Challenge No:1

Problem Statement/Challenge title	30 mm Proximity Fuze.
Challenge brief/definition	The present ammunition gun uses 30mm HE ammunition with Direct Action (DA) & Self Destruction (SD) Fuze. For effective engagement against aerial targets, development of proximity/ Programmable fuze for the ammunition is proposed. This would present a definite engagement response against all aerial targets including swarm drones. The proximity effective operation is envisaged approximately between 0.5 to 1 m. (a) **Proposed Product Concept**. Design and development of proximity fuze for incorporation in the existing 30mm HE ammunition used by IN. The fuze would initiate the round when in proximity to designated targets. The fuzes should be designed and manufactured to be assembled with the existing 30mm HE/I rounds. This would provide additional target engagement capability to IN ships in CIWS. (b) **Key Technologies to be Applied**. (i) RF technology to sense the target proximity. (ii) Battery module with firing circuit (iii)Safe and Arm Device (SAD) to prevent premature initiation. (c) **Size and Form Fit.** The fuze should be compatible with the existing 30mm ammunition in the IN. The form and fit should correspond to firing from AK 630 Guns. The system shall be able to program the ammunition in 12 msec.

Challenge No:2

Problem Statement/Challenge title	AI Based barrel crawling Bot Inspection System (software & hardware)
Challenge brief/definition	The existing inspection involves uses of cross piece gauges to undertake measurement of concentricity and other critical parameter of barrels as part of schedule maintenance. Further, these barrels are dismantled to check erosion, damage and other defects as part of Series Inspection/ maintenance. This is manpower intensive activity and takes considerable time based on availability of maintenance manpower/ spares/ availability of ship. Further, the inspection data are analysed manually for undertaking predictive analysis based on trends. Therefore, undertaking inspection in-situ without dismantling the barrel by using AI crawling bot for checking the material health of barrel would not only aid in exploiting the full operational life of the Gun/TTs/RLs but would also aid in prescriptive maintenance based on defect observed during these inspections. (a)**Proposed Product Concept**. AI based barrel crawling bot inspection system shall be able to assess the structural health of barrel in situ and undertake predictive analysis to determine the residual operational life. Further, this would also aid in product development as part of indigenisation. This would also aid in efficient product lifecycle management. Damage prognosis, health monitoring, crack detection, measurement of erosion, historical analysis and predicting remaining useful life of barrel would be undertaken without dismantling the gun. (b)**Key Technologies to be Applied**. (i)Sensor technology with Crawling bot to sense the various key parameters relevant for serviceability of barrel. (ii) An AI algorithm for structural integrity analysis as well as predictive analysis. (iii)Real time inspection Data Capturing capability system (iv) IoT for wireless transfer of data into master data for easy storage and retrieval on demand. (v) GUI for easy data input by the inspector and display of various analysis for quick decision making and efficient lifecycle management (c) **Size and Form Fit**. AI based barrel crawling bot inspection system shall be modular, light weight, easy to handle and

	upgradable to future upgrades for inclusion of more components.In the extant proposal, AI based barrel crawling bot inspection system shall be able to undertake inspection and analysis of barrels from calibre 30 mm to 537 mm. List of sizes of barrels/ Launchers available with IN would be provided to potential firms.

Challenge No:3

Problem Statement/Challenge title	AI Based Gun Parts Inspection System (software & hardware)
Challenge brief/definition	The existing inspection involves dismantling & measurement of critical parameter of Gun Parts during scheduled interval by using various gauges. This is manpower intensive activity and takes considerable time based on availability of NAD manpower/ spares/ availability of ship. Further, the inspection data are analysed manually for undertaking predictive analysis based on trends. Adaptation of AI for checking the material health of Gun components would not only aid in exploiting the full operational life of the components but would also aid in timely spare management by NADs (a)**Proposed Product Concept.** AI based Gun Parts inspection system shall be able to create digital twin and undertake predictive analysis to determine the residual operational life of critical components. Further, the digital twin generated shall aid in product development as part of indigenisation. This would also aid in efficient product lifecycle management. Damage prognosis, health monitoring, crack detection, measurement of erosion, historical analysis of components and predicting remaining useful life of components shall be integral feature of the AI based Gun Parts inspection system. (b)**Key Technologies to be Applied.** (i) Sensor technology to sense the various key parameters relevant for serviceability of Gun components. (ii)An AI algorithm for structural integrity analysis as well as predictive analysis. (iii) Real time inspection Data Capturing capability system (iv) IoT for wireless transfer of data into master data for easy storage and retrieval on demand. (v) GUI for easy data input by the inspector and display of various analysis for quick decision making and efficient lifecycle management (c)**Size and Form Fit**. AI based Gun parts inspection system shall be modular, light weight, easy to handle and upgradable to future upgrades for inclusion of more

	components. In the extant proposal, AI based Gun parts inspection system shall be able to undertake inspection and analysis of five critical gun components prone to failures during exploitation. List of SRGM gun components would be provided to potential firms.

