has evolved out of situations where various Unmanned Aerial Vehicles/ Drones/ Quadcopters have been sighted around own defenses along Line of Control surveying our deployment & headquarters.
 - (c) **How it was being Overcome.** Problem has not yet been overcome fully as sentries deployed along the Line of Control, can only spot & report the presence of Unmanned Aerial Vehicles. Moreover, these small yet maneuverable aerial vehicles pose very less Radar Cross Section (RCS) which makes it difficult to counter them.
5. **Who has the Problem.**
 - (a) User. All troops deployed along the line of control and tactical headquarters.
 - (b) Operating environment. Line of Control and Tactical headquarters located close to it.
6. **Why is it Important to Solve.** It is important to solve so as to enable the troops and security agencies deployed along the borders and tactical headquarters in preventing the air surveillance by the hostile and antinational elements.
7. **Contemporary Solution by Other Countries/ Organisations.**
 - (a) **AIRFENCE.** The US Marine Corps service has contracted with counter-unmanned aerial system company "**Sensofusion**" to develop a technology known as AIRFENCE, which can automatically detect, locate, track and takeover unmanned aerial vehicles control.



- (b) **Laser Weapon Systems (LaWS).** LaWS is a directed energy weapon developed by the US Navy for ship defense. The weapon uses an infrared beam from a solid state laser which can be tuned to high output of upto 30 thousand watts to destroy the target or low output to warn or cripple the sensors of a target.
- (c) **Signal Jamming.** Three British Companies have created the Anti-Unmanned Aerial Vehicles Defence System (AUDS) which jams drone's radio signal connection with its operator, making it unresponsive.



8. **Timelines.**

- (a) **Feasibility Study** – One/Two years.
- (b) **Technology Solution** – Two/Three years.
- (c) **Implementation** – In a both Conventional Operations and Counter Insurgency/ Counter Terrorism environment.

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PROBLEM DEFINITION STATEMENT - 89

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.

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PROBLEM DEFINITION STATEMENT - 90

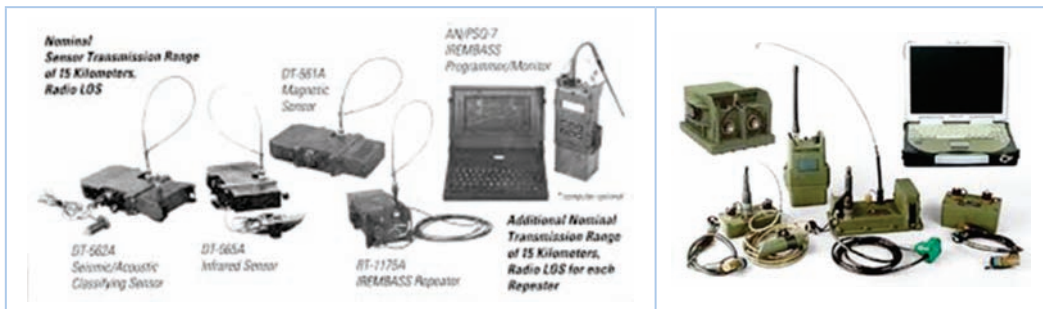
DEVELOPMENT OF ENHANCED UNATTENDED GROUND SENSOR SYSTEM

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 frame work deployed at the Line of Control and even in hinterland to check infiltration. The sensors deployed are based on older technology and possess inherent limitation in terms of detection range and capability. Further the efficacy of the sensors is limited by the problem of low power backup and false triggering. Thus there is a need to develop a sensor platform which overcomes these problems. An example of false triggering is a Passive Infrared (PIR) sensor triggering even when a leaf falls or a branch shakes leading to a false notion of viable target detected.
 - (b) **Evolution of the Problem.** A suggested architecture for development of the sensor platform to overcome the mentioned problem shall consist of the following:-
 - (i) **Micro Controller.** This interfaced with the sensors either individually or collectively shall enable processing of signals detected form the sensors to overcome the problem of 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**
 - (a) **User.** All troops deployed in Counter Insurgency and Line of Control Operation.
 - (b) **Operating Environment.** Counter Insurgency / Counter Terrorism and Line of Control.
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 of infiltration attempts.

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) Tech Soln - 2/3 Years
- (c) Implementation - In CI/LC

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PROBLEM STATEMENT NO - 91 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 Agency.** Directorate General of Artillery and Battlefield Surveillance System (BSS).
3. **Type of Challenge.** Unsolved/ Technology Infusion.
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.
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PROBLEM DEFINITION STATEMENT - 92 POWER MANAGEMENT AT OBSERVATION POST

1. **Short Title.** Short Title. Power Management at Observation Post.
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** With the induction of ACCCS, the battle load of an Artillery Observation Post has undergone a major overhaul in terms of equipment, accessories & weight. The major increase in weight can primarily be attributed to the power system comprising batteries & charger set thus impinging upon mobility, flexibility & sustainability of Observation Post party.
 - (b) **Evolution of the Problem.** With an aim of keeping pace with ongoing modernization of armed forces & development of overall Tactical C3I architecture, a project was introduced to automate the acquisition & passage of target data thus increase the accuracy & simultaneously reducing the response time. This equipment (system) is over & above the conventional instruments & stores carried by the Observation Post party.
 - (c) **How it was Being Overcome.** Presently the problem lies unaddressed thus leading to sub optimum exploitation of ACCCS due to power management issues & also affecting the mobility & flexibility of Observation Post.
5. **Who has the Problem.** The problem is being faced by Observation Post parties who are responsible for direction & adjustment of artillery fire on target.
6. **Why it is Important to Solve.** It is important to solve the problem to enable speedy engagement of targets with maximum accuracy without hampering the mobility & flexibility of Observation Post party
7. **Contemporary Solutions by Other Countries/Organisations.** Use of solar energy based power system with rooftop charging panels & vehicle integrated charger by Israel Defence Forces.
8. **Timelines.**

(a) Feasibility Study	- Three/ Four months.
(b) Technology Solution	- Six/eight months.
(c) Development of prototype & Trials	- 12/18 months.
(d) Implementation in field	- 24/30 months.
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PROBLEM DEFINITION STATEMENT - 93

COMMON METEOROLOGICAL PROBING PLATFORM FOR LONG RANGE VECTORS

1. **Short Title.** Common Meteorological Probing Platform for Long Range Vectors.
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need).**
 - (a) Statement of Problem. Common Meteorological Probing Platform with improved space validity of 70 km and altitude probing of 30 km is currently not available for Long Range Vectors.
 - (b) Evolution of the Problem.
 - (i) The present Digicora MW 15/31 provides the meteorology requirement.
 - (ii) The Digicora MW 31 is able to provide meteorology requirement for normal High Explosive rockets however with Extended Range rockets, there is a requirement of meteorological system with improved space validity of 70 km and altitude probing of 30 km for effectively engaging the target.
 - (c) How it was Being Overcome. At present, all the Long Range Vectors are using their respective meteorological systems with different formats and the problem persists. As on date no solution has been worked out.
5. **Who has the Problem.** Artillery Regiments.
6. **Why it is Important to Solve.** It is important that a common meteorological probing platform with improved space validity of 70 km and altitude probing of 30 km be developed for providing the meteorological requirement.
7. **Contemporary Solutions by Other Countries/Organisations.** Other countries/organisations are using a meteorological system with same format for all their Long Vectors. The problem is specific to our artillery wherein there are different meteorological formats for different long range vectors which are not compatible with each other.
8. **Timelines.**
 - (a) Research and development of system - Two years.
 - (b) Prototype and Trials - Two years.
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PROBLEM DEFINITION STATEMENT - 94

THERMAL IMAGER INTEGRATED OBSERVATION EQUIPMENT (TIIOE)

