

WEBINAR PROCEEDINGS OF “FORCE PROTECTION INDIA 2022”

(Organised by the Centre for Joint Warfare Studies (CENJOWS) and Indian Military Review (IMR) on 24 June 2022 as a Webinar and Virtual Expo)

1. On June 24, 2022, CENJOWS and IMR conducted a webinar and virtual expo themed "**Force Protection India 2022.**" The objective of the webinar was to provide the armed forces and paramilitary forces a platform to discuss their needs and requirements for new technologies with the DRDO and industrialists. These technologies would be employed for the protection of personnel, equipment, military infrastructure and assets.

2. During the course of the proceedings the participants discussed the current requirements, challenges and future of surveillance and perimeter protection; intrusion detection and monitoring; ballistic protection of personnel, equipment, vehicles, helicopters, aircraft, ships, and infrastructure; counter-IED equipment; and high altitude and CBRN (Chemical, Biological, Radiological and Nuclear) protection.

SESSION I – INAUGURAL SESSION

3. In his welcome address, **Lt Gen Sunil Srivastava** AVSM, VSM**(Retd), Director, CENJOWS provided an overview of the challenges faced by the Indian Defence Forces and emphasised the need to meet these threats and risks by enhancing the protection of our infrastructure, personnel, and equipment through cutting-edge solutions provided by the industry and academia. He highlighted the importance of maintaining a balance between the mission, men and material and enumerated the risk and cost analysis that comes with undertaking defence operations. He underscored the necessity for synergy and complementarity between the tri-service forces in an endeavour to identify solutions to combat the vulnerabilities of conventional platforms. He called for innovative solutions from the forces, the DPSUs, DRDO, the industry and academia and underlined the need for focus towards mission and asset criticality, platform vulnerabilities and a clear eyed view of the credibility of the threat dimension.

4. In the inaugural address, **Air Marshal SP Wagle**, VM, DCIDS (DOT), HQ Integrated Defence Staff, emphasised the importance of protecting the body and habitat on high altitudes and the need for advanced training and equipment. He opined that in this evolving warfare environment the enemy forces may use new technology, thus our forces should concentrate on perimeter protection and intruder detection by employing advanced technology such that the threat on our perimeters can be neutralised and countered. He called for an improvement in the quality of our bulletproof jackets and helmets which should now be of lighter composite material such that a balance can be maintained between cost and availability. He emphasised the growing significance of incorporating intelligence and signal surveillance into our efforts as well as the necessity of multi-layered border defence. In his final remarks, he emphasised how biological threats have entered the realm of warfare's developing dimensions and how rogue states can use them to asymmetrically offset our capabilities.

5. In the keynote address, **Maj Gen SK Vidyarthi**, SM, ADG EM, Master General Sustenance Branch, underlined the need for the diversification of supply chains and the importance of indigeneous weapons and Aatmanirbharta. He

provided an overview of Force Protection outlining how it involves assessing threats, identifying equipment and evaluating strategies. He shed light on the need for production of indigenously made bullet proof jackets, ballistic helmets and full-body armoured suits with four layer protection. He highlighted the increasing indigenization of equipment and the manner in which it has become an intense focus area which is being pursued with vigour. In addition, he mentioned that ordnance factories have been corporatized to produce Special Clothing and Mountaineering Equipment to provide for extremely harsh weather conditions. He stated that the aim of the Master General Sustenance Branch is to sustain the armed forces and their commitment lies towards collaborating with industries to offer critically important indigenous products. He concluded his address by emphasising the commitment of the forces toward import substitution and the need for the industry and academia to enhance our capabilities.

6. Providing the industry perspective, **Colonel KV Kuber**, Director Defence and Aerospace, Ernst and Young underlined the preventive measures that need to be employed by the defence forces in the wake of biological, physical and economic threats. He emphasised on the increasing need for enhancing our cybersecurity systems for protecting control systems, enhancing risk mitigation and intrusion detection. He introduced the dimension of whether Aatmanirbharta should be an isolated project or a collaborative measure and opined that it lies in our favour to collaborate with leading industries from other nation states to gain a comprehensive industry perspective. He spoke about the National Advanced Surface to Air Missile System which is a potent area security system developed jointly by Raytheon and Kongsberg Defence & Aerospace, primarily for the Royal Norwegian Air Force and outlined its features which include a multi-layered defence system with multiple radars that secures key cities in the region. With regards to this, he mentioned the manner in which its structure and features could be incorporated within India's defence sector in order to provide enhanced security and protection. He concluded by stating that force protection needs should be met by the industry in a realistic manner.