Challenge No:4

Problem Statement/Challenge title	Long Range Communication Technology for locating torpedoes
Challenge brief/definition	Presently heavyweight practice torpedoes having horizontal surfacing, are using SBRT (Satellite Based Reporting Terminal) system which transmits location of torpedo at the end of the run. SBRT transmits the location of the torpedo to satellite which in turn transmits the location to the receiving station. The location is then, through respective MOC, is passed to the ships for recovery of the torpedo. However, SBRT cannot be used for heavy weight and light weight torpedoes attaining vertical position post completion of vertical position at the end of the run. Thus, a transmitter is required to be fitted in the nose section which is exposed out of water post end of torpedo run. This transmitter should be able to directly communicate to the ship the location of the torpedo.

Challenge No:5

Problem Statement/Challenge title	Development of Super Hydrophobic paint for torpedoes to reduce skin friction of water
Challenge brief/definition	Electrical and thermal torpedoes in IN inventory have been exhibiting low speed during practice firings. Use of super hydrophobic paint on torpedoes can increase the speed without any hardware changes and thus solve the problem of low speed.

Challenge No:6

Problem Statement/Challenge title	Hardware enforced solution against advanced, persistent and coordinated attacks to prevent kernel mode malware
Challenge brief/definition	The security of applications hinges on the trustworthiness of the operating system, as applications rely on the OS to protect code and data. As a result, multiple protections for safeguarding the integrity of kernel code and data are being continuously proposed and deployed. These existing protections, however, are far from ideal as they either provide partial protection, or require complex and high overhead hardware and software stacks. The aim is to create a low-overhead, hardware assisted, memory protection scheme that safeguards the operating system from rootkits and kernel-mode malware.

Challenge No:7

Problem Statement/Challenge title	AI BASED FOD(FOREIGN OBJECT DEBRIS) DETECTION AND CLASSIFICATION SYSTEM FOR FOD MANAGEMENT AT IN AIR STATION
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 to aircraft operations, enhancing FOD management capability by harnessing evolving AI technology for a comprehensive 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 manoeuvring areas, during day and night and also during inclement weather (heavy shower experienced during monsoon}, 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.

Challenge No:8

Problem Statement/Challenge title	AIRBORNE HIGH PERFORMANCE LIGHTWEIGHT COMINT SYSTEM.
Challenge brief/definition	COMINT system architecture should be a combination of signal/ multiple wide and multiple narrow band receivers and/or digital down convertors (DDC) with high sensitivity to ensure maximum probability of interception along with at least 32 channels for audio and data communication monitoring and provision of simultaneous recording on all channels (recording as selected/activated by operator). Facility to infer & reproduce communication signal data intercepted in user friendly/understandable form through audio and graphical user interface should also exist.

Challenge No:9

Problem Statement/Challenge title	Expendable Mobile ASW Training Target (EMATT), capable of simulating the sounds and movement of a real Submarine.
Challenge brief/definition	The EMATT should be capable of being deployed from P8I aircraft, MH60R helicopters and ships (doing speed upto 10 kts). No modifications should be undertaken on the platform from which the EMATT is required to be launched. t should be dropped through the sonobuoy launch mechanism of the aircraft. After entry into the water, it should be capable of generating different types of acoustic signals (discrete tones, broadband noise, active emissions, magnetic signature and echo repeats of sonar and torpedo system) including dynamic characteristics of a Submarine. Thus, a single EMATT can simulate different types of target (Submarines and Torpedoes), thereby ensuring maximum training value to the crew without actual employment of various types of Submarines/ Torpedoes.

Challenge No:10

Problem Statement/Challenge title	DIGITAL RADIO FREQUENCY MEMORY (DRFM) BASED SIMULATOR ON A DRONE FOR AD TRAINING AND RADAR CALIBRATION
Challenge brief/definition	To develop a Digital Radio Frequency Memory (DRFM) based radar target simulator on a drone which can simulate targets at ranges varying between 5 km to 500 km and can be used for AD training and radar calibration.

Challenge No:11

Problem Statement/Challenge title	AIR BORN MINE DETECTION SYSTEM (AMDS) FOR INDIAN NAVAL HELICOPTER
Challenge brief/definition	Mines are inexpensive and easy deployable means that could effectively disrupt maritime operations, thereby, preventing Naval forces from achieving their defined objectives. It could also inflict heavy damage and may lead to blocking of harbours if thorough Mine Counter Measures (MCM) are not resorted. Towards enhancing MCM capability, IN is looking for Airborne Mine Detection Capability. This capability would be utilised for various maritime operations viz establishment of Swept Channel, Littoral warfare and integral operations of Expeditionary and Amphibious task Force. This capability is envisaged to be organic to the ship.