1. **Short Title.** Indigenous Thermal Imager Integrated Observation Equipment.
2. **User Directorate(s).** Directorate General of Artillery.
3. **Type of Problem.** Partially solved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** TIIOE is an important asset available to the Forward Observation Officer /Observation Post Officer for accurate acquisition and speedy engagement of the targets both during offensive and defensive operations. In order to achieve futuristic operational requirements, the Indigenous TIIOE to be developed and it should have following additional characteristics:-
 - (i) **Light Weight.** The approx. weight of TIIOE is approx 16.9 kg (with tripod). It needs to be reduced to 8-10 kg approx. so that it can be easily carried by Forward Observation officer during Operations.
 - (ii) **Integration of Various Components.** TIIOE is having three major components i.e. Artillery Thermal Imager Long Range (AARTIMLR), Laser Range Finder (LRF) and Goniometer. There is a requirement to integrate all major components into one single system which will drastically reduce weight of the system and will be easy to handle during operations.
 - (iii) **Calculation of Height.** The height worked by TIIOE is not very accurate, even when all necessary precautions are taken during setting up of the system. Any error in the height severely affects the accuracy of artillery engagement.
 - (iv) **Global Positioning System (GPS).** Indigenous TIIOE to have inbuilt GPS. The GPS is to be connected externally in the present system. There is requirement of inbuilt GPS in TIIOE.
 - (v) **Mounting and Portability.** To be capable of operating both from tripod and shoulder. The system to be made man portable by reducing the weight of the system. It should also to be configured to be mounted on the vehicle.
 - (vi) **Day Camera.** Day camera should be incorporated for better observation and recording of data during day light.
 - (vii) **Operating Time.** The operating time of ARTIMLR with standard NiMH Battery (continuous operation at room ambient temperature) is two hours. It needs to be increased to 6 to 8 hours.
 - (viii) **Integration with ACCCS.** The equipment should be able to connect to the Enhanced Tactical Computer of the ACCCS architecture for acquisition and engagement of targets.
 - (b) **Evolution of the Problem.** The TIIOE was introduced into service to overcome the problem faced by Observation Post Officer in acquiring the accurate target data. The TIIOE has been successful in overcoming a lot of difficulties faced by the Observation Post Officer.

- (c) **How it was Being Overcome.** Additional manpower / fighting porters are being provided to units with observation party to carry the additional load.
- (d) **Any Innovations to Locally Overcome the Problems.** Nil.
5. **Who has the Problem.** The problem is being faced by the Observation Post officers and Forward Observation Officers both in offensive and defensive operations.
6. **Why it is Important to Solve.** It is important to solve the problem to enable engagement of targets with speed and accuracy and inflict maximum damage with least probability of errors.
7. **Contemporary Solutions by Other Countries/Organisations.** Light weight TIIOE are available worldwide and are being manufactured by companies like ARTES Slovenia ATLAS Israel and DHY 307, CILAS France.
8. **Timelines.**
- (a) Development of a System - One year.
 - (b) Prototype and trials - Two years.
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PROBLEM DEFINITION STATEMENT - 95 NEED FOR APPLICATION SECURITY

1. **Title.** Non availability of application layer security algorithms for Army owned Software products.
2. **User Directorate.** 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 Problems.** 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/ Orgs.** 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 yr.
(c) Implementation in field	-	One yr.
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PROBLEM STATEMENT NO - 96

INTEGRATION OF APPLICATIONS ON DISPARATE NETWORKS

1. **Short Title.** Integration of Applications on Disparate Networks.
2. **User Agency.** Deputy Director General of Information Technology (DDGIT).
3. **Type of Problem.** Technology Infusion.
4. **Nature of Problem.** Indian Army is presently networked through multiple networks which are air gapped from each other. The present and envisaged applications have been hosted on these networks. However, there is a constant need for these applications to interact with applications/ users of other networks which are air gapped from each other. Further these networks have varying grade of security classification as Unit LANs, Internet, Inter Service networks etc. Details of certain scenarios are given below:-
 - (a) **Connectivity to Civilian Functionaries.** Certain applications on the Army Data Network (ADN) presently under development / planned for development require to interact with civil functionaries like Integrated Financial Advisor (IFA), Principal Controller of Defence Accounts (PCDA) and Ministry of Defence (MoD) for workflow / process flow. As per official policy these functionaries cannot be given direct access to ADN due to policy constraints.
 - (b) **Connectivity to Internet.** Certain processes such as e-procurement are required to be hosted over the Internet as per Govt instructions. The approval process for such procurement has to necessarily reside over the ADN, as Army functionaries are on ADN. Publishing information on the Internet requires connectivity between ADN and Internet. There is a need to bridge the air gap between ADN and Internet while maintaining the integrity of air gap.
 - (c) **Connection between ADN and Unit LAN.** The units and formations have a separate LAN for their internal networking. The unit LAN is also physically air gapped from the ADN. Certain applications on unit administration, human resources management and logistics functions are hosted on Unit LAN. However, these unit level applications are feeder applications to the 'Enterprise Wide Information Systems' which is on ADN. This requires data to flow from Unit LAN to ADN.
5. **Why it is Important to Solve.** Technical solution is required for integration of disparate networks like ADN, Internet, unit LANs etc without violating the airgap policy. Applications are being developed on ADN like Indian Army Information System (IAIS) and on 'VPN on Internet' like Computerised Inventory Control Package (CICP) which need to talk to each other while maintaining air gap at the same time. Hence, there is a functional and operational requirement of providing a solution so that data can seamlessly flow between disparate networks.
6. **Contemporary Solution by other Countries.** Optical Refresh, Data Diode.

7. Timelines.

- (a) Product conceptualization - 5-6 months.
- (b) Research and design - 8-10 months.
- (c) Manufacturing of prototype - 3-4 months.
- (d) Field trials/user trials - 3-4 months.

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PROBLEM STATEMENT NO - 97

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 Agency.** 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) **Suggested Innovation.** 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 stolen software tokens no good unless the PIN is known as well. However, in the case of 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 authenticates. If there are attempts made to 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 can 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 STATEMENT NO - 98

MECHANISM FOR FAST PROTOTYPING METHOD FOR DEVELOPING MODULAR APPLICATIONS

1. **Short Title.** Mechanism for fast prototyping method for developing modular applications.
2. **User Agency.** Deputy Director General of Information Technology (DDGIT).
3. **Type of Problem.** Unsolved/Technology Infusion.
4. **Nature of Problem.**
 - (a) **Statement of the Problem.** In order to achieve fast tracked modular mobile application development, there is a need for a solution design and development mechanism which caters to high speed application development and deployment process.
 - (b) **Evolution of the Problem.** Indian Army is in the process of implementing a mobile app for all serving Army personnel. The key aspect of the mobile application will be to ensure that in keeping with the Government of India directive on Digital India wherein all services of unclassified nature are to be provided to serving personnel of Indian Army. Under the present scenario due to requirement of CERT-IN audit for hosting applications on the NIC ; cloud addition of functionalities in the application require lengthy audit process thereby reducing development and deployment speed.
 - (c) **How is it being Overcome.** Not yet overcome.
 - (d) **Suggested Innovation.** The solution recommended should include the following: -
 - (i) Most suitable platform for development and deployment of modular application ecosystem.
 - (ii) Recommended design for preventing re-audit of entire application environment on addition of functionalities.
 - (iii) Recommended solution should include recommendations for developing the fast tracked modules for all three ecosystems such as Android, iOS and Windows.
 - (iv) The solution should be preferably coded in Dot Net platform using C#.
 - (v) The solution should be accompanied by a working model of modular application design with requisite security features built.
5. **Why it is Important to Solve.** To improve the development and deployment speed of various modules of applications.
6. **Contemporary Solution by other Countries.** Not Known.
7. **Timelines.**
 - (a) Product conceptualization - 2 months
 - (b) Research and design - 2 months
 - (c) Manufacturing of prototype - 2 months
 - (d) Field trials/user trials - 3 months.