SESSION II – PERIMETER PROTECTION AND INFILTRATION DETECTION

7. Session II on the theme “**Perimeter Protection and Infiltration Detection**” was chaired by **Brig H.S. Sandhu**, SM, Brig Infantry-B, Dte Gen of Infantry, Army HQ. The three-member panel deliberated upon the protection of the perimeter, the challenges in infiltration detection, and the perspective of the industry respectively. The Chair, while opening the proceedings pointed out that perimeter protection is significant in the present environment as the aerial threat is increasing and emerging threats such as drones, and UAVs need to be taken care of. He also emphasised that the industry could offer pathbreaking solutions to overcome these challenges.

8. **Wing Commander Ajay Dwivedi**, OIC IPSS, Provost Marshal, Air HQ, while presenting his views on “**Protection of Air Force Bases**” enumerated the threats that can manifest and highlighted that terrorists are now using more advanced technologies including drones, GPS systems, and encrypted messaging services. He also talked about the Integrated Perimeter Security System and provided recommendations for the improved safety of the Air Force bases. The highlights of the presentation were as under:-

(a) He covered the facets of Air Force assets and mentioned that they are of high density and value, equipment-intensive, and highly dependent on-ground infrastructure and maintenance activities.

(b) He dwelled on motivated attacks and highlighted that the Global Terrorism Impact Report of 2022 states that terrorist groups are more likely to target police, military, or government officials.

(c) He elaborated on the modus operandi of the terrorists through examples such as the Bandaranaike Airport attack, Anuradhapura Airport attack, and various attacks on the Indian Air Force's Air Base focusing on the recent attack on Jammu Air Force Base and use of drones in that attack.

(d) He also brought out that the use of conventional weapons will continue and the technological advances like Autonomous Delivery Vehicles guided with the help of AI Systems may facilitate terrorists to conduct high-profile attacks.

(e) Further, he said that base security is not limited at entry points and should be integrated with (i) Gate Management, (ii) Perimeter Security, and (iii) Early-warning signals.

(f) He covered the Integrated Perimeter Security System that was started in the year 2019 post the Pathankot Attack. This system has 3 objectives (i) Provide ICT based integrated security solution for the entire perimeter to facilitate the first responder, (ii) Layered security with 24x7 intrusion detection, and (iii) Alert generation through fusion and correlation of inputs from multiple sensors.

(g) Lastly, he gave recommendations for the protection of the Air Force Bases. These were (i) Open and scalable frameworks for future upgradation as per the local security requirement. (ii) Use AI-based technology in the C2 System that will help in the reduction of false alarms, fully automated decision making, and classification of the intruder. (iii) Integrate with the gate management system and smart card system. (iv) Manufacture indigenised sensors. (v) Categorisation of bases for optimisation of sensors that will help in ascertaining the probability of attack, and the type of sensor to be used.

9. **Mr. Asif Jalal**, IPS, IG BSF, Punjab Frontier, presented on the topic "**Challenges in countering infiltration from Pakistan**". He gave an introduction about the BSF, covered the modus operandi of the infiltrators, and elaborated on the present and emerging challenges and threats in countering infiltration. He finally talked about the requirement against the infiltration that was needed to curb infiltration. The highlights of the presentation were as under:-

(a) He provided an introduction that the BSF is the largest border guarding force in the world and is mandated to secure the border with Pakistan and Bangladesh and highlighted the fact that the force works under tough climatic conditions.

(b) He brought forward the challenges and the first being nature itself. River Ravi & Sutlej provide a challenge as they flow from North East to South

West and crisscross the territories of India and Pakistan several times forming numerous seasonal Nullahs that create space for armed intrusion through riverine gaps. Extreme weather conditions and thick vegetation are also a challenge. Occasional power outages and swiping of troops during the repair of BFL are other challenges.

(c) He also dwelled on the emerging threats from drone/UAV activities and the difficulty in observation at night, and reliance on the hearing capability of troops. The drones are used for dropping narcotics, explosives such as IEDs, Pistols, etc., and also for surveillance purposes. Tunneling is also a significant threat.

(d) Lastly, he elaborated on the requirements against infiltration and focused on the need for (i) Anti tunnelling technology, (ii) Anti-drone system, (iii) Anti-fog HHTIs, (iv) Sonar / underwater sensors for underwater threats, and (v) Technology to detect the use of mobile and RF signals near the borders.