Challenge No:12

Problem Statement/Challenge title	AI BASED REMOTE MONITORING SYSTEM TO ASSESS WEAR DOWN OF OUTBOARD SHAFT BEARING
Challenge brief/definition	The Main Propulsion onboard ship consists of Main Engine, Reduction Gear (RG), Shafting and Propeller. To avoid sagging of the shaft, it is supported by Plummer Blocks (inside the ships) and thordan bearings (external to the ship). The plummer block comprises of a journal bearing which is self-lubricated. The thordan bearing is made of composite/ rubber/ wood and sea water is used for lubrication of this bearing. To monitor the wear down/ condition of journal bearing, shaft loading checks are undertaken onboard periodically in afloat condition. However, no methodology exists to assess the condition of outward bearings (AP bracket and outer stern tube bearing) in afloat condition and can be determined only whilst the ship is in dry dock. Therefore, to obviate the requirement of dry docking a ship to assess the condition of outer shaft bearings, a monitoring system may be designed which can give the wearing values of these bearing, whilst the ship is in afloat condition itself.

Challenge No:13

Problem Statement/Challenge title	GNSS BASED 3-D HELO APPROACH AND LANDING AID FOR IN HELICOPTERS FOR ASSISTANCE IN APPROACH ON LANDING IN BAD WEATHER/ REDUCED VISIBILITY/ NIGHT AT SEA STATES.
Challenge brief/definition	The system is aimed towards enhancing operational envelope of helicopters and aiding recovery of helicopter on the helo deck in night/ reduced visibility and bad weather with centimetric accuracy. IN is looking for suitable GNSS based 3D approach and landing system for IN helicopters (ALH), which is capable of operating in GPS denied environment through compatibility with GLONASS, GALILEO, GAGAN SBAS and IRNSS

Challenge No:14

Problem Statement/Challenge title	LIGHTWEIGHT INTEGRATED INDIGENOUS ELINT/ COMINT SYSTEM FOR NSUAS/ MULE CLASS RPA
Challenge brief/definition	EW has emerged as a decisive factor in modern day warfare and influences the outcomes of Naval operations and engagements very significantly. Pertinently, correct identification of radar intercepts by ESM systems in a dense maritime environment plays a critical role. Similarly, COMINT systems are also required to detect, intercept and demodulate different types of voice/ data transmissions that are emitted at sea. The capability to have an COMINT integrated ESM cum which is lightweight to meet space and RPA stability requirements onboard tactical platforms, and has modern features (including ability to detect and DF 'A' band transmissions) needs to be developed indigenously. The EW system should be a COMINT lightweight integrated ESM and system incorporating latest technologies, indigenously designed and developed for airborne applications. The system should be capable to monitor and DF all simultaneously available RF Signals (both Radar and Radio) in the given band.

Challenge No:15

Problem Statement/Challenge title	LONG RANGE COMMUNICATION FOR TRACKING AND EXCHANGING SHORT MESSAGE BETWEEN IN HELICOPTER (CHETAK) AND THE SHIP
Challenge brief/definition	Presently, CH operational range is limited afloat view no availability of tracking aid and positional information of the helo/ship on-board ship and helo respectively. Fitment of a suitable system to aid in providing positional information, aid the aircraft to home on to the ship and passing messages without breaking RT silence and vise a versa is considered essential for enhancing operational range of the helicopter

Challenge No:16

Problem Statement/Challenge title	MOISTURE WICKING HYDROPHOBIC WEAPON COVER
Challenge brief/definition	The challenge is to manufacture weapon/ gun covers which are flame proof, hydrophobic from the external side, and also possess moisture wicking properties such that nil resultant water accumulation is noticed underneath the covers.

Challenge No:17

Problem Statement/Challenge title	STUDY FOR COMPARISON AND SELECTION OF LITHIUM ION BATTERIES AND THEIR OPTIMAL CONFIGURATION FOR USE IN EXTRA LARGE UNMANNED UNDERSEA VEHICLE (XLUUV)
Challenge brief/definition	It is required to undertake comparative analysis and identify an optimum Lithium Ion battery solution to meet requirements of a high-capacity, high-endurance unmanned underwater vehicle. The scope of work would involve identifying, characterizing (by testing) and recommending the most suitable Lithium-ion battery solution for usage onboard XLUUV, Covering the following aspects: (a) identification of alternative solutions in Lithium-ion batteries (b) Comparison of characteristics, including testing (c) Identify most appropriate type and configuration (d) Prepare specifications for selected battery type (e) Recommend integration interfaces with vehicle (f) Indicate through-life requirements

Challenge No:18

Problem Statement/Challenge title	ANALYSIS AND OPTIMIZATION OF VEHICLE DYNAMICS & SYSTEMS FOR AN EXTRA LARGE UNMANNED UNDERWATER VEHICLES (XLUUV)
Challenge brief/definition	Undertake vehicle-level studies/ simulations for development of dynamic model and sub-systems configuration for XLUUV, for vehicle design to be provided by IN

Challenge No:19

Problem Statement/Challenge title	AUTONOMOUS STARTING, RUNNING AND SHUTTING DOWN OF A DIESEL ALTERNATOR SUITABLE FOR CHARGING LITHIUM ION BATTERIES
Challenge brief/definition	The task is to undertake literature/ market/ technology survey, identify suitable diesel alternator and demonstrate its autonomous starting, operation and control for charging a Lithium-Ion Battery bank. This combination of Diesel Alternator and Lithium Ion Batteries is intended for application in an Extra Large Unmanned Underwater Vehicle (XLUUV).