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PROBLEM STATEMENT NO – 99 INTEGRATED QUARTERMASTER PACKAGE ADOPTER MODULE

1. **Short Title.** Integrated Quartermaster Package (IQMP) Adopter Module.
2. **User Agency.** Army Software Development Centre (ASDC).
3. **Type of Challenge.** Technology Challenge (Implementation of Open Source Artificial Intelligence (AI) Engine on Integrated Quartermaster Package (IQMP) for Corps Maintenance Area (CMA) for stock forecasting.
4. **Nature of the Challenge.**
 - (a) **Statement of the Challenge.**
 - (i) Integrated Quartermaster Package (IQMP) as an application gathers comprehensive data on rations, clothing, Fuel Oil Lubricants etc. Artificial Intelligence is already being extensively used by retail giants for warehousing/ management of items stock in anticipation of the customer demands.
 - (ii) Stocking of items by anticipating the demands/requirements of users during war as well as peace needs improvement as the data set used for projection of requirements is small.
 - (b) **Evolution of the Challenge.**
 - (i) Implementation of Open Source AI engine on IQMP for CMA to aid Supply and Logistics echelons.
 - (ii) Draw accurate intelligence from extensive data using capability of AI.
 - (iii) Use open source APIs to interface AI engine with existing Dot Net based CMA IQMP software application.
5. **Why it is Important to Solve.** In order to facilitate availability of Quarter Master related data at various levels in the formations hierarchy, it is significant to design and implement a new database.
6. **Timelines.**

(a) System Study	-	1 month
(b) System Design	-	1 month
(c) Sys Implementation	-	1 month
(d) Testing	-	1 month
7. **Future Enhancements.** The Quarter Master related data available at Commander can be fed to other applications if required in future.



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PROBLEM STATEMENT NO – 100

COMMANDER'S MODULE FOR HUMAN RESOURCE MANAGEMENT SYSTEM

1. **Short Title.** Commander's Module for Human Resource Management System (HRMS).
2. **User Agency.** Army Software Development Centre (ASDC).
3. **Type of Challenge.** Technology Software Challenge.
4. **Nature of the Problem.**
 - (a) **Statement of the Problem.** Development of Commander's module for Human Resource Management System (HRMS) to capture human resource data from unit Human Resource Management System in online and offline modes.
 - (b) **Evolution of the Problem.** Human Resource Management System (HRMS) is a unit level software with a local database. There is a void of information related to human resource (HR) of units at formations/establishment above unit level where no data of units is available.
 - (c) **Suggested Innovation.** To design a new database Central Data Repository by combining Human Resource Management System data related to human resources of more than one unit.
5. **Why it is Important to Solve.** In order to facilitate availability of human resource related data at various levels in the formations hierarchy, it is significant to design and implement a new database.
6. **Timelines.**

(a) System study	- 1 month.
(b) System Design	- 1 month.
(c) System Implementation	- 1 month.
(d) Testing	- 1 month.
7. **Future Enhancements.** The HR related data available at Headquarters can be fed to other applications if required in future.
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PROBLEM STATEMENT NO - 101 HUMAN RESOURCE MANAGEMENT SYSTEM E-MAIL MODULE

1. **Short Title.** Human Resource Management System (HRMS) e-mail Module.
2. **User Agency.** Army Software Development Centre (ASDC).
3. **Type of Problem.** Technology Software Challenge.
4. **Nature of the Problem.**
 - (a) **Statement of the Problem.** To integrate the e-mail facility into HRMS.
 - (b) **Evolution of the Problem.**
 - (i) Existing Human Resource Management System implementation at Unit level is devoid of inter-person and informal communication between users.
 - (ii) No e-mail exchange can be done using the Office Management package (OMP).
 - (c) **How is it Being Overcome.** Using open source Mail delivery systems for integration to Dot Net based Human Resource Management System software application for facilitation of e-mail within HRMS 2.0 users.
5. **Why it is Important to Solve.** At present, the system provides notification/alerts to the user only once he/she logs in the application. The e-mail facility shall facilitate user notified through e-mail on events such as leave application sanction required or file/noting perusal which requires user attention in the application.
6. **Timelines.**

(a) System study	-	1 month
(b) System Design	-	1 month
(c) Sys Implementation	-	1 month
(d) Testing	-	1 month
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PROBLEM STATEMENT NO - 102
AUTOMATIC SYNCHRONISATION OF HUMAN RESOURCE MANAGEMENT SYSTEM AND INTEGRATED QUARTER MASTER PACKAGE DATABASES

1. **Short Title.** Automatic synchronisation of Human Resource Management System (HRMS) and Integrated Quarter Master Package (IQMP) databases.
2. **User Agency.** Army Software Development Centre (ASDC).
3. **Type of Problem.** Technology Software Challenge.
4. **Nature of the Problem.**
 - (a) Statement of the Problem. Automation synchronisation of HRMS and IQMP database.
 - (b) Evolution of the Problem.
 - (i) HRMS and IQMP exist at the Unit level on separate servers.
 - (ii) No provision exists for auto sync of both databases.
5. **Why it is Important to Solve.** The resolution shall facilitate the two applications to seamlessly synchronize the data from Human Resource Management System to Integrated quartermaster project (IQMP) which shall obviate double feeding of data by the user therefore saving effort and reducing likely errors.
6. **Timelines.**
 - (a) System study - 1 month
 - (b) System Design - 1 month
 - (c) Implementation - 1 month
 - (d) Testing - 1 month
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PROBLEM STATEMENT NO - 103

ANDROID VERSION OF ONE MODULE OF HUMAN RESOURCE MANAGEMENT SYSTEM

1. **Short Title.** Android version of one module of Human Resource Management System (HRMS).
2. **User Directorate.** Directorate General Information Systems.
3. **Type of Problem.** Technology Software Challenge.
4. **Nature of the Challenge.**
 - (a) **Statement of the Problem.** Android version of one module of Human Resource Management System (HRMS).
 - (b) **Evolution of the Problem.**
 - (i) HRMS with its four modules is widely being exploited for Part II order publication through Human Resources (HR) module. Portable version of HR module is unavailable for future implementation on mobile platform.
 - (ii) There is a requirement of development of an Android version of HR module as a PoC to explore its deployability on android based mobile platform.
 - (c) **How is it Being Overcome.** At present, the application is not available for mobile platform. The application if available on mobile shall communicate over a secure connection over the Internet.
5. **Why it is important to solve.** The availability of application on mobile platform will enable all ranks to access personal HR related data without physical accessing the application through a computer terminal.
6. **Timelines.**

(a) System study	-	1 month
(b) System Design	-	1 month
(c) Implementation	-	1 month
(d) Testing	-	2 month
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PROBLEM STATEMENT NO - 104

ENHANCEMENTS TO CENTRAL UTILITY OF HUMAN RESOURCE MANAGEMENT SYSTEM

1. **Short Title.** Enhancements to central utility of Human Resource Management System (HRMS).
2. **User Directorate.** Directorate General Information System.
3. **Type of Problem.** Technology Software Challenge.
4. **Nature of the Problem.**
 - (a) Statement of the Problem. Enhancements to central utility of HRMS.
 - (b) Evolution of the Problem.
 - (i) Central Utility Application of Human Resource Management System (HRMS) at present provides only basic function of upload/transfer of daily order Part II orders from units to PCDA (O), Pune.
 - (ii) There is a requirement for the user/unit to be able to upload the DO part II order for selected agencies. The administrator should be able to search and view Part II Order history like total uploaded/ downloaded/ pending, agency/unit wise with specific search criteria. Also there is a requirement of amendment for enhancing the existing dashboard where users can see the required information at one place like patch version, change/ update password, history of uploads by users and their approvals.
 - (c) How is it Being Overcome. At present, the application does not have features to enable the administrator to monitor/analyse the progress of upload of officer's part II orders. In additional, the application requires features to ease out user experience through UI enhancements.
5. **Why it is Important to Solve.** The enhancements are required in order to facilitate other agencies to better utilize the application by online receipt of officer's part II order data.
6. **Timelines.**
 - (a) System study - 1 month
 - (b) System Design - 1 month
 - (c) Implementation - 1 month
 - (d) Testing - 1 month
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PROBLEM STATEMENT NO - 105 ERP FOR MANAGEMENT INFORMATION SYSTEM

