PROCEEDINGS OF SEMINAR ON "NIGHT VISION AND ELECTRO OPTICS INDIA 2018" : 18-19 JAN 2018

DAY 1: (18 JAN 2018)

INAUGURAL SESSION

1. **Welcome Address.** Lt Gen Vinod Bhatia, PVSM, AVSM, VSM, (Retd), Director CENJOWS, welcomed the chief guest and all participants in the seminar. He said that the aim of the seminar was to give a common platform to all stakeholders in building night vision capability of the Armed Forces and fruitful ideas have come to the fore during the previous seminars on the subject. Interaction with troops on the frontline has revealed that Night Vision Devices are lacking both in terms of quantity and quality. Transgressions on the Chinese front have doubled and face offs have increased manifold, including the one at Doklam. Along our northern borders China has invested heavily in the three Rs i.e. Roads, Reserves and Radars. We have to similarly increase our surveillance and upgrade our night vision capabilities and ensure that we secure our borders. Along the LC the CFVs have increased manifold as also infilt attempts. He informed the house that scaling of NVDs for Indian Army was finalized during his tenure as DGMO there was a requirement of a colossal number of Night Vision Devices (NVDs) which required substantial funding. However he stressed that despite the high cost, these devices are required urgently for achieving optimal surveillance capabilities and hoped that the soldier would get the required night vision capabilities that he needs to guard our land borders, air space and the long coast line.

2. **Inaugural Address**. Lt Gen RR Nimbhorkar, UYSM, AVSM, SM**, VSM, MGO, Army HQ, informed the house that most of MGOs budget is consumed by Ordnance Factories and DPSUs and this leaves only about 4% of funds for procurement by army. DPM mandates the MGO to procure from DPSUs, but this needs to change as now the country's private industry has become technically advanced, especially in the field of NVDs, and there should be a level playing field for all manufacturers. However, private manufacturers sometimes have a tendency to stop production once their financial goals are met which creates problems in placing repeat orders and this needs to be guarded against. Our payment procedures must also be fast tracked so that private vendors can keep the costs low. He spoke about the new initiative of ammunition manufacturing under the 'Make in India' scheme which will enable manufacturing of critical ammunition within the country in 6-8 months.

3. **Keynote Address**. Lt Gen Sanjay Verma, VSM**, DG WE, Army HQ, brought out that as far as NVDs are concerned there is a gap between perception of Industry and the actual requirement of the armed forces. The first priority is that a soldier must be equipped properly and be able to see the battle field clearly. The second priority is that he should be able to communicate this battlefield picture backwards to his higher commanders. Then there is a requirement to have NVDs of mixed/different ranges as each terrain, be it high altitude, jungle, riverine or desert, has its own peculiarities. Moreover NVDs should be able to withstand vagaries of weather, able to record and communicate images to higher headquarters, have in-built GPS and LRF, be easily portable and easily maintainable. It would also be desirable to have the weapons slave to the sight for faster engagement of the enemy. For easy upgradation and better flexibility future night sights should be modular, with a common basic structure and add-ons based on requirement.

4. **Theme Address**. Maj Gen Bipin Bakshi, IG(Training), NSG said that a few decades back surveillance of battle field was a tactical level issue but now it has moved to the operational level . Also war fighting has largely shifted to non-conventional operations and this necessitates a modification in surveillance philosophy. We now need to equip soldiers with night vision from sub tactical level operations to operational and strategic levels. Efforts must be made to shorten the sensor to shooter loop. Critical requirements for NVDs are weapon compatible ranges, ruggedness, easy sustainability and adequate power requirements. The biggest challenge for the soldier is carriage of multiple power banks at remote posts or during patrolling. A common power bank/charging system will greatly help in reducing the load on the soldier especially for SF operations. At the sub conventional level and in border guarding role there has been a paradigm shift in the surveillance techniques and the next level is the convergence/fusion of all images in a manner so that commanders are able to get a comprehensive picture of their area of interest. Future NVDs also must cater for measures to guard against anti NVD devices.

4. **Industry Perspective**. Mr Vaibhav Gupta, Director MKU said that a large number of NVDs are required by the Indian Army and 'Make in India' provides an opportunity in this field to the private industry. While inclusion of IDDM category in DPM 2016 is a welcome step, DPSUs still have an unfair advantage as they often bag contracts on nomination basis. Participation must be based on merit and not on nomination. DPM needs further modification to iron out issues regarding participation private industry to increase participation and reduce the unfair advantage enjoyed by DPSUs. He emphasized that industrial capacity cannot be built if we keep on going back to the public sector for solutions in spite of the private industry having the capability to fulfil our requirements. The need of the hour is to get into mission mode and create national capability and also find the right partner.

5. **Industry Perspective**. Mr Arvind Lakshmikumar, CEO, Tonbo Imaging, said that Tonbo Imaging had gained a lot of perspective on the requirements of army through first hand interaction and this needs to translate into product development. He highlighted that the ToT route may not be ideal as it does not cater for evolving technology and success in this area will only be achieved once basic fundamentals are strong. He informed that Tonbo industries is trying to incorporate these fundamentals into their night vision technology development. There four core areas where the country is lacking as far as NVDs are concerned. These are, ensuring high quality specifications even if it leads to reduction in number of vendors, commonality of specifications across platforms to achieve cost savings, implementation of IDDM in letter and spirit for both DPM and DPP and the need to understand the difference between OEM, Integrator and Distributor as best solutions will be provided by OEM and not others.

SESSION -1

(EMERGING TECHNOLOGIES)

6. **Chairman's Talk.** Maj Gen GD Bakshi, SM, VSM (Retd), explained the importance of having superior night vision and said that the longer detection capability of US Abrams tanks vis-à-vis Iraqi T-72s was a major factor in the US winning all tank battles in the Gulf War. He spoke of how the HHTIs have turned the Line of Control battle in our favour. He emphasized that the night and all weather fighting ability will be the most critical component of RMA in future battles.

7. **New IR Detectors and Technologies to Support Today's Increased Night Vision Demands.** Mr Kobi Zaushnizer, SCD, Israel informed that SCD was the one stop shop for all night vision solutions across the IR spectrum and was the world leader in the field of cooled detectors. He highlighted that the company was developing technology in house and was not dependent on any other country. Though it is selling worldwide, India is one of the most important customers of SCD. The products of SCD are all weather, have long detection range, are dismountable from main platform and usable in dual role, have low weight, long operating time, low maintenance requirements and have a reduced cost of ownership. The company has developed two new technologies i.e. Short Wave Infra Red (SWIR) which is mainly used for hand held or dismounted sensors in the IR band and High Operating Temperature (HOT) technology for Thermal Imagers. Both these techniques help to reduce weight, size, cost, power requirements and maintenance. He showcased some of SCD products like Mini BB 1280, Pelican DLW, SWIR Imager, etc.

8. **Designing Next Gen Night Vision Systems.** Mr Arvind Lakshmikumar, CEO, Tonbo Imaging, informed that exponential growth in sensor technology and knowledge about current approaches to imaging had led to development of high quality NVDs. He enunciated that they were producing highly accurate, reliable and light weight night vision devices with enhanced ranges. He further showcased some NVDs developed by Tonbo Imaging.

9. **ULIS, HGH, MKU and Sofradir Products.** Dr Ludvic Brasse, ULIS, France, informed that ULIS was developing new detectors like XGA, VGA, etc. Mr Ambreesh Dixit, HGH, France, brought out the challenges faced by armed forces and how their new ultra-light and quickly deployable system Spyrel-M will help overcome some challenges. Mr Raghav Jain, MKU indicated the advancements made by MKU in image intensifiers and thermal imagers and showcased some products like TW 4000 Thermal Weapon sight and TM 4100 Multi Sensor Binocular. Mr Aurelien Dariel, Sofradir, France said that their company had developed a range of night vision products in different wavelengths and briefed the house regarding some SWIR, MWIR and LWIR products.

10. **Alpha Design Technologies Products**. Col Sunit kumar Nijhawan, Alpha Design Technologies, stressed on the need for timely induction of sensors into the Armed Forces. He said that the user must give only operational parameters to user and not technical parameters to enable companies to use their ingenuity and come up with products best suited for operational requirements. He then showcased come products of the company.

11. **Questions:-**

Question. Can systems working on Android platform and using wifi be hacked by our adversaries?

Answer. Hardware used by companies for military grade equipment is hardened and Android OS is a very secure OS. Though any system in a network can theoretically be hacked by a determined attacker but it will be very difficult to hack Android based systems as a number of experts are working around the clock to keep Android systems secure.

Question. What kind of power source can we expect in the future so that the need for frequent recharging of NVDs is reduced?

Answer. The future of batteries is Lithium Ion batteries and the capacities of batteries are ever increasing. Also there is an effort is towards developing devices which have lower power consumption. However, during the procurement process, the user must ask for battery specifications required for for majority of equipment and not try to cater for every contingency in which the battery may have to operate as this increases procurement costs drastically.

Special Talk : Management of NVDs in the Supply Chain

12. Lt Gen Giri Raj Singh, SM, DG OS, informed the house that the NVD market in India is growing at twice the worldwide growth rate and 90% of India's requirement of NVDs comes from the armed forces. The primary sourcing of this large quantity of NVDs is from OFB and BEL. He then opened the house for an interactive session and during the interactive session he brought out that the Industry must work to meet the aspirations of the services as far as NVD development and production is concerned. He clarified that adequate number of reserve batteries are available to cater to power pack requirements, though some of these batteries lose some of their residual life in storage.

SESSION 3

(CHALLENGES IN COMBAT OPERATIONS)

13. **Mech Forces in Night Operations.** Brig Anil Loomba, DDG (Armd Corps), DG MF, spoke about Mech Forces in Night Ops. He highlighted the core issues of Mech Forces in operations i.e. night enablement and timely connectivity. He briefed about battlefield environment and various conflict scenarios which are ever evolving with varying factors of space, probability and high visibility. He also spoke about peculiarities of Mech Forces to include its fleet of current and obsolete eqpt, types of NVDs and their integration within crews and their aspirations. He then emphasized requirement of Mech Forces in terms of improved detection, recognition, identification, day & night continuous capability, integration, maintenance & sustenance, reduction in size, weight, cost and power consumption and lastly soldier friendly i.e. easy to operate. He then mentioned about various challenges to include upgradation of NVDs of existing fleet, cost of fast changing technology, long period of procurement which prevents currency of technology and requirement of indianised solutions.

14. **Enhancing Inf Ops by Night.** Col JS Saharawat, Director Inf-8, Inf Dte, Army HQ, spoke about operational requirements of NVDs, challenges faced and recommendations for enhancing infantry operations by night. The operational

requirements are maximum range, wide FoV, all weather surveillance capability, light weight and low power requirements. Some of the challenges of NVDs were highlighted which are resolution, SNR, no imaging in pitch dark night, image affected by rain, fog, mist, foliage and wind velocity. He spoke about some of the challenges faced at target end, atmospheric conditions, platform, sensor/device and display and level of observer training. Then he gave out measures to enhance night operations which were mixed authorisation of II and TI sights, availability of good fusion technology, upgrades to 3rd generation technology, seamless flow of info from forward areas to HQs in real time frame and improving operator training.

15. **Surveillance and Target Acquisition.** Col Amitabh Kumar, CO SATA Regiment, explained various types of sensors to include ground based electo-optical sensors (PNVBs, PNGs, IR Cameras, HHTIs, TIIOE and LORROS), BFSRs, EW Eqpt, UAVs, WLRs and HMSS. He then gave out recommendations for capability development to include authorisation of UAVs at various levels, surveillance platform for helicopters, long range WLRs and light weight & portable electro-optical devices. There is a need to continuously develop, maintain and fine tune surveillance assets and a requirement of UCAVs armed with precision guided munitions to be inducted in artillery arsenal.

DAY 2: (19 Jan 18)

SESSION 3

(NIGHT AIR COMBAT AND SUPPORT OPERATIONS)

16. **Chairman's Talk**. Air Marshal Anil Chopra, PVSM, AVSM, VM, VSM (Retd), former Head Flight Centre ASTE, stressed on the need to give primacy to users perspective of NVDs, be it in Mech Forces, Infantry or Artillery. He emphasized the need of night enablement of all components of armed forces in high tempo operations and other brought out certain other challenges of the battlefield.

17. **Indian Air Force Night Operations.** Gp Capt VD Badoni, VSM, Director Ops Helicopter Induction, Air HQ, brought out the peculiarities of night operations in IAF. He said that though present NVDs had good intensification capabilities these were helmet mounted, heavy and uncomfortable. Hence pilot performance was degraded to some extent. 60% of helicopter accidents are at night. Basic NVD requirements for helicopters are good system design characteristics, ability to operate in adverse environmental conditions and caters for physiological considerations of operator and type of aircraft. The path ahead should cater for proper maintenance and isolation of below par NVGs and plan for a calibrated increase in NVG availability.

18. **Army Aviation : Supporting Night Operations.** Brig KP Ranjan, DDG Army Aviation, informed that the mechanism of conduct of operations by Army Aviation was similar in both day and night. Certain peculiarities and challenges faced in night operations were highlighted. To enhance night capability, requirements during Fly in, At station and Fly out phases were highlighted. Infrastructure and logistics were indicated and it was stressed that a large number of support and handling equipment must be

miniaturized. He further highlighted the requirements of developing capability for night operations by Army Aviation.

19. **Naval Air Operations by Night.** Capt(IN) Vishal Bishnoi, Indian Navy, brought out that the challenges of naval air operations which are no reference points, unpredictable weather, limited landing area, unstable landing platform and high level of pilot disorientation/illusions. Due to this naval air accidents at night were nearly 10 times more than at day time. He then explained the conduct of naval missions by night. He highlighted the peculiarities and requirements of NVDs in each scenario.

20. **Questions:-**

Question. Will the induction of Gen 3 NVGs bring down air accidents?

Answer. Most accidents take place at night due to loss of depth perception and misinterpretation of rate of descent by the pilot. A lot of training is required for pilots to fly using NVGs. NVGs must be used in conjunction with instruments to get the correct picture. Gen 3 NVGs will definitely bring down accidents.

Question. When will Cheetah and Chetak helicopters be phased out as they are prone to accidents?

Answer. Limited quantity of KAMOV-226 helicopter will be procured wef 2021 onwards which will replace existing fleet. Balance requirement will be made up by the Light Utility Helicopter which is being developed by HAL. The LSP version of this helicopter is likely to be inducted by 2022.

SESSION 4

(R&D AND MAINTENANCE SUPPORT)

21. **Enhancing Border Surveillance.** AK Sharma, IG(Communications), BSF HQ said that availability of good quality surveillance equipment is a