Challenge No:20

Problem Statement/Challenge title	DEVELOPMENT OF SHIPBORNE LIGHTWEIGHT INTEGRATED ESM CUM COMINT SYSTEM
Challenge brief/definition	EW has emerged as a decisive factor in modem day warfare and influences the outcomes of Naval operations and engagements very significantly. Pertinently, correct identification of radar intercepts by ESM systems in a dense maritime environment plays a critical role in the decision cycle of a Commander at Sea. Similarly, COMINT systems are also required to detect, intercept and demodulate different types of voice/ data transmissions that are emitted at sea. The capability to have an integrated ESM cum COMINT which is lightweight to meet space and stability requirements onboard small ships, and has modem features (including ability to detect and DF 'A' band transmissions) needs to be developed indigenously. The EW system should be a lightweight integrated ESM and COMINT system incorporating latest technologies, indigenously designed and developed for shipborne applications. The system should be capable to simultaneously monitor and DF all available RF Signals (both Radar and Radio) in the given band.

Challenge No:21

Problem Statement/Challenge title	AXIAL FLUX MOTOR BASED LIGHTWEIGHT ELECTRIC OBM WITH OPTIONAL FUEL CELLS
Challenge brief/definition	Presently, conventional OBMs are being used by MARCOs on rubber dinghies for Special Operations missions. These OBMs are relatively large in size, have a prominent aural signature and produce a wake which can lead to visual and audible detection of the rubber dinghy by the adversary.

Challenge No:22

Problem Statement/Challenge title	DISPOSABLE LIGHT WEIGHT DRONE (DLD) CAPABLE OF PROVIDING THE GROUND SOLDIER WITH IMMEDIATE SITUATIONAL AWARENESS
Challenge brief/definition	Presently, no such equipment exists that can provide immediate situational awareness to the troops on ground. Troops are majorly depended on command stations/ UAVs for relaying data. This information from UAVs and other sources is usually processed by using various filters and then provided which may be unrelated to actual requirement or delayed.

Challenge No:23

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

Challenge No:24

Problem Statement/Challenge title	Underwater Remotely Operated Vehicle (UWROV) for underwater inspection and repairs
Challenge brief/definition	Manufacture of UWROV to obviate dependency on foreign OEMs for niche technology spares service. Additionally, it will be redundancy to existing UWROVs.

Challenge No:25

Problem Statement/Challenge title	AI based collision avoidance system for unmanned vessels
Challenge brief/definition	To develop an Al based fully autonomous collision avoidance system for unmanned vessels.

Challenge No:26

Problem Statement/Challenge title	Autonomous Weaponized Boat Swarms
Challenge brief/definition	There is a need to develop an unmanned vessel with integrated system capable of performing a variety of naval and security missions which would include Littoral/ ODA Patrol, High Speed Interdiction, Coastal Surveillance, Local Naval Defence Constabulary Operations, C4ISR, Medium Sized Unmanned Surface Vessel and Low Intensity Maritime Operations (LIMO).

Challenge No:27

Problem Statement/Challenge title	Beamforming ASIC based Radar with massive MIMO technology
Challenge brief/definition	To develop a lightweight radar based on beam forming at the chip level covering I band to serve as the navigational radar on ships .

Challenge No:28

Problem Statement/Challenge title	Blue Green Lasers for underwater applications
Challenge brief/definition	Presently acoustic based systems are the primary means of detecting underwater objects. However, acoustic detection is limited by various physical parameters of water column like temperature, depth, salinity, ambient noise etc. Consequently, secondary means for detection of underwater objects need to be developed. Inter alia, these secondary means include Blue-Green Laser based systems which are showing promise in detection of underwater objects.

Challenge No:29

Problem Statement/Challenge title	Converting Oxygen torpedoes to UW targets for ASW training and practice torpedo firings
Challenge brief/definition	There exists a need to develop an UW target that can be embarked on a ship to facilitate sonar tracking exercises as well as torpedo firing exercises. To facilitate this, existing Oxygen torpedoes available within IN inventory may be converted to Self-Propelled Underwater Recoverable Target.

Challenge No:30

Problem Statement/Challenge title	AI enabled automatic floatation device dispersal drone
Challenge brief/definition	**Problem to be resolved.** The current procedure for recovery of man overboard involves stoppage of the ship to lower a boat or execution of a Williamson's Turn to retrace the path of the ship. Both these processes are time consuming. The man in water would find it difficult to stay afloat without a lifebuoy or lifejacket. Furthermore, the more time that elapses, the more difficult it would be find the man. **Definition .of Challenge.** To devise a method by which a man that has fallen overboard may be quickly found and provided with a floatation device.