1. **Short Title.** ERP for Management Information System (MIS).
2. **User Agency.** Management Information System Organization (MISO).
3. **Type of Problem.** Technology Challenge.
4. **Nature of Problem.**
 - (a) **Statement of the Problem.** Presently, MIS applications of Indian Army are working in different platforms e.g J2EE for Management Information System Organization (MISO), Dot Net for Integrated Quarter Master Package (IQMP) etc which leads to a problem in management of applications and integrations.
 - (b) **Evolution of a Problem.** All MIS applications were conceived & executed in different time frame and with independent requirements. However over a period of time it was realized that integration of these application can give better dividends to organisation.
 - (c) **How is it Addressed.** Data is stored on excel format & transfer in optical drives.
 - (d) **Suggested Innovation.** One ERP can be selected for all MIS applications which can give robust environment for the flow of data.
5. **Why it is Important to Resolve.** Running of different application can lead to the problem of data integration & multiple entries for user which ultimately give an ineffective working environment. Therefore it is imp to resolve the issue which can lead to:-
 - (a) Robust environment
 - (b) Timely flow of data.
 - (c) Secured environment.
 - (d) Effective & efficient system.
6. **Contemporary Solution by Industry.** Most of the companies follow one ERP model.
7. **Timelines.** Team of consultants can study the requirements & suggest best suited model for Indian Army for long term implementation.
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PROBLEM STATEMENT NO - 106 DATA EXCHANGE BETWEEN DEPENDENT APPLICATIONS

1. **Short Title.** Data exchange between dependent applications.
2. **User Agency.** Management Information System Organization (MISO).
3. **Type of Problem.** Technology Challenge.
4. **Nature of Problem.**
 - (a) **Statement of Problem.** Management Information System Organization (MISO) & ARPAN application are on ADN while Human Resource Management System (HRMS) & Integrated Quartermaster Project (IQMP) applications are hosted on unit LAN. A XML based secure inter exchange sys between ADN & Unit LAN based applications need to be developed for integration & data transfer.
 - (b) **Evolution of Challenge.** Management Information System Organization application was developed as an independent application. The flow of information is presently captured directly from the user. Operations in integrated environment is the need of hour. Therefore, applications like IQMP, ARPAN, HRMS etc need to be integrated with MISO application.
 - (c) **How is it being Done.** Due to multiple applications, users face problem in entry data in all the applications separately leading to time penalty.
 - (d) **Suggested Innovation.** All applications have facility to export data in XML format. Necessary utility needs to be developed to accept the data received from other application into MISO.
5. **Why it is important to Resolve.** This facility will ensure
 - (a) Integrated Environment.
 - (b) Increased user satisfaction.
 - (c) Speedy flow of data/ information.
 - (d) Real time information availability.
 - (e) Decision support system.
6. **Contemporary Solution by other Industries.** Integration is the basic requirement addressed for most of the application across industry.
7. **Timelines.** Team of experts can design in two to three months.
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PROBLEM STATEMENT NO - 107

INTEGRATION OF APPLICATIONS WITH DISPARATE SECURITY PROFILE

1. **Short Title.** Integration of applications with disparate security profile.
2. **User Agency.** Project Management Office Command Information and Decision Support System (CIDSS).
3. **Type of Problem.** Technology Infusion.
4. **Nature of Problem.** Within the overall Tactical C3I architecture, many Operational Information System (OIS) sub sys are being developed. The OIS applications are being developed with different security profiles depending on the classification of data residing on them. As per official policy, integration of applications with different security grading is not possible because of different security grading of these networks. Due to non-integration of applications, it is not possible to provide a coherent tactical picture to the Commander, beating the very essence of automation.
5. **Why it is Important to Solve.** Various sub systems of Tactical C3I systems are being developed independently. In order to provide a coherent tactical picture, all the Operational applications being developed have to be integrated allowing seamless flow of data between them. However the security restricts the flow of data between applications with disparate security profile. Hence, a comprehensive security solution is required to enable flow of data between such systems with different security grading.
6. **Contemporary Solution by other Countries.** Filtering based on information content.
7. **Timelines.** The rough timeline are as follows:-
 - (a) Product conceptualization - 5-6 months.
 - (b) Research and design - 8-10 months.
 - (c) Manufacturing of prototype - 3-4 months.
 - (d) Field trials/user trials - 3-4 months.
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PROBLEM DEFINITION STATEMENT - 108

DECODING AND DE-MULTIPLEXING OF INTERCEPTED HOSTILE TRANSMISSION

1. **Short Title.** Specialised Decoding and De-multiplexing Facility.
2. **User Directorates / Establishment.** Corps of Signals.
3. **Type of problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problems.** In most cases, hostile transmission intercepted by Electronic Support Measure (ESM) detachments are encoded and/ or multiplexed and therefore extracting enemy information/ intelligence is difficult and time consuming.
 - (b) **Evolution of Problem.** The ESM detachments after matching the equipment characteristics of frequency, modulation scheme, ESM feature, etc are able to record the transmission. When complex encoding technologies are employed by adversaries the transmission cannot be decoded as these are beyond manual rudimentary technology. Similar is the case for complex modern multiplexing schemes. There is thus 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 ESM detachments deployed in field 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.
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PROBLEM DEFINITION STATEMENT - 109

ONLINE TRANSLATION OF CHINESE INTERCEPTS IN DIFFERENT DIALECTS

1. **Short Title.** Development Auto Chinese Translator.
2. **User Directorate(s)/ Establishment.** Infantry Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** In number of occasions, forums and activities Indian Army members are required to interact with their Chinese counterparts. In all such occasions language becomes a key barrier. The number of Chinese language qualified personnel/ interpreters in the Indian Army are negligible. Since Chinese language course cannot be imparted to all individuals, there is a need to develop/ procure Chinese language translator to solve the problem.
 - (b) **How is it Being Overcome.** By employment of interpreters.
 - (c) **Innovations to Locally Overcome the Problem.** Google Translator.
5. **Who Has the Problem.** User.
6. **Why is it Important to Solve.** Chinese language course cannot be imparted to all individuals and hence development/ procurement of a Chinese language translator would go a long way in solving language barrier that exists at present. Availability of genuine Chinese language translator would also help military researchers and analysts of foreign and strategic affairs, and have a multiplier effect in the field of China studies in the Indian Army. It would also facilitate better understanding during Joint Exercises.
7. **Contemporary Solution by Other Countries/Organisations.** Not Known.
8. **Timelines.** Two to three years.
9. **Point of Contact.**

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PROBLEM STATEMENT NO - 110
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.
 - (c) **How is it Being Overcome.** Presently, only voice communication and very little data transfer in terms of short text messages are being transferred.
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 STATEMENT NO - 111

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 STATEMENT NO - 112
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 Agency.** Deputy Director General of Information Technology (DDGIT).
3. **Type of Problem.** Unsolved/Technology Infusion.
4. **Nature of Problem.**
 - (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 external 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 compressive 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 (geofence) set on a real life location to know presence/absence whenever they enter/leave a present geofence.
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.
8. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 113

TEST EQUIPMENT FOR TESTING OF ANTI TANK GUIDED MISSILE LAUNCHERS OF BMP-II

1. **Short Title.** Test equipment for testing of Anti-Tank Guided Missile (ATGM) launchers of BMP-II.
2. **User Directorate(s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Unsolved/Partially solved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Requirement of Indigenous Test equipment for testing of ATGM launchers of BMP-II.
 - (b) **Evolution of Problem.** ATGM launchers of BMP-II are primarily of Russian origin. The test equipment is also of Russian origin, is of old vintage. Repair support is also limited for the Russian test equipment.
 - (c) **How it is Being overcome.** There is another test equipment fabricated by M/s BDL but its reliability is not yet certified. Hence issue remains unresolved.
 - (d) **Any Innovation to Locally Overcome the Problem.** Efforts to overcome problem locally being carried out.
5. **Who has the Problem.** All EME workshops of Army.
6. **Why is it Important to Solve.** This is a very important test equipment to check serviceability of ATGM launchers and there is no alternative to it. These Russian test equipment are of old vintage. There is a requirement to have an indigenous test equipment to check ATGM launchers of BMP-II.
7. **Contemporary Solutions by Other Countries/ Organisations.** No information.
8. **Timelines.** 24 months.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 114
DEVELOPMENT OF AUGMENTED REALITY BASED SOLUTIONS FOR CARRYING OUT OF PREVENTIVE MAINTENANCE AND FAULT DIAGNOSIS OF VARIOUS EQUIPMENT BY THE USER

