**Mobile Multi Object Tracking Radar with detection range upto 250 Kms**

As a component of the Challenge 1, it is proposed to develop a mobile Multi Object Tracking Radar which can be deployed on any existing suitable military prime mover or develop a suitable one, for mobile operations. This radar should have a detection range of min 250 km or more and should be able to track at least 15 objects (25 x 25 cms) simultaneously. All radar system accessories incl power system should also be integrated with the radar.

**Intelligent Onboard System for Satellite Mission Planning**

As a component of challenge 3, it is proposed to develop an Intelligent On-board System for Mission Planning of Satellites with RF sensors. This intelligent on-board system should be able to execute missions autonomously based on inputs from ground control and collect critical RF data in an efficient manner for successful detection of various RF sources.

**Ground controlled Satellite Antenna Frequency Switching System**

As a component of challenge 3, it is proposed to develop a Space based, Multi-band Antenna system for RF sensor satellites that can operate in different frequency bands, eliminating the need for separate antennae for different frequency bands. It should be configurable by a ground based control system for switching and tuning the on-board antenna for various frequency bands.

**Multiband RF Sensor Data Processing and Analysis System**

As a component of challenge 3, it is proposed to develop a Data Processing and Analysis tool for multiband RF data collected by RF sensor satellites. This multiband RF data is to be processed by a ground-based processing platform and analysed using AI tools.

**Imagery data fusion for Optical and Radar data sources**

As a component of challenge 4, it is proposed to develop a multi format imagery data fusion platform along with AI analytical tool which is capable of integrating the data received from multiple optical and radar sensors into a unified data set. The AI tool will analyse this unified data set to provide reliable space situational awareness.

**AI/ ML based Change Detection for Multi Payload fused Imagery Data**

As a component of challenge 6, it is proposed to develop a AI/ML based analytics on board for EO imagery which can give change detection and also can take intelligent decisions based on the outcome of imagery analysis. The on-board AI system which analyses the data generated from different payloads to glean useful information.

**Quantum Encryption Modules for Secure Satellite Communication**

The present satellites use traditional cryptographic algorithms for ensuring confidentiality of data. The requirement of employing Quantum Encryption in satellite communication is the need of the hour. The quantum encryption module should be able to support standard data rates of DVB-S2 modems which are typically at 2 to 4 Mbps. The module should be in a plug and play form factor. The module should be able to interface with the existing antenna systems.

**Intelligent Object Identification System with LIDAR and EO sensors**

As a component of challenge 10, it is proposed to develop an AI-based system to recognise potential threats to the satellite from debris. The satellite will carry LIDAR and EO sensors as payloads, whose data will be analysed by the on-board AI tool to predict approaching debris for collision avoidance and for providing inputs to the proximity and docking operations.

**High Throughput Communication Satellite in LEO with User Terminals**

At present communication satellite services availed through GEO has inherent disadvantages in terms of its known location and latency. It is proposed to develop a LEO constellation of two satellites for extending satellite communication services. The payload configuration could be 'Ku' or 'Ka or higher bands of microwave spectrum to accommodate high data rate applications. End-to-end solution is envisaged, with ground control systems and hub infrastructure. Multiple SDR based user terminals could be planned depending upon operational utility with data rates better than 100 Mbps. The user terminals could be static, airborne and mobile.

**Secure Satellite Communication based Automated Info Broadcast system using Receive only User terminals**

Right info at right time to field forces is a vital element in operations. Hence, a secure Information Broadcast System using Receive only Terminal to combat teams in field is proposed. This broadcast system should have high data rate (greater than 1Mbps) with small form factor, ruggedized Receive only Terminals, operating in S band and powered by a battery offering backup time of 2 hrs. The broadcast system should be able to transmit images, text messages and small video to dedicated terminals.