Challenge No:31

Problem Statement/Challenge title	Development of Hydro acoustic ASW Vector Sensors which can be used with drones
Challenge brief/definition	There is hence a need to develop a light weight hydro acoustic ASW vector sensor which could be mounted on light weight platforms.

Challenge No:32

Problem Statement/Challenge title	Microwave Obscurant Clouds(MOC) which are programmable based on the threat
Challenge brief/definition	Modern Antiship cruise missiles employ a variety of complex guidance and navigation asures to defeat ship defences. These include Infrared Imaging (IIR) and Electro-Optical seekers, high speed supersonic terminal approach and ECCM techniques against conventional Chaff & Jamming. To counter this, navies across the world use a combination of both hard kill and soft kill measures. Accordingly, passive measures such as Microwave obscurant clouds are increasingly relevant as a soft kill option to divert/ counter the incoming missile threat away from the ship.

Challenge No:33

Problem Statement/Challenge title	Portable RCS Measuring Device that is capable of independent operation and deployable from multiple platforms (ship, boat, UAV, etc.)
Challenge brief/definition	Radar Cross Section measurement of ships is an important aspect in formulating various easures and doctrines. In deployment of chaff, RCS of a ship leads to the number of chaf rockets to be fired. Portable RCS Measuring Device will give IN the capability to measure RCS of ships and enable in better utilization of soft kill measures against anti-missile defence.

Challenge No:34

Problem Statement/Challenge title	Reusable off-board Missile Decoy
Challenge brief/definition	Anti-ship missiles fly at 3-5 m in terminal phase of 10-12 km at speeds upto 3 Mach. The reaction time for Anti-Missile Defense (AMD) is therefore about 10-25 sec. AMD measures include 'Hard kill' measures (physical destruction of the incoming threat through the use of Surface to Air Missiles or Close in Weapon Systems) and 'Soft kill' measures (anti-missile decoys, Jamming or Chaff). Modern missiles are designed with ECCM against conventional Chaff & Jamming. Seekers also have ARM home-on features. Active Missile Decoys can impersonate target ship RCS and can be effective as a soft kill AMD measure in terminal phase of the incoming missile. Further, decoys can also radiate transmissions such that missiles which passively home on to radiation are also decoyed.

Challenge No:35

Problem Statement/Challenge title	AI based Multi Radar Signal Conversion, Distribution & Multi Target Tracking for ***IN*** ships (particle Filter)
Challenge brief/definition	To develop an Al based multi RADAR signal conversion and distribution to one single window.

Challenge No:36

Problem Statement/Challenge title	3D Forward Looking Sonar for surface platforms and Autonomous Underwater Vehicles (AUVs)
Challenge brief/definition	Development of a 3-dimensional forward looking sonar for installation onboard surface platforms and AUVs for imaging of sea bed and water column for detection of ground mines, moored mines and other underwater obstacle.

Challenge No:37

Problem Statement/Challenge title	AI based adaptive noise cancellation for sonars of Autonomous Underwater Vehicles(AUVs) and ship borne sonar
Challenge brief/definition	Efficacy of passive and active sonars are dependent on their ability to cancel out ambient noise, self-noise and radiated noise of the platform. Further, the various types of noises are constantly changing due to various environmental factors such as water temperature, salinity, weather conditions, sea bottom characteristics depth, traffic density in the area etc. These noises cause an inherent degradation in the sensor capability. Hence any noise cancellation system for a ships sonar and AUV should be able to cancel out noise in varying Conditions in an adaptive manner to detect the signal of interest. Further, it should be able to adaptively classify noises from sources such as warships, submarines and merchant ships. Use of AI in noise cancellation, adaptive as per changing conditions to filter noise from the signal of interest would improve sonar detection ranges.

Challenge No:38

Problem Statement/Challenge title	Underwater Communication for Swarm of AUVs
Challenge brief/definition	Transmitting data reliably through water is extremely difficult. The effectiveness AUVs in swarm configuration depends largely upon communication network. There is a requirement of transmitting data wirelessly underwater and establishing two way Communication between swarm of AUVs for undertaking swarm of AUVs. The communication system be developed using following techniques: (a) Laser based underwater data link. (b) Acoustic modem for urnderwater communication. (C) Electromagnetic underwater communication.

Challenge No:39

Problem Statement/Challenge title	Underwater Navigation System for AUVs
Challenge brief/definition	There exists a need to develop underwater navigation system to facilitate accurate navigation for UUVs.

Challenge No:40

Problem Statement/Challenge title	Submarine Voyage Data Recorder (SM-VDR)
Challenge brief/definition	Voyage Data Recorder 1s an integral part of Safety of life at Sea. The purpose of a Voyage Data Recorder, as per IMO Resolution MSC 163(78) is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a vessel. It aims to aid in re-establishment of the Voyage details during an incident investigation (akin to Black Box of an airplane). The IN submarines are currently not equipped with a Voyage Data Recorder, therefore there exists a requirement of SM-VDR to recover information regarding the sequence of events leading to a submarine incident as well as for crew training.