1. **Short Title.** Development of Augmented Reality based solutions for carrying out preventive maintenance and fault diagnosis of various equipment by the user.
2. **User Directorate(s).** Directorate General of EME.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Equipment deployed with troops in Counter Insurgency and Counter Infiltration grid and in other operational areas continues to be extensively exploited. Timely preventive maintenance is to be ensured for keeping all such equipment serviceable at all times. Effective fault diagnosis at the user end itself would shorten the overall repair chain as well as downtime of the equipment. The deployment of troops is usually in detachments in far flung areas in inhospitable terrain. With the scarce availability of technical manpower (maintainers) who will be involved in carrying out this preventive maintenance and fault diagnosis, there is a need felt that the user may himself be able to carry out the basic preventive maintenance as well as fault diagnosis of the equipment required. Whereas it is not possible to train the user in carrying out preventive maintenance and fault diagnosis of all types of equipment that he is utilizing, there is a possibility of introducing augmented reality based solutions so that user himself is able to carry out preventive maintenance and fault diagnosis of certain equipment such as generators, small arms and surveillance devices.
 - (b) **Evolution of the Problem.** The requirement has evolved out of the far flung deployment of troops in rough terrain and of the need for carrying out preventive maintenance and fault diagnosis if need be, of each and every hi-tech equipment held at user end rather than waiting for technical manpower to resolve the issue.
 - (c) **How it was Being Overcome.** Problem is being addressed by sending out technically trained manpower to repair equipment and by preventive maintenance.
5. **Who has the Problem.** All troops, users as well as maintainers.
6. **Why is it Important to Solve.** It is important to solve the problem so as to ensure maximum serviceability of war like equipment at all times.
7. **Contemporary Solutions by Other Countries/ Organisations.** Augmented reality solutions are offered and are being employed by various industries/ organisations across the globe.
8. **Timelines.**
 - (a) Feasibility Study- Four/ Six Months.
 - (b) Technology Solution- Eight Months/ One Year.
 - (c) Implementation- In Conventional/ Hot War deployment.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT-115
TEST EQUIPMENT: CHECKING BARREL WEAR OF ARTILLERY GUNS
(LASER BASED INSPECTION)

1. **Short Title.** Test Equipment for checking barrel wear of Artillery Guns.
2. **User Directorate(s) / Establishment.** Artillery Directorate.
3. **Type of Problem.** Poorly Solved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Serviceability & state of gun barrel is ascertained by measuring the ovality of gun barrel from time to time. Based on the measured wear, correction to ideal muzzle velocity is applied which directly affects the accuracy of fire.
 - (b) **Evolution of the Problem.** Accuracy of fire is affected if the barrel wear is not measured accurately. The existing procedure is cumbersome & has certain inherent errors as it is based on human interpretation.
 - (c) **How is it being Overcome.** Presently Gauge Measuring Bore is being used to measure the wear of a gun barrel.
 - (d) **Any Innovations.** No innovation exists.
5. **Who has the Problem.**
 - (a) **User (Skill Sets).** All Field & Medium units.
 - (b) **Operating Environment.** All types of terrain.
 - (c) **Periodicity of Exploitation.** During operations & training.
6. **Why it is Important to Solve.** LASER based system are not subjective to the inspector, detect issues invisible to human eye & capture data to provide users with all of the information required to effectively manage the gun barrel. Moreover, increase in accuracy of measurement of barrel wear will give correct perspective of barrel wear. Accuracy & efficacy of fire can be enhanced by working out correct muzzle velocity based on the measured wear of the barrel.
7. **Contemporary Solution.** Bore Erosion Measurement & Inspection System (BEMIS) developed by United States & Australia.
8. **Timelines.** Two to three years.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 116 HYBRID VEHICLES FOR HIGH ALTITUDE AREAS

1. **Short Title.** Development of Hybrid Vehicles for High Altitude Areas (HAA).
2. **User Directorate (s).** Supplies and Transport Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** The efficiency of B vehicles drops when employed in HAA. Due to lack of air density and pressure at high altitude the mass flow rate to engines drops considerably with increase in altitude thereby affecting the volumetric efficiency of the engine. Engine horse power decreases about 3% for each 1000 feet above sea level indicating 18% reduction in engine performance, similarly the air pressure reduces by 42% at 600m. Considering these factors of reduction in engine horse power and air pressure, the engine performance is bound to reduce in HAA.
 - (b) **Evolution of the Problem.**
 - (i) Due to extremely cold climate, fuel and oil freezes.
 - (ii) Due to cold climate, viscosity of diesel increase affecting fuel supply. Consequently, its fluid dynamics changes due to which its state from liquid changes to highly viscous liquid state thereby blocking pores of fuel filter and water separator.
 - (iii) The oil in the sump of engine which is essential for lubrication of engine freezes thus adversely hampering lubrication of engine resulting in possible engine seizure.
 - (iv) The frozen fuel also blocks injectors and rotary pump of class B vehicles. Hence there is a frequent need to change those parts in B vehicles deployed in High Altitude Area.
 - (c) **How is it Being Overcome.** Special grades fuel and oil is being used to minimise the problem. However it is still not very effective during peak winters from November to March. The vehicle gets off road during this period and there is a requirement of hybrid vehicle in order to solve such problem.
6. **Who has the Problem.** All B vehicles operating in HAA.
7. **Why it is Important to Solve.** To save essential manpower and resources during operations, hybrid vehicles with dual power source can be used to overcome problems which B vehicles are facing presently during extremely cold climatic conditions. Hybrid electric drive achieves greater efficiency in stop and go mission profiles than they do in long overhaul commercial duty cycles. The regenerative braking resources stores power as electrical energy stretches fuel further, and electric motor can generate instantaneous power for better off road manoeuvring.
8. **Contemporary Solution by Other Countries/Organisations.** Hybrid vehicles are currently being developed for use by United States Military.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT - 117

PRECISION DRONES WITH HIGHER PAYLOADS FOR DELIVERING STORES

1. **Short Title.** Precision Drones with Higher Payloads for Delivering Stores.
2. **User Directorate.** Infantry Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Number of defended localities in High Altitude Areas are not connected by road which necessitates ferrying of loads to these locations using mules/ porters. Further, number of such locations is under developed with limited/ no habitation which makes availability of adequate number of porters during operations uncertain.
 - (b) **Evolution of the Problem.** Carriage of war fighting stores ahead of road head in High Altitude Areas requires extensive mule and porter effort. Carriage of stores by mules/ porters is inefficient especially over distance exceeding two days turn around and is contingent upon availability of these resources. There is therefore a requirement of unmanned drone/ multi copter based solution with capability to airlift minimum 50 kg. The system should be intuitive to use and rely on Global Positioning System based control system to overcome limitations of Line of Sight (LoS) in mountains.
 - (c) **How is it Being Overcome.** The issue is presently addressed using following means:-
 - (i) Use of air lift which is vulnerable to weather conditions which permits limited windows of aerial operations, requires coordination with Indian Air Force and availability of suitable helipads.
 - (ii) Use of mules/local ponies and civilian/ fighting porters.
 - (d) **Innovations to Locally Overcome the Problem.** Nil.
5. **Who Has the Problem.**
 - (a) User (Skill sets). Troops employed for defensive/ offensive operations in High Altitude Areas with no road connectivity and involving travel by foot/ mule tracks.
 - (b) Operating Environment. Operational areas in High Altitude Areas with no road connectivity.
 - (c) Periodicity of Exploitation. Extensive by infantry battalions deployed in High Altitude Areas.
6. **Why it is Important to Solve.**
 - (a) Operational requirement of quick build up is contingent upon timely transportation of stores.
 - (b) Uncertainty in availability of porters especially in un-developed terrain with little/ no habitation.
 - (c) Limited viability of mules/ porters for transportation of stores over distance in excess of two days turnaround.
 - (d) Inability of ponies to lift awkward load.