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| Directorate & organization | DSOD |
| Problem Statement/ Challenge title | Underwater Photography Noise Cancellation using Artificial Intelligence and Deep Learning |
| Challenge brief/ definition | Underwater photography in turbid waters gives sub optimal results. Cancellation of noise to provide clearer pictures is necessary for  many applications. |
| Future Expectations | 1. Better quality pictures. 2. Obviate dependency on foreign OEMs for niche technology/ spares/ services. 3. Reduction in Cost. 4. Building expertise in niche technology. |
| MoQ | 10 |
| Project Officer | Cdr Anjani Kumar |

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| Directorate & organization | DAWFS |
| Problem Statement/  Challenge title | Development of AI (Artificial Intelligence) based FOD (Foreign Object Debris) detection and classification system for FOD management at Air Stations. The system should be based on computer vision algorithm using image  sensors to monitor airport runway images in real time and perform FOD detection and classification |
| Challenge brief/ definition | FOD prevention and clearance is an important aspect of safe flying operations. FOD has been root cause of quite a few failures of aero engines as well as damage to costly air assets. There are various FOD measures in place at Naval Air Stations and Ships, however there is scope for improvement. Owing to relevant threats associated with aircraft operations, enhancing FOD management solution is considered key priority for ground operations. Towards enhancing IN capability for FOD detection and classification capability, IN is looking for an AI based, self- learning FOD detection system having full control and visibility of runway and manoeuvering areas, during day and night and also during inclement weather, capable of detecting and classifying FODs ranging from small aircraft parts such as rivets, washers, screws etc. to large objects  including birds and other wild life. |
| Future Expectations | The system should be capable of detecting and classifying FOD on the runway and manoeuvering areas in real time. The monitoring, detection and classification of FOD should be based on computer vision algorithm (using optical image and radar sensors) and advanced image and radar data processing technology. The AI based FOD detection system is required to augment IN FOD mitigation measures  at air stations for detection and classification of FODs towards enhancing overall flight safety. |
| MoQ | 10 |
| Project Officer | Cdr Ashish Ganu S |

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| Directorate & organization | DSR |
| Problem Statement/ Challenge title | AI Based collision avoidance system |
| Challenge brief/ definition | To develop an AI based fully autonomous collision avoidance system for unmanned  vessels. |
| Future Expectations | 1. Elimination of human error/ intervention for safe navigation. 2. Reduction of manpower. 3. Reduction in cost. 4. Obviate dependency on foreign OEMs for niche technology/ spares/ service. 5. Building expertise in niche technology. |
| MoQ | Will be intimated |
| Project Officer | Cdr Abhishek Kumar |

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| Directorate & organization | DSMO |
| Problem Statement/ Challenge title | AI Based Ship Recognition software |
| Challenge brief/ definition | An AI based software is required for image processing and identifying a ship visible through the periscope using an inbuilt library. A software is required to use the already available library of ships and quickly identify the same based on the ship visible on the periscope there by saving time and improving  efficiency of the periscope watch-keeper. |
| Future Expectations | 1. Higher accuracy. 2. Limit the human error. 3. Save time compared to identifying the ship manually. 4. Integrating the available library for real- time outcome. |
| MoQ | Will be intimated |
| Project Officer | Will be intimated |

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| Directorate & organization | DNBCD |
| Problem Statement/ Challenge title | Personal locator device with fall detection |
| Challenge brief/ definition | Damage control patrols and fire-fighting are high risk duties in which the fire fighter or patrol man can become incapacitated and is unable to safely leave an immediately dangerous to life and health environment. During firefighting operations, a firefighter may also get disoriented and get left behind in the compartments filled with smoke and other dimly lit conditions. Similarly, Damage Controls Patrols operate in silent hours and are the detectors/first responders to a fire or flooding emergency. While operating alone, these personnel are at risk of being incapacitated by injury resulting in inability to  raise an alarm or seek help. |
| Future Expectations | 1. Use of location / alarm devices onboard ships to prevent injury/loss of life. 2. Obviate dependency on foreign OEMs for niche technology/ spares/service. 3. Reduction in cost. 4. Building expertise in niche technology. |
| MoQ | Will be intimated |
| Project Officer | Will be intimated |

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| Directorate & organization | DNBCD |
| Problem Statement/ Challenge title | Fire Fighting bot |
| Challenge brief/ definition | Remote controlled firefighting BOT is to be designed to allow a user to control a fire fighter robot, which is essentially an unmanned ground vehicle equipped with a water jet. To allow the user to control the firefighting effort, the bot equipped with water jet / spray and trainable to the required direction. This can be connected to fire main of the ship and have a Thermal Imaging Camera (TIC) making it capable of detecting and suppressing fires in enclosed spaces. Being lightweight and portable would be required for the bot. |
| Future Expectations | To increase the efficiency and safety of crew in Fire Fighting Organization, the use of fire- fighting BOT has been proposed. |
| MoQ | Will be intimated |
| Project Officer | Will be intimated |