Challenge No:41

Problem Statement/Challenge title	Ai based ship recognition software using image processing
Challenge brief/definition	A software is required to use the already available library of ships and quickly identify the same visible on the periscope thereby saving a lot of time of the periscope watch-keeper.

Challenge No:42

Problem Statement/Challenge title	Depth Based Positioning System to navigationally fixing position of Submarine
Challenge brief/definition	Design a software solution which can statistically co-relate the depths observed by a high definition echo sounder of the submarine with the existing depths in an Electronic Chart stored and displayed in the Electronic Chart Display System (ECDIS) and accurately fix the position of the submarine.

Challenge No:43

Problem Statement/Challenge title	Design a Tethered/ Expendable Submarine Communication Buoy
Challenge brief/definition	Design a Tethered / Expendable Submarine Communication Buoy. The Tethered Submarine Communication buoy should be capable of being released I retracted from a depth of 300 m with the submarine propelling at speeds upto 6 knots. The communication buoy should house antennae's capable of receiving VLF, HF and SATCOM and transmitting SATCOM and HF signals

Challenge No:44

Problem Statement/Challenge title	Fire Suppressant material that can suppress fire in the initial stage only.
Challenge brief/definition	Incidences like that of INS Sindhuratna wherein the IN lost two fine Officers due to a major fire on-board in third compartment can be avoided by using the fire suppressant material now available in the market The fire on-board was initiated through Main Line Gables of the submarine which are inaccessible in the normal operating conditions. Hence, use of the proposed material by M/S AADVANCE Safety Technologies Pvt Ltd is highly recommended. The material is available in multiple options such as PAD for flooring, wire or cable's covering, covers and tape to be applied on small places.

Challenge No:45

Problem Statement/Challenge title	Multi Sensor real time monitoring of running machinery on-board submarine
Challenge brief/definition	Due to constrained space on-board submarines, it is proposed to install multi-point monitoring sensors on critical machineries for real-time health monitoring. This will be a check on the rudimentary method of physical inspection for each and every machinery visually and by using SPM meters. Moreover, it is considered very essential for submarine because of the confined places where physical access from all sides of the machinery is not possible without degutting of the equipment due to limited access window. These sensors are proposed to be installed on vital equipment such as Supply-Exhaust blowers, Hydraulic Motors, ACs, Alternators for their continuous monitoring and together with software and AI predictive failures could be done. But that is not proposed for SPRINT and could be undertaken in a phased manner subsequently.

Challenge No:46

Problem Statement/Challenge title	Noise Augmentation Unit for masking submarine's own signature when operating within the vicinity of FFCs (Friendly Foreign Countries)
Challenge brief/definition	Stealth is the most important strength of submarines. While exercising with friendly foreign countries a submarine shares its acoustic signature with the FFC units. Thus, it is important to mask our own acoustic signature

Challenge No:47

Problem Statement/Challenge title	Non hull penetrating connectivity solution for submarines at harbour
Challenge brief/definition	Unlike IN Warships, conventional submarines do not have any fixed point for establishing communication at Jetty. Mostly they are using the loose cables running down the conning tower as a temporary measure for establishing communication. This is only a temporary solution and possess many challenges such as, frequent damage to the cables resulting in non-availability of the LAN most of the time, removal of the cables for every evolution which requires closing of Escape Hatch for checking water and air tight integrity of the submarine, wastage of man-hour and Ethernet cable. All this could be easily avoided by providing a set of watertight box at the fin wherein all the telephone, LAN and power connectivity could be given without penetrating the hull. One of the methods to achieve this is using EOPL technology.

Challenge No:48

Problem Statement/Challenge title	Smart, lightweight, retractable and easily deployable cable gangways for submarine shore supply
Challenge brief/definition	Shore supply and shore charging cables have been one of the biggest problems in the submarine-arm since the inspection of the submarines in the IN. The same are always required when the submarine is alongside. Presently, there is a big shortage of these cables due to their unnatural wear and tear. To avoid this it is proposed to design and develop a small and smartly deployable gangway for submarines for housing and routing these cables from the Jetty till the Shore Supply and Charging Points. This light and portable gangway is essential for the submarines for shore supply and shore charging both. In the absence of these gangways the cables get damaged while coiling between the Jetty and the submarine and I or pontoons. This not only involves huge financial loss but also is a severe safety issue as these damage cables pose high risk of electric shock, short circuit, fire and thus require continuous repairs. Several instances of minor-fires have happened in the past on these cables.