7. **Contemporary Solution by Other Countries/Organisations.** Commercial drones/ Unmanned Aerial Vehicles/ multicopters are available with heavy lift capability such as:-
- (a) Stark Hx8 with lift capability of 30 kg.
 - (b) AZ 4K UHD with lift capability of 20 kg.
 - (c) Free fly Alta 8 with lift capability of 18 kg.
8. **Timelines.**
- (a) Product Conceptualization. Three months.
 - (b) Research and Design. Twelve months.
 - (c) Manufacturing of Prototype. Twelve months.
 - (d) Field/ User Trials. Six months.
 - (e) Manufacturing. Twelve months.
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PROBLEM DEFINITION STATEMENT - 118

HYDRAULIC ARMoured FIGHTING VEHICLE (AFV) LIFTING DEVICE & RAMP

1. **Short Title.** Requirement of Hydraulic AFV Lifting Device & Ramp.
2. **User Directorate(s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Railway ramps and Military Rail Girder (MRG) sets are presently used for unloading AFVs from rolling stock. However, there can be an eventuality wherein AFVs are required to be unloaded at a place where railway ramps do not exist and MRG sets are either not available or are inadequate. Moreover, use of MRG sets can cause some damage to railway tracks which needs to be repaired before further usage which may imply delay in induction of subsequent forces. Hence, alternative ways for AFV unloading need to be devised. It is proposed to design and fabricate a lifting device (akin to a set of heavy duty jacks) that can lift the loaded tank and turn it sideways. The tank can then be unloaded using a ramp.
 - (b) **Evolution of the Problem.** Problem has arisen due to inadequate availability of railway ramps/MRG for unloading of tanks and Infantry Combat Vehicles at every place.
 - (c) **How it was Being Overcome.** With available railway ramps and MRG sets which are inadequate vis-à-vis the requirement.
5. **Who has the Problem.** Mechanised Forces Units.
6. **Why it is Important to Solve.** It is important to solve the problem so as to speed up the induction during the operations.
7. **Contemporary Solutions by Other Countries/Organisations.** Not adequately known. Possibly, use of cranes and ramps.
8. **Timelines.**
 - (a) Feasibility Study - Two/three months.
 - (b) Technology Solution - Four/six months.
 - (c) Implementation in peace - Eight/ten months.
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PROBLEM DEFINITION STATEMENT - 119

DESIGN & DEVELOPMENT OF INDIGENOUS ALL TERRAIN VEHICLE (ATV)

1. **Short Title.** Design & Development of Indigenous All Terrain Vehicle (ATV)
2. **User Directorate(s).** Directorate General of Infantry.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Any Infantry Battalion deployed in High Altitude Area experiences a vast variation in weather conditions throughout the year. The climatic temperature varies from minus 55 degrees Celsius in peak winters to plus 20 degrees Celsius during summers. This area is under developed in terms of road connectivity and thus has limited mobility. It has permafrost formation over soil and during melting of frozen water/ moisture of the soil in summers, it results in boggy ground at base of mounds/ bumps due to accumulation of the water.
 - (b) **Evolution of the Problem.** Mobility of all vehicles are greatly restricted.
 - (c) **How it was Being Overcome.** No permanent solution till now. Locally innovated All Terrain Vehicle (ATV) based on Maruti Gypsy Chassis is being tried out.
5. **Who has the Problem.**
 - (a) **User (Skill Sets).** Problem is being faced by Users and Electronics and Mechanical Engineers.
 - (b) **Operating Environment.** High Altitude Area
6. **Why it is Important to Solve.** During winter movement of vehicle is extremely restricted.
7. **Contemporary Solutions by Other Countries/Organisations.** Polaris, USA has developed an ATV.
8. **Timelines.**
 - (a) Feasibility study - Four/Six months.
 - (b) Technology Solution - Eight / Ten months.
 - (c) Locally innovated All Terrain Vehicle (ATV) based on Maruti Gypsy chassis can be worked upon by the Industry to come up with an indigenous ATV within one year.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT- 120

ENGINE AUTO SHUT DOWN MECHANISM FOR 'A' VEHICLES

1. **Short Title.** Engine Auto Shut Down Mechanism for 'A' vehicles in case of high temperature or low coolant level or low engine oil pressure.
2. **User Directorate(s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Poorly solved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** A need is felt to devise a mechanism which will constantly monitor the engine oil pressure, temperature and coolant level of an AFV and will automatically shut down the engine if engine oil pressure or coolant level falls below the specified limits or if the engine temperature exceeds the higher limit thus preventing engine seizure.
 - (b) **Evolution of the Problem.** Large fleet of tank is held with Indian Army out of which approx 60 tanks engines seize prematurely per annum are reported due to low engine oil pressure or high temperature or low coolant level because there is no full proof method of monitoring all these essential parameters.
 - (c) **How it was Being Overcome.** To overcome this problem, upgrades have been envisaged which would give audio visual warnings in case of exceeding the acceptable limits of these parameters. However, even this is not fool proof as the fatigued driver during operations may not be able to constantly monitor any such warning in the heat of the battle.
 - (d) **Any Innovations to Locally Overcome the Problems.** An auto shut down mechanism has been developed by a Mechanised Brigade Workshop which on detecting the changes beyond the specified limits will send the signal to activate the auto shut down mechanism for the engine shut down and prevents the engine seizure.
5. **Who has the Problem.**
 - (a) **User.** Field units equipped with T-72, T-90 tanks and BMP-II.
 - (b) **Operating Environment.** This mechanism will be exploited/operated by the units equipped with 'A' vehicles while undergoing routine exercise and operations.
 - (c) **Periodicity of Exploitation.** The expected periodicity of exploitation is till the useful life of the engine or the AFV.
6. **Why it is Important to Solve.**
 - (a) At present Tank T-72/ Tank T-90 and BMP-II are the main stay of our mechanised forces in Indian Army. It is very essential to keep these 'A' vehicles in mission readiness state so that high degree of operational readiness is achieved throughout the short duration fast paced warfare.
 - (b) The main problem which is being faced in field conditions pertaining to tanks and ICVs is that of engine seizure due to high temperature or low coolant level or low engine oil

pressure. This leads to premature failure of Tank engine before the stipulated life and renders it Non Mission Capable (NMC). This is due to lack of any automated mechanism which causes the engine to shut down on its own in case of very high temperature or low coolant of low engine oil pressure. Presently, the onus is on the driver to constantly monitor the engine parameters and take corrective anticipatory action which may not be possible in the heat of battle.

- (e) The cost of overhauling of a tank engine works out to be approx 5-6 lakhs whereas the cost of any original engine is approx 90 lakhs. Therefore, a pan Indian Army initiative is needed to be undertaken to carry out this modification in all the tanks and ICVs held with IA which is highly cost effective and works out only Rs 8,500/- per tank/ICV.

7. **Contemporary Solutions by Other Countries/Organisations.** The ‘David’ auto shut down mechanism for certain ‘B’ vehicles engine and generators has been made by US based company ‘Murphy’. However this kind of mechanism has not been designed and fabricated for ‘A’ vehicles.

8. **Timelines.**

- (a) Product Conceptualisation - 06 months.
- (b) Research and Design - 06 months.
- (c) Manufacturing of Prototype - One year.
- (d) Field Trials/ User Trials - One year.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT - 121

METAL COMPOSITES & 3D METAL PRINTING FOR PRODUCTION OF SPARES

1. **Short Title.** Capability development in 3D Metal Printing of Metal Composites for Production of Spares.
2. **User Directorate(s).** Directorate General of Army Air Defence.
3. **Type of Problems.** Unsolved problem.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Army Air Defence is holding legacy equipment like L/70 40mm Gun, ZU 23mm 2B Gun, USFM & FWCS radars and missile system. Most of the equipment were bought ex-import without Transfer of Technology. Production of most of the equipment as well as their spares have been stopped the world over. Non availability of spares is making the sustenance of these equipment difficult. To manufacture the spares in India and maintain the equipment, it is required that capabilities should be developed both in metallurgy as well as 3D metal printing so that spares with exact dimensions can be produced out of metal composites which are able to sustain the pressure and force produced during exploitation of equipment during firing.
 - (b) **Evolution of Problem.** Army Air Defence equipment is of old vintage and has been exploited over the years leading to wearing and degradation of various parts. As spares are no longer being produced worldwide, their supply has reduced tremendously rendering a large number of equipment non-operational.
 - (c) **How it was Being Overcome?** Spares ex stock wherever available were being procured and supplied mostly by Defence Public Sector Undertakings. However, these sources have also nearly dried up. In an attempt to maintain the equipment, a Life Time Buy of spares is being done however 100% spares availability is still not assured.
5. **Who has the Problem.** The user, affiliated workshops and Base Workshops.
6. **Why it is Important to Solve.** Till the time successors of all the equipment are not procured, it is a must to keep the current inventory of weapons of Army Air Defence in operationally working condition. Hence, it is important that spares using metal composites are manufactured using 3D Metal Printing to ensure availability of spares to enable sustenance of vintage Air Defence equipment.
7. **Contemporary Solution by Other Countries/ Organisations.** Composite Metals as well as 3D Metal Printing technology exists in other countries.
8. **Timelines.** Research, manufacture of prototype and trials are proposed to be completed in one year.
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PROBLEM DEFINITION STATEMENT NO - 122
EXTREME COLD CLIMATE (ECC) CLOTHING FOR CREW OF ARMoured FIGHTING VEHICLE (AFV)

1. **Title.** ECC Clothing for AFV Crews.
2. **User Directorate (s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** Need to issue ECC compatible Overall/Dungaree for AFV crews to retain crew efficiency.
4. **What is the Problem.** The Regiments are deployed in High Altitude Area and extreme climate has direct bearing on the efficiency of crews. There is no provision of ECC clothing for AFV crews in High Altitude Area.
5. **Who has the Problem.** All Armoured Regiments and Mechanised Infantry Battalions deployed in High Altitude Area and personnel involved in repair/maintenance of AFVs.
6. **Why is it Important to Solve.** To enhance the crew efficiency for execution of Crew Battle drills/procedures thereby maintaining the 'Operational Readiness' of field army.
7. **Contemporary Solution.** Scaling of ECC clothing (Overalls/ Dungaree) to all Armoured Regiments & Mechanised Infantry Battalions deployed in HAA and EME personnel involved in maintenance/ repair of AFVs. Case to be taken up for scaling of ECC compatible Overalls/ Dungaree.
8. **Timelines.** 12 months.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 123

POOR BATTERY LIFE OF LRF LH-30

1. **Title.** Poor battery life of LRF LH-30.
2. **User Directorate(s).** Directorate General of Infantry and Directorate General of Mechanised Forces.
3. **Type of Problem.** Unsolved Problem.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** Hand Held LRF LH-30 is powered by 12V, 220 mAh Ni-Cd (Nickel Cadmium) battery. In present scenario LRF LH-30, battery backup is inadequate
 - (b) **Evolution of the Problem.**
 - (i) Due to lower energy capacity of battery i.e. 220mAh and high power consumption 550mAh of the equipment, the battery does not last long.
 - (ii) Requirement of high quality and compact batteries when equipment was procured.
 - (c) **How it was Being Overcome.**
 - (i) By correctly storing the batteries.
 - (ii) By timely recharging batteries.
5. **Who has the Problem.**
 - (a) **User (Skill Sets).** Problems being faced by Infantry and Mechanised Forces.
 - (b) **Operating Environment.** Peace/Fd/HAA.
6. **Why is it Important to Solve.** LRF LH-30 is extensively used by field Army and is an important electro-optical equipment for combat and combat support arms as it enhances the first round hit probability. The vintage batteries have less power backup which hinders the exploitation of equipment to its full potential.
7. **Contemporary Solution of Other Countries/ Organisations.** By replacing Ni-Cd battery with Li-Ion battery which are compact and highly efficient.
8. **Timelines.** 12 months.
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PROBLEM DEFINITION STATEMENT - 124 COMPOSITE MEDICAL DIAGNOSTIC EQUIPMENT FOR POSTS

1. **Short Title.** Composite Medical Diagnostic Equipment for Posts.
2. **User Directorates/ Establishment.** Infantry Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need)**
 - (a) **Statement of Problem.** There is a need to design Composite Medical Diagnostic Equipment for Posts to check heart/ pulse rate, oxygen levels, Blood Pressure & other health parameters.
 - (b) **Evolution of the Problem.** The likely reduction of strength of Army Medical Corps and non-availability of Nursing Assistants/ Battle Field Nursing Assistants for each isolated post necessitates elementary medical support, health monitoring at unit/ sub unit level.
 - (c) **How is it Being Overcome?** By periodic visit to isolated posts/ sub units by Regimental Medical Officer/ Nursing Assistant/ Battle Field Nursing Assistant.
 - (d) **Innovation to Locally Overcome the Problem.** Nil.
5. **Who has the Problem.** Infantry and other Arms and Services.
6. **Why is the Important to Solve.** Facilitate monitoring of heart/ pulse rate, oxygen levels, Blood Pressure & other health parameters at unit/ sub unit level in absence of Nursing Assistant/ Battle Field Nursing Assistant.
7. **Contemporary Solution by other Countries/ Organisations.** Modern Armies of the world are using such devices for health monitoring.
8. **Timelines.** 2-3 years.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 125

RAPIDLY DEPLOYABLE MOBILE OPERATION THEATRES

1. **Short Title.** Rapidly Deployable Mobile Operation Theatres.
2. **User Directorate(s)/ Establishment.** Army Medical Corps/ Field Hospitals.
3. **Type of Problem.** Poorly Solved problem of establishment of operation theatre in High Altitude Area as well as dessert terrain.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** It is difficult to establish an Operation Theatre, in a time bound manner, in absolute sterile space in the tents especially in desert due to wind, storm, dirt as well as thorns/ bushes and in High Altitude Area due to space crunch as well.
 - (b) **Evolution of Problem.** Problem has been well acknowledged during various operational exercises in desserts as well as High Altitude Area.
 - (c) **How is it Being Overcome.** At present, Operation Theatres, for conduct of field surgeries, are being established in four men ordnance issue tents. Medical equipment like aseptisizers have been issued to achieve sterile environment.
 - (d) **Any Innovation to Locally Overcome the Problem.** Some of the formations have modified ALS vehicles as ' Operation Theatre on Wheels'.
5. **Who has the Problem.**
 - (a) **User.** Operation clinicians (Surgeon &Anesthetists) as well as clientele.
 - (b) **Operating Environment.**
 - (i) In dessert due to aseptic conditions like wind, storm, dirt as well as thorns/ bushes.
 - (ii) High Altitude Area due to aseptic conditions like wind, storm as well as space crunch.
 - (c) **Periodicity of Exploitation.** During various formation level operations/ exercise as well as during disaster management.
6. **Why it is important to Solve?**
 - (a) **Criticality.** It is well established fact that a surgery has to done on a patient within six hours of sustaining the injury.
 - (b) **Limiting Factor.**
 - (i) At present, conventional Operation Theatres in the war zone are being established in the ordnance issued shelters/ tents. The minimum number of tents required is six four men sets for pre operation, operation theatre, post operation, scrub room as well as space for keeping the equipment required to keep the operation theatre functional.
 - (ii) Establishment of operation theatre in the tents within a given timeframe is not only a limiting factor for achieving 100% sterility but as well as not so practical in High Altitude Areas where availability of space is a major limiting factor.

(iii) Establishment of operation theatre within six hour of arrival at designated area is also a constraint due to location factors like weeds, bushes, thorns, reptiles, dust/ snow etc.

7. **Contemporary Solutions by Other Countries/ Organizations.** Modern Armies of the world are using Rapidly Deployable Mobile Operation Theatres.

8. **Timelines.** Mid Term Research Project (05 - 06 years).

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT NO - 126

FUEL CELL TECHNOLOGY

1. **Short Title.** Fuel Cell Technology.
2. **User Directorate(s).** Directorate General of Infantry.
3. **Type of Problem.** Unsolved.
4. **What is the Problem (Need).**
 - (a) **Statement of Problem.** The Power Source/ batteries held in the inventory of Infantry/ Army are bulky and have limited life which poses consequent challenge in carriage and recharging in field conditions.
 - (b) **Evolution of the Problem.** The plethora of electronic devices held in the inventory of Army to meet the requirement of the digitized battle field has led to increase in the demand for power. This has resulted in the consequent increase in the inventory of batteries and related problems of providing replacement/recharging options in field conditions.
 - (c) **How it was Being Overcome.** Presently Ni-MH and Ni-Cd batteries are essentially being used by the troops. However, these batteries are bulky, have a reduced life and have problems of recharging in field conditions. Power solutions like fuels cells which are light weight and can facilitate easy recharging will assist in achieving the desired field requirements.
5. **Who has the Problem.** Across Indian Army.
6. **Why it is Important to Solve.** The present inventory of batteries have limited life and are bulky. Fuel cell technology offers several advantages over older technology. They are upto 80% lighter and soldiers can carry replacement fuel cartridges or with an option of refilling the cells/batteries/power pack with desired electrolyte / solution to keep the equipment functional for a longer duration. Fuel cells also have the advantage of operating at fairly low temperatures.
7. **Contemporary Solution by Other Countries/ Organisations.** Not known.
6. **Perceived Solution.** To provide a light weight, long lasting and easily rechargeable Power Source which is compatible with existing electronic devices held in the inventory of Army for meeting the future operational requirements. For eg a Radio Set to have a Fuel Cell of miniaturised design as a power source. On battery / Fuel Cell getting discharged the Battery / Cell is refilled using the electrolyte, thereby providing instant recharging. Having option of providing a similar power source for other electronic devices will also assist in reducing the inventory.
8. **Timelines.** The problem needs to be solved at the earliest to enhance the efficiency of field army.

9. **Point of Contact.**

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PROBLEM STATEMENT NO - 127

TEST KITS FOR CHECKING QUALITY OF MEAT

1. **Short Title.** Test kits for checking quality of meat during active hostilities and overseas operations.
2. **User Dte (s)/Est.** Dte Gen RVS/RVC Centre and College/ RVC officers engaged in inspection of food of animal origin.
3. **Type of Problem.** Poorly solved. Food safety especially that of food of animal origin wrt detection and prevention of accidental food contamination has been part of mandate of RVC.
4. **What is the Problem (Need).** Veterinary officers of RVC are mandated with the task of inspection of meat group items supplied to troops in field & peace. But they are handicapped in making judgment on the meat quality based on sound scientific logic due to lack of field test kits for identification of excess microbial load, over expiry of date of frozen meat, detection of hormones, antibiotics and various toxins in meat.
 - (a) **Statement of Problem.** Food safety especially that of foods of animal origin, wrt detection and prevention of accidental food contamination has been the part of mandate of RVC. Provision of test kits to detect excess bacterial load, over expiry date of frozen meat, presence of chemicals, hormones, antibiotics and toxins will go a long way in ensuring public health.
 - (b) **How is it Being Overcome.** Currently Fresh/Frozen/Chilled meat and chicken are subjected to visual, olfactory and sensory evaluation for quality. Suspicious samples are subjected to few basic lab tests that can be carried out under field conditions. RVC Veterinarians also utilise DFRL (DRDO) kits for detecting spoiled meat and cold slaughter.
 - (c) **Any Innovations to Locally Overcome the Problem.** No
5. **Who has the Problem.**
 - (a) **User (Skill Sets).** RVC officers engaged in inspection of food of animal origin are unable to carry out their duties efficiently due to lack of readymade test kits to detect microbial load, pesticides, antibiotics, bacterial toxins and other harmful chemicals in meat/chicken. The problem is further aggravated by the procurement of self-certified frozen/chilled meat and chicken for consumption by IA troops.
 - (b) **Operating Environment.** Field units /Peace establishment of Defence/Overseas Operations.
6. **Why it is Important to Solve.** Army Veterinary officers play an important role in supply chain management of frozen/chilled chicken and meat from production to consumption to avoid public health hazards to troops due to accidental contamination and sabotage. Technology solution in the form of readymade test kits needs to be provided to veterinary officers tasked with the responsibility of meat inspection. These include biological agent identification kits, food toxin identification kits to detect common toxins like botulinum toxin, aflatoxin etc. which can lead to serious food poisoning in troops.

7. **Contemporary solution by other Countries/Organization.** Ready to use test kits for detecting excess bacterial load, specific bacterial species like anthrax, chlorine, toxins like botulinum, pesticides & antibiotics are available in several developed countries and are being used by their Army Veterinarians.

8. **Timeline.**

S No	Task	Time line
Development of test kits for detection		
(a)	Excess microbial load in meat/chicken.	2 Years
(b)	Excess chlorine.	2 Years
(c)	Diseased meat (anthrax & bird flu).	3 Years
(d)	Antibiotics (Specific Kit for each antibiotic).	3 Years
(e)	Hormones (Specific kit for each hormones viz oxytocin & growth hormones).	3 Years
(f)	Detection of over expiry date frozen meat/chicken.	3 Years
(g)	Detection of pesticides in chicken/meat.	3 Years

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT - 128

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 under taken.
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) Precast structures airlifted to sites.
8. **Timelines.**
 - (a) Feasibility Study - Two months.
 - (b) Technology Solution - Three months.
 - (c) Implementation - Based on success achieved.

9. **Point of Contact.**

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PROBLEM DEFINITION STATEMENT NO - 129

HEATED SHELTERS

1. **Short Title.** Heated Shelters.
2. **User Directorate(s).** Directorate General of Mechanised Forces.
3. **Type of Problem.** The entire service equipment in High Altitude Area needs to be kept in heated shelters to avoid damage to equipment.
4. **What is the Problem (Need).** The equipment is held in unheated shelters which is unsatisfactory.
5. **Who has the Problem.** All Armoured Regiments, Mechanised Infantry Battalions and their support services units.
6. **Why is it Important to Solve.** To ensure high degree of operational readiness state in field armies at High Altitude Area.
7. **Contemporary Solution.** The civil industry uses Climate Control Sheds for its inventory stocks in various locations.
8. **Timelines.** 12 months.
9. **Point of Contact.**
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PROBLEM DEFINITION STATEMENT - 130 MODULAR HABITAT FOR HIGH ALTITUDE AREA

1. **Short Title.** Development of Modular Habitat for High Altitude Area.
2. **User Directorate(s)/Establishment.** Engineer Directorate.
3. **Type of Problem.** Unsolved.
4. **What is the Problem?**
 - (a) **Statement of Problem.** The existing habitat is primitive, non-relocatable in most cases and not suitable for extreme climatic conditions. Therefore, there is a need to create modular habitat for operational areas meeting the following requirements:-
 - (i) Ability to re-locate.
 - (ii) Inbuilt allied facilities.
 - (iii) Light weight.
 - (iv) Easy to construct i.e. can be constructed by unskilled individuals.
 - (v) Suitable for extreme weather conditions (insulated from heat & cold).
 - (vi) RADOME shaped to be used for deception.
 - (vii) Caters for waste disposal.
 - (b) **Evolution of Problem.** The existing habitat is primitive, non-relocatable in most cases and not suitable for extreme climatic conditions. Therefore there is a requirement to create a re-relocatable modular habitat for operational areas. The modular habitat requires less manpower and time for construction and have inbuilt allied facilities. It can be erected by unskilled individuals and suitable for extreme weather conditions.
 - (c) **How is it being Overcome?** By using tent extendable, make shift habitats and pre – fabricated habitat on hit and trial basis.
 - (d) **Any Innovations to Locally Overcome the Problem.** Use of makeshift habitat/ tents.
5. **Who has the Problem.** The entire Indian Army. The troops deployed in the operational area are presently accommodated in primitive habitats and requires modular habitats for improving living condition and operational efficiency.
6. **Why it is important to Solve.** It is important to address the issue so as to improve living condition of troops deployed in operational area thereby enhancing operational efficiency.
7. **Contemporary Solution by Other Countries/ Orgs.** Most countries have/ developed it and are utilising modular habitats.
8. **Timelines.** Short Term project (1-2 years)



9. **Point of Contact.**

(a) **Primary Contact.**

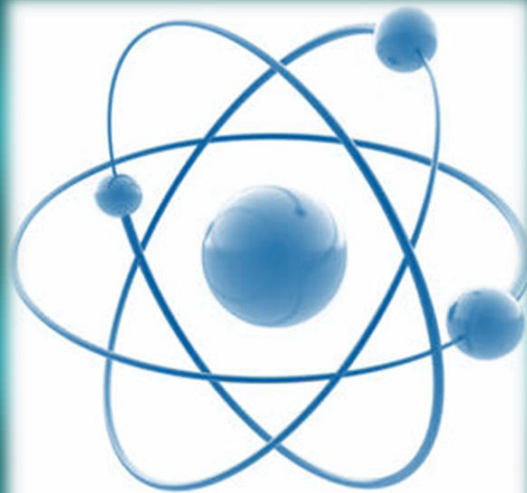
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