10. **Mr. Sandeep Saigal**, Head of Business Development, TATA Advanced Systems Ltd. presented the topic “**One TATA philosophy for Defence & Product Offering.**” He started by highlighting that TATA has solutions for the problems enumerated by the previous speakers and it is in TATA’s DNA to protect the borders and the people. In One TATA philosophy, TATA has also brought all of its various companies under TATA advanced systems to combine strength and bring synergy and bring quick solutions. The highlights of the presentation were as under-

(a) He explained that TATA now has a surveillance platform, SKY I and VTOL, that have the capability to provide the surveillance capacity for the infiltration on the borders and TATA also can modify these platforms for a specific use.

(b) He stated that TATA has complete Land Mobility Solutions from logistics to the combat vehicles and these vehicles have a quick reaction capability. He elaborated that TATA has the requisite military vehicle platform from 4x4 to 12x 12 vehicles.

(c) In his presentation, he covered that TATA is the first Indian company to indigenously develop Wheeled Infantry Combat Vehicle that can work in any terrain and is currently in use with the Indian Army. TATA also has a full-fledged dedicated line to manufacture Mine Protected Vehicles that provide a blast and ballistic protection.

(d) He further added that TATA now has border protection and coastal security solutions that can integrate every radar and sensor under one roof for protecting strategic assets. TATA also has various strategic missile launchers for surface-to-air missiles and has integrated them into the high mobility platforms.

(e) He brought out that TATA is providing combat management systems for ships and submarines and also portable driver detection sonar for the Indian Navy. Naval Radar systems and 3D Air Surveillance Radars for surveillance at sea.

(f) He stated that TATA has material for bulletproof jackets and has provided it in different configurations according to the threat levels including the head gear.

11. He concluded by saying that TATA has a complete solution for border and base protection including unmanned ground sensors that can be integrated into the command-and-control centres. TATA also has a five-layered solution that will have zero blind spots and can be configured according to the requirement of the forces.

SESSION III – PERSONNEL PROTECTION TECHNOLOGIES

12. Session III on “**Personal Protection Technologies**” was chaired by Maj Gen **SH Naqvi**, Addl DG Rashtriya Rifles, Army HQ. The three-member panel deliberated on various aspects of personal protection technologies in the forces. The chair began the proceedings by stressing the importance of efficient personal protection technologies, especially in the era of asymmetric warfare. He then pointed out that a major research program is required to be dedicated to ‘soldier direct protection’. He further added that new technologies combined with new materials which are more efficient are required. Highlighting this point, he gave the example of a ‘fully bulletproof jacket’ with increased sensory capabilities for better command. He also talked about the call for collective efforts of eminent experts from various fields such as academia, energy industries, scientists, engineers, etc to be able to get cpst effective solutions.

13. **Mr. A S Parihar**, Sc F, DRDO, talked about “**Defence Materials & Stores Research & Development Establishments’ work on Ballistic materials**”. He began his presentation by talking about how in order to increase soldier protection, the focus is needed on the material part and not just the design part. He then highlighted the recent trends in the use of Ballistic materials for armour applications and he highlighted the following points:-

(a) Informing about sub-systems and material groups used in present-day body armour systems he shared that mainly the following are used:-
 (i) Polyester/ Nylon woven fabric, printed with a disruptive pattern is used for camouflage uniforms, known as carrier fabric, (ii) soft vest consisting of a pack of layered UHMVPE prepregs, called the Soft Armour Panels (SAPs) sealed within a coated nylon fabric, (iii) moulded backing material, consisting of cross plied UHMWPE based prepregs, called Hard Armour Panels (HAPs) and (iv) Ceramic strike face material of HAP, consisting of Silicon Carbide multi-curved tile.

(b) He informed that for body Armor applications, three main grades are available commercially: (i) high-purity alumina, (ii) silicon carbides and (iii) boron carbides, increasing in ballistic performance, and price, in that ascending order.

(c) He also shared that boron carbide is an efficient solution on the material front and it’s the third hardest known material apart from the diamond and the Boron nitrate. And Indian industries have been effectively making the hot-pressed boron carbide.

(d) He informed that although as of now all the grades of UHMWPE are imported, the DRDO has been trying to develop the same.

(e) He said that even with the advent of ultra-lightweight laminates based upon UHMWPE, with their remarkable ability to arrest some of the mild steel-cored ammunition, ceramic remains the most important group of armour material as of now because they are very effective against hard-cored, armour-piercing ammunition. He further added that for ceramics, the hardness of the strike-face material by and large governs its ballistic performance.

(f) For most ballistic applications, boron carbide remains the ultimate armour material of choice as it is one of the hardest ceramic materials.

14. **Lt Col Ashish Tandon**, OIC EDD, CME, shared his views on the topic, **“Concept and Application of Counter- IED Strategy”**. He began his presentation by talking about the importance of looking into the networks and not just limiting the focus on devices to get a better understanding of the threat. He covered the following points:-

(a) Various terrorist groups regularly interact with each other which can be traced. One can get an idea about the functioning of these groups through leadership, finances, planning and recruitment patterns.

(b) He gave a background of the internal security challenges, the use of IEDs by various groups, how a common approach is lacking and the need for a counter IED strategy.

(c) Talking about the challenges in identifying the threat, he highlighted factors such as: - (i) presence of numerous networks, (ii) gaps in the capability of different groups and (iii) there are no rules of engagement.

(d) Bringing forward countermeasures he talked about (i) having a whole-of-state approach; (ii) proficiency of Counter- IED Tactics, Techniques and Procedures (iii) synergy of capability and comprehensive response.

(e) He also gave an insight into the existing C- IED setup. He further elaborated that the current security structure has: - (i) a multi-agency centre at IB; (ii) NTRO to scan terrorist organizations (BCAS to monitor aviation security); (iii) CIED establishments (ATS of state police agencies) and (iv) forensic labs for PBI and forensic analysis.

(f) He also highlighted the challenges of the current C-IED setup. Where he talked about the challenges of near-time intelligence, inadequate research, incomplete database and delay in procurement.

(g) He talked about the objectives of the C-IED strategy which include attacking complex IED support networks, operations and intelligence fusion and building C- IED community of action for training and capability development.

(h) He dwelled on the line of operation in the C-IED strategy which, he said, lies between reactive and proactive measures. It includes, (i) defeating

the device by searching and detecting; (ii) pre-initiating by neutralising the device and finally; (iii) physical exploitation and analysis by mitigating physical effects by prophylactic protection.

15. He concluded his presentation by bringing forward a proposed '**National C-IED Organization**' to function at the apex level which included representation from various government institutes such as Police, CRPF, NIA, IB and so on.

16. **Col. Amitoz Singh**, SM, Col Infantry-8, presented the topic, "**Protecting the Soldier- Requirements and Challenges**". He began by talking about the need for comprehensive equipment and went into the details of each piece of equipment (head to toe) such as Ballistic Helmet, Tactical Gloves, Ballistic Goggles, Ballistic shields and so on. He further covered some crucial points relating to the subject such as:-

(a) For individual protection, he spoke about the development of a Ballistic Helmet which would ensure protection against Rifle bullets and blast fragments. It will also be integrated with tactical right Rails and NVG Shroud. It is in the process and should be completed within 3-4 months from now.

(b) He also talked about the bulletproof jacket which would be updated to MOLLE to reduce weight. It would be particularly effective for close combat scenarios. And the full-body bulletproof suit or the 'Sarvatra Kavach' provides all-around protection to the body.

(c) Talking about the Ballistic Goggles he informed that these would ensure protection against blast fragments, from dust and smoke. RFI is being formulated for the same.

(d) He further talked about Tactical Gloves, Ballistic shields, elbow knee pads for which around 6000 orders are already placed, and Boot Anti Mine for specific operational requirements, for which also 1lakh+ orders are already placed. He shared that all these are developed by indigenous industries.

(e) He spoke about Exoskeletons, which are still at stage, prototype are expected in the next two months. This is being developed by a private company.

(f) He concluded his presentation by talking about the expectations from the industries, and stressed upon more indigenisation of raw materials/ Nice technologies, development of lighter equipment for individual protection, sharing of ballistic test reports to verify their claims and finally product demonstrations and feedback at ITDU, Infantry School Mhow.

SESSION IV – LAND PLATFORMS, IEDS, FIRE AND CBRN

17. Session IV on the theme "**Land Platforms, IEDs, Fire, and CBRN**" was chaired by **Brig RR Bhat**, Cdr Faculty of Combat Engineering, CME. The three-member panel deliberated on the protection of land platforms, the CBRN protection policy, and the modernisation of fire protection infrastructure at ammunition depots. The chair started the proceedings by pointing out that the new technology is evolving at a fast pace and the nature of warfare is changing. The advent of drones, UAVs,

and high-precision systems afford various options for targeting combat and logistic systems. He also highlighted the current conflict in Ukraine is a clear indicator of the vulnerability of the combat capabilities and how it can be targeted by a weaker adversary. He also emphasised that the logistic installations in the hinterland need to focus on asset protection against the weather, and accidental triggers that could lead to a loss of life.

18. **Col Vivek Goyal**, Strategic and Planning Dte, Army HQ while presenting his views on “**Protection of Land Platforms**” enumerated that it is a contemporary and complex topic. Globally, think tanks are debating the changing nature and the character of warfare. The debate is between the technology-driven strategists that emphasise that large-scale ground forces will give way to niche domains like cyber, space, and AI-based autonomous weapon systems whereas the traditional strategists argue that conventional platforms will only be used but technology will be an enabler that will enhance the performance of the system. The highlights of the presentation were as under:-

(a) He cited examples of the killing of Maj Gen Qasem Soleimani in which a drone that was controlled from a distant place carried out a precision strike on a moving vehicle, the Armenia-Azerbaijan conflict of 2021 in which the traditional land units suffered heavy losses due to drones and Electronic Warfare. These conflicts highlight the vulnerabilities and requirements for a paradigm shift in the employment of land platforms.

(b) He said that all military platforms require basic ballistic protection from blast fragmentations. The troop-carrying combat vehicles require a higher degree of protection, and the maximum protection is necessary for the armoured and the combat fighting vehicles the threat is enormous, ranging from IEDs to land mines, aircraft, UAVs, etc. The land platforms can be rendered ineffective by making their navigational systems, fire control system, and other sensory equipments dysfunctional.

(c) He elaborated that protection in a land platform would entail a higher degree of survivability against the adversary and weather, enhanced mobility in every terrain, and precision firepower and lethality.

(d) He gave a brief overview of the Indian security perspective and the increasing unconventional threats coupled with the conventional threats. India needs to maintain a strong land force and for effective, integrated, and organic grouping – artillery, air defence, engineering, EW systems, and communication centres need to be tracked, self-propelled, and towed for matching mobility and enhancing their security.

(e) He focused on the triangle i.e., firepower, mobility, and protection. Three aspects are interrelated. Warheads with enhanced depth of penetration are a necessity. Upgraded and new equipment will have multi-layered protection by active and passive measures.

(f) He emphasised that the infantry should be protected during combat transportation by protecting mobility vehicles, armoured personnel carriers, etc. with adequate ballistic protection.

(g) He also highlighted the use of data that can be used in the future to evolve a coherent and intelligent common operating picture that will enable better survivability and precision targeting.

(h) He concluded that 'atmanirbharta' in defence has become a strategic necessity. The Army Design Bureau has been created to provide an institutional interface towards building synergy between start-ups, academia, and industry.

19. **Col Rajesh Gupta**, Col CBRN, Strategic Planning Dte, presented his views on the topic '**CBRN: Protection Policy in Indian Army**' and enumerated that the topic is becoming increasingly relevant in contemporary times. The 'Big B', that is, biological has taken the centre stage and the on-going pandemic has made everyone realise the vulnerability of the human race. He focused on the nature of emerging CBRN threats, the CBRN policy of the Indian Army, and the CBRN grid rolled out in TBA. The highlights of the presentation were as under:-

(a) He started by dividing the nuclear weapons state into 3 groups – the western group that has the first use policy, the eastern group that has no first use policy, and a few countries that have an ambiguous policy. There are three prominent trends, first, the nuclear arsenal post-cold war that was declining has plateaued and there have been predictions that there is a rise in nuclear arsenals around the world. Secondly, there is a shift towards tactical nuclear weapons. Lastly, the race for hypersonic weapons has truly begun.

(b) He then focused on the chemical threats by giving the example of the Syrian Civil War and the ease of availability of these weapons is a threat. Pakistan and China have more than 1400 schedule 1, schedule 2, and schedule 3 chemical production capabilities that can be of dual-use.

(c) He highlighted that biological weapons have taken prominence and it is possible to create man-made viruses in labs. In any future contingency, it is imperative to have indigenous vaccines. These viruses impact ordinary citizens.

(d) He said that the CBRN doctrine has a view to providing the apprehensive capability to effectively operate in a contemporary CBRN environment. The Op philosophy hinges on 2 aspects – to withstand a CBRN attack and remain battleworthy to operate through a contaminated environment, and the forces must be able to fight through the contaminated area for a limited period of time for achieving the military mission.

(e) He brought forward that the equipment policy has 2 principles – providing the minimum capability to maximum troops to survive and fight in a CBRN environment and it also seeks to provide a fighting dirty capability to designated troops which should be able to operate through a contaminated zone.

(f) He said that for collective protection the army has various RCC shelters, Inflatable shelters, and containerised shelters. The Indian Army has detection capability based on chemical, radiological, and biological detectors. DRDO has taken projects to develop indigenous biological detectors.

Decontamination will be taken to restore combat effectiveness and reduce casualties and it is to be done as early as possible and as forward as possible.

(g) Lastly, he elaborated on the CBRN brick system of the Indian Army is of two types – base threat and high threat and is custom-made for various levels of threat. At the national level, there are 11 QRMTs for reaction in a hinterland contingency. There are also 12 NDRF battalions and in these 2 companies, each is nominated as a CBRN response team. In TBA the CBRN grid is established right from the battalion level up to the theatre level.

20. **Col Prashant Kumar**, Dte Gen of Ordnance Services, presented on the topic **“Modernisation of Fire Protection Infrastructures at Ammunition Depots”**:-

(a) He began his presentation by talking about the vulnerabilities that ammunition depots face, making them more prone to internal accidents such as wildfire, explosions, etc. He pointed out the following challenges: - (i) the sheer size of the ammunition depot itself, (ii) explosives because of their chemical nature tends to degenerate and (iii) the ammunition depots are located in remote areas outside the cantonment premises.

(b) He called for robust techniques for fire prevention, detection and firefighting. He informed that modernization projects to upgrade fire protection techniques have been started at Central Ammunition Depot, Pulgaon along with two other depots in the country. These depots have obtained major firefighting trucks, portable fire pumps, hydrants, static water tanks and sprinklers to a limited portion.

(c) He further added that these depots still faced a major drawback that in order to fight the fire the person had to go in close proximity which led to a lot of casualties among the army personnel thus, it led to the idea of the automation process of the whole firefighting system.

(d) He said that detection is the first and most crucial stage of the firefighting process for all kinds of fires. He said, if detected on time the fire can be handled by a single boot on the ground.

(e) He shared that their experiences led them to start the integrated fire fighting system which consists of three main steps: - (i) detection, (ii) firefighting and (iii) a central command centre.

(f) He said that on the detection front the depots today are looking for a ‘Thermal images camera’ having a complete day-night vision. This would also help cover the vast areas of the depots which are humanly impossible. He said that roughly each ammunition depot needs around 180-280 cameras.

(g) He said for the areas with air – conditioners, where normal smoke alarms can’t function, “Aspirating smoke detectors” are required.

(h) Moving towards the fire fighting part, he also spoke about the need for remote control monitors which would help in fighting the fire remotely. It would have various modes of operation such as manual or remote, according to the

demand of the situation. These monitors would be connected to the hydrant networks and the static water tanks inside a particular depot.

(h) He said that the central command centre would be web-based, through which all the flame detectors, cameras, sensors, smoke detectors, RC monitors, etc inside a depot would give the direct feed to the central command. In this way, the person in control can remotely observe every inch within the depot at all times and can take informed decisions whenever required. It would have a communication system catering to the hierarchy.

(j) He concluded his talk by adding that a fire can be controlled easily if detected on time, it can be fought well if not allowed to spread beyond manageable proportions. He said there was a lack of visibility within the system and all these voids can be covered by the proposed system. He also shared that they are in process of finalising the RFI in which almost 16 Ammunition depots, spread all over India are going to be covered.

SESSION V – PROTECTION OF AIR ASSETS, NAVAL ASSETS AND SPECIAL CONDITIONS

21. Session V on '**Protection of Air assets, Naval assets and Special Conditions**' was chaired by **Cmde Vivek Dahiya**, Cmde (Staff Requirements), Naval HQ. The three-member panel discussed the protection of air assets and platforms, protection against mines and underwater threats and solutions for negotiating hazards in high altitude and snow bound areas. In his opening remarks, he discussed the manner in which the defence forces are grappling with unconventional warfare and the rise in the weaponization of inanimate objects. He shed light on the peculiarity and nature of the beast in the Ukraine-Russia conflict and their employment of open and crowd sourced intelligence as warfare techniques. He emphasised the manner in which warfare is evolving and there is a transformation of character and means however the fundamental nature of warfare remains the same. He concluded his opening remarks by underlining the need for providing the right resources to our combatants on ground in the wake of technology innovation and acceleration.

22. Group Capt Joshi spoke about the '**Protection of Air Assets and Platforms**'. The scope of his presentation covered types of air assets, their limitations, types of threats and the protective measures and tactics that need to be employed by the defence forces in order to counteract them. He laid down the attributes of fighter aircrafts, transport aircrafts, helicopters, Unmanned Armoured Vehicles and drones. The highlights of his presentations are as follows:-

(a) He laid down a flowchart of the types of threats which includes a confluence of detection and interception. Under detection, it is important to focus on surface and AI radars, while interceptions employ an amalgamation of surface to air missiles, anti-aircraft missiles and electronic warfare.

(b) He dwelled on protection against ground radars, airborne radars, surface to air missiles and attacks by enemy aircraft. With reference to protection against ground radars, he emphasised on the increase of radar cyber security through the use of stealth technology and radar absorbent paint material. He underlined the need for application of electronic counter

measures by employing escort jammer aircrafts for jamming radar frequency and manipulating frequency parameters for deception.

(c) According to him, protection against airborne radars should include electronic warfare tactics such as evasive manoeuvring and chaff deployment for creating false targets. It is important to employ the application of electronic counter measures such as the use of airborne self protection jammers and neutralising the enemy fighter by hard kill through surface to air or air to air missiles or directed energy weapons.

(f) For protection against surface to air missiles, he emphasised the need for using missile attack warning systems and directed/laser infrared countermeasures for jamming the infrared seeker head of missiles. He also outlined the importance of deployment of chaffs and flares for deception and manoeuvring aircraft to avoid missiles. With reference to protection against attack by enemy aircraft, the use of air to air missiles, air to air guns and surface to air missiles was underlined.

(g) He emphasised the need to counter electronic countermeasures through the employment of polarisation, pulse compression/suppression and frequency agility and diversity. In addition, he spoke about protection of unmanned armoured vehicles and drones against jamming and spoofing. He mentioned that the new generation of UAVs can carry radar jammers and it is extremely crucial for the ground operator to skillfully command and control UAV operations. For drones, he emphasised the need for drones to be immediately returned to base mode in the event of jamming or spoofing.

(h) He stated that latest threats by swarm drones can endanger flying objects, therefore it is extremely essential for the defence forces to employ jammers and spoofers against GPS guidance of swarm drones.

23. In his concluding remarks, he stated that air assets are vital for national security. They are costly, accurate and necessary for achieving early advantage in any war. Protection of air assets in air is a challenge which can be met by coherent efforts of the operator's use of technology and innovative tactics.

24. **Cdr Nitin Kumar**, -----, spoke about '**Protection against Mines and Underwater Threats**' and emphasised on clandestine attacks, torpedoes and sea mines. The highlights of her presentation are as follows:-

(a) Under clandestine attacks, he covered the essential nature of free divers with explosive, swimmer delivery vehicles, limpet mines, drifting mines and unmanned underwater vehicles. Moving forward, he emphasised on harbour defence and surveillance systems, the importance of diver detection sonars and surveillance through boat patrol.

(b) He spoke about anti-torpedo measures and the relevance of sea mines. He outlined the importance of mechanical sweeping and influence sweeping and stated that the use of mechanical sweeps like wire ropes with cutters to physically disrupt the mines is extremely essential in addition to disrupting mines by emulating a ship's magnetic and acoustic signature by use of Clip-on Sweeps.

(c) He underlined the advancement in torpedo technology and explained the characteristics of torpedo hunting, propulsion, guidance, and signal processing. Under mine hunting, it is essential to localise, identify, classify and neutralise mines, employ side scan sonars and expendable mine disposal systems such as the K-STER I and K-STER C.

(d) He emphasised the need to conduct a route survey during naval operations through the use of side scan sonars, blue green lasers, autonomous underwater vehicles and data from the mine warfare data centre.

(e) For enhancing future Mine Counter Measures capabilities, Commander Kumar underscored the need for MCMVs with unmanned MCM suite, autonomous surface vessels, high endurance autonomous underwater vehicles, clip-on sweeps and organic MCMs with side scan sonars.

25. In his concluding remarks, Commander Kumar emphasised on the need to enhance the MCM capabilities of the defence forces which will provide us with comprehensive results and state of art warfare. He underlined the need for augmentation of undersea warfare and the manner in which due impetus must be paid towards a Make-in-India initiative for the same.

26. **Colonel Vibhor Pant**, Col CE-6, E-in-C's Branch presented his views on '**Solutions for Negotiating Hazards in High Altitude and Snow Bound Areas**'. In his presentation, he covered the challenges faced in high altitude and snow bound areas, the different dimensions of protecting the habitat, the manner in which avalanches can be mitigated and crevasse crossings can be enhanced. The highlights of his presentation are as follows:-

(a) He outlined by outlining the challenges faced by the defence forces in high altitude and snow bound areas with special reference to weather, terrain and the environment. In such areas, the forces are faced with low oxygen, extreme cold, snow, high winds, high altitude deserts, lack of water, avalanches and crevasses. The difficulties brought by the environment are that all tasks are manpower intensive and require high construction time and there is a limited working season accompanied by high equipment failure.

(b) For sustenance, he underscored the need for living spaces to be insulated, air tight, heated and made with minimum foundation. The water supply should be attached to the living spaces of the personnel and there should be provisions for hot water. As for sewage, there should be continuous flow of waste and a proper plan should be charted for treatment and disposal. In addition, he emphasised supply of electricity through the use of fossil fuels and batteries.

(c) He then explained the utility of Polyurethane foams (PUF) which can be used for insulating the army quarters in high altitude and snow bound areas. PUF Panels are a layer sandwiched between two GI metal sheets and can be used on the walls as well as the roof. He outlined the characteristics of PUF Panels and highlighted their modularity, pre-engineering, compactness, light weight, ability to sustain wind and snow loads, and resistance to fire, water, and weather.

(d) Moving forward, he highlighted the use of solar and wind hybrid power plants and fuel cells for supply of electricity. For water supply, he suggested that water should be pumped into an overhead tank only during utilisation and water tanks should be insulated using Polyurethane foams.

(e) He divided the avalanche mitigation strategies into two categories: active and passive. The defence forces should improve forecasting and training, raise awareness, and maintain a supply of safety and rescue equipment as elements of passive measures. The army should erect a diversion wall, build catch dams, and shed snow as part of active measures. For crevasse crossing, he put forth the idea of employing telescopic ladders, 9m Modular Hybrid Composite bridges and 25m Quick Deployable Tactical Assault bridges.

(f) He then enumerated two research and development projects for habitats in high altitude areas that are underway in the Gujarat University and IIT Gandhinagar. A prototype of a 10 men shelter with toilets for high-altitude settings has been created by the Gujarat University. The shelter's construction is simple, its materials are easily transportable, it employs renewable energy, has modular restrooms with integrated waste management systems, and it can be relocated. Whereas, IIT Gandhinagar is developing a freeze-drying-based waste disposal technology for high altitude regions. By directly converting solid waste to gases, the technique isolates the water content from waste, and dried human waste is combusted and used as fuel.

(g) He also discussed the creation of solar-heated, insulated Ladakhi shelters in collaboration with Sonam Wangchuk from HIAL was then discussed by Colonel Pant. Clay, straw, wood chips, and pashmina hair are readily accessible building materials that can be used to construct these shelters. The shelters will be south-facing and operate on solar energy; they will feature flooring and walls that are thermally retained by water-filled bottles, and the temperature inside will be around 15 degrees even when it is extremely cold outside.

27. He stressed the importance of identifying strategies that can be used to construct habitats in high-altitude and snow-covered places in his final remarks. He discussed fuel cells, which would aid in producing electricity in small habitats, and hybrid generators, which would offer tailored solutions and harness solar and wind potential. According to him, we must work on creating long endurance batteries, high-head kerosene pumps, and a strategy for the treatment and disposal of wet sewage.

28. The webinar was concluded with closing remarks by Maj Gen Ravi Arora, CEO, Indian Military Review. Summing up the deliberations of the day, he highlighted the need for the industry, academia, DPSUs, and the defence forces to direct their efforts towards modifying and advancing our weaponry, techniques, and technology for the betterment and protection of personnel, equipment, military infrastructure and assets. He called for enhanced integration of the triservice forces with the industry and academia to achieve comprehensive results which would help in the strengthening of our man, material and mission in the wake of the changing geopolitical status.