Challenge No:49

Problem Statement/Challenge title	Smart mobile units for shore supply and charging cable
Challenge brief/definition	A total of 5 Shore supply and around 16 shore charging cables are required for a Sindhughosh class of submarine. Managing these have been one of the biggest problems in the submarine-arm since the inspection of the submarines in the IN. The same are always required when the submarine is alongside to preserve its battery and to charge them. Any cold move of the submarine from one jetty to another becomes a major evolution for shifting all these cables. Further, there is no provision to store these cables. Thus a smart solution is proposed for storing, transporting and deploying of these cables

Challenge No:50

Problem Statement/Challenge title	Blue Green Laser Technology based on Light Detection & Ranging (LiDAR) to establish communication from a ship or an aircraft to a submarine
Challenge brief/definition	This technology will provide a communication between a dived submarine and a surface ship or an aircraft thus maintaining the stealth of the submarine.

Challenge No:51

Problem Statement/Challenge title	Submerged Submarine Launched Expendable Bathy Thermograph (SSLXBT)
Challenge brief/definition	Submarines rely heavily on knowledge and exploitation of the Bathymetric profile in the area of operations. Presently the submarine has to physically dive to its maximum depth frequently to measure bathymetric profile. This puts strain on the hull, machinery and crew. The Submerged Submarine Launched Bathy Thermograph System (sSLXBT) enables a submarine to deploy an expendable probe through the existing Submerged Signal Ejector tube to measure sea water temperature from the surface level down to depths far exceeding its maximum diving depth without physically changing depth.

Challenge No:52

Problem Statement/Challenge title	Aerogel based Fire Fighting proximity suit for better efficiency in fire fighting
Challenge brief/definition	**Problem definition.** To increase the efficiency and safety of crew in fire fighting by using aerogel based fire proximity suits, thereby reducing weight and increase heat resistance. **(a) Proposed produced concept**. It is intend to use aerogel based fire proximity suit for better efficiency in fire fighting, thereby reducing weight and increase heat resistance. (**b) Key Technologies**. Aerogel based suits. **(c) Size & form fit.** The specifications of the suit should be as per SOTR of the existing suit, excluding weight and heat resistance properties.

Challenge No:53

Problem Statement/Challenge title	Axial motor based portable submersible pumps in order to sustainability reduce weight
Challenge brief/definition	To use axial motor based submersible pumps in order to substantially reduce weight. (a)**Proposed produced concept.** It is proposed to reduce weight of the submersible pumps by using axial motors. (b)**Size & form fit.** The weight of the pumps should be lighter and meeting all specifications as per SOTR for the existing submersible pump/motor

Challenge No:54

Problem Statement/Challenge title	Caged Drone with TIC for firefighting in confined spaces
Challenge brief/definition	**(a)** **Proposed produced concept.** To a allow user to control fire fighter robot, which is essentially UAV/Drone with TIC making it capable for detecting seat of fire as well as presence of human in smoke filled compartments **(b)** **Size & form fit.** The cage around the drone has to be designed to enable operations within confined spaces and TIC should be meeting all specs/requirements as per SOTR.

Challenge No:55

Problem Statement/Challenge title	Lightweight filtration based Breathing Apparatus
Challenge brief/definition	To use lightweight BA in compartments where oxygen is available but air is contaminated with pollutants. **(a) Proposed produced concept.** The product has been designed to filter air contaminated with pollutants and use as breathing apparatus. **(b) Size & form fit.** The weight of the filtration based BA should be lighter and have better filtration capability.

Challenge No:56

Problem Statement/Challenge title	Fire Fighting BOT to allow a user to control a fire fighter robot
Challenge brief/definition	To increase the efficiency and safety of crew in Fire Fighting Organization, the use of fire fighting BOT has been proposed. (a) **Proposed produced concept.** The product has been designed to allow user to control Fire Fighting BOT which is essentially unmanned ground vehicle equipped with water jet. This can be connected to ship fire main and TIC making it capable for detecting and suppressing fire. (b) **(6) Key Technologies.** Remote control. (c) **Size & form fit.** The weight of the Bot should be lighter, making it easier for the crew to shift onboard. Further, the water jet nozzle should be compatible with sizes of hoses existing in IN.

Challenge No:57

Problem Statement/Challenge title	Indigenous Aluminised Fire Proximity Suit (AFPS)
Challenge brief/definition	Presently, AFPS suits are being imported. It is proposed to develop indigenous AFPS. **(a) Proposed produced concept.** It is intend to develop indigenous AFPS. **(b) Size & form fit.** The specifications of the suit should be as per SOTR of the existing suit.

Challenge No:58

Problem Statement/Challenge title	Development of low cost, indigenous Morpene compound
Challenge brief/definition	Presently, Morpene used for firefighting purpose including Aircraft Carriers is being imported from Russia. **(a) Proposed produced concept**. To develop low Cost indigenous Morpene compound

Challenge No:59

Problem Statement/Challenge title	Instant Cooling Vest for fire fighters
Challenge brief/definition	To provide relief to fire fighter while fighting the fire, instant cooling vests which has ability to lower temperature can be used. (a) **Proposed produced concept.** It is intend to use instant cooling vests for fire fighters in order to provide relief. **(b) Size & form fit.** The specifications of the vest should be light weight and have heat resistance properties.

Challenge No:60

Problem Statement/Challenge title	Personal Locator Device with Fall Detection for Firefighters/ Damage Control Teams on-board ships
Challenge brief/definition	Damage Control Patrols and fire fighting are high risk duties onboard ships 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 get disoriented and get left behind in the ensuing mayhem in compartments filled with smoke and other dimly lit conditions. Similarly Damage Control Patrols operate in silent hours and are the detectors/first responders to a fire or flooding emergency. While operating alone in high sea states and visiting high risk compartment places, these personnel are at risk of being incapacitated by injury resulting in inability to raise an alarm or seek help.

Challenge No:61

Problem Statement/Challenge title	Portable Hydraulic Metal Cutter
Challenge brief/definition	Ships have husbandry tools like angle grinder, metal Cutter, shearing machine and drilling machine etc. which are not sufficient to perform the above mentionèd tasks in damage control scenarios. Therefore, it is required that such type of equipment which are lightweight, portable, easy to carry and operate and can easily cut the metal in a short time be explored for use on IN ships. (a) **<u>Proposed Product Concept</u>**. The equipment which is proposed is a back pack based hydraulic system with multiple tools (changeable) for breaching of doors, cutting metal etc. **(b) Key Technologies to be Applied** (i) It should be workable/capable in marine environment. (ii) It should be battery operated. (iii) It should be lightweight and easy to carry. (iv) It should to safe and simple to use. (v) It should be easy to maintain. (c) **<u>Size and Form Fit.</u>** It should be compatible with the existing tools of IN.

Challenge No:62

Problem Statement/Challenge title	Remote controlled NBC monitoring BOT using suitable sensors
Challenge brief/definition	To remotely undertake NBC monitoring with BOT fitted with suitable sensors. (a) **Proposed produced concept.** The product has been designed to allow a user to remotely control the device fitted with suitable sensors for NBC monitoring. (b) **Key Technologies.** Remote control. (c) **Size & form fit**. The weight of the Bot should be lighter, making it easier for the crew to shift onboard. Further, the sensors fitted should be as per specifications of the NBC sensors being used onboard.

Challenge No:63

Problem Statement/Challenge title	Portable rugged, waterproof and lightweight torch for DC/FF activities including underwater
Challenge brief/definition	To design rugged, waterproof and lightweight torch for DC/FF activities including underwater. (a) Proposed produced concept It is intend to develop rugged, waterproof lightweight torch. (b) (b) Size & form fit. The torch should be meeting all specs/requirements as per SOTR.

Challenge No:64

Problem Statement/Challenge title	Smart Firefighting features to the existing Breathing Apparatus
Challenge brief/definition	To increase the efficiency and safety of crew in Fire Fighting Organization, smart firefighting BA has been proposed as an add-on to the existing breathing apparatus which can monitor parameters such as pressure, breathing rate and time remaining and convey the same to firefighting buddy using RF means. (a) Proposed produced concept. The product has been designed to provide additional information such as pressure, breathing rate and time remaining and convey the same to firefighting buddy using RF means. (b) Key Technologies. RF technology. (c) Size & form fit. The size and fit should be compatible with the existing BA sets used in IN.

Challenge No:65

Problem Statement/Challenge title	Airborne high performance multi-mode Active Electronic Scanned Array (AESA) radar
Challenge brief/definition	Radars fitted on IN aircraft are currently operating on Pulse Doppler technology. There is a requirement to replace these radars with modern AESA radars with simultaneous air to air and air to surface modes. These radars are expected to fit within the already existing random shapes, use the existing mounting arrangements and remain within the power budgeting of installed equipment. Integration of the radar on to existing Display Systems/ Tactical Management Systems also is to be undertaken by the system provider.

Challenge No:66

Problem Statement/Challenge title	ASIC based space Communication using software defined antenna
Challenge brief/definition	To develop a lightweight ASIC based communication system using software defined antenna for LEO, MEO and GEO satellite communication.

Challenge No:67

Problem Statement/Challenge title	Electro Optical Infrared sensor system contained in an external Pod composed of a variety of sensors
Challenge brief/definition	Electro Optical Infrared sensor system contained in an external Pod is required for operation from fighters, helicopters, maritime patrol aircraft and remotely piloted aircraft operating from and over both land and sea to designate specific targets. A software configurable digital wide band Data Link is required to provide real time connection between the aerial and ground segments. A ground exploitation station which enables optimized mission planning, real time mission control, exploitation management, real time image interpretation and data analysis (including change detection), reporting and dissemination is also to form part of the system.

Challenge No:68

Problem Statement/Challenge title	Propulsion System of AUVs
Challenge brief/definition	Development of suitable propulsion system optimized for hydrodynamic efficiency and low acoustic noise for AUVs.

Challenge No:69

Problem Statement/Challenge title	Autonomous Beach Check Survey Device
Challenge brief/definition	To Develop an Autonomous Beach Check Survey device which is portable lightweight boat with an echo sounder to undertake check soundings prior beaching/operations close to inner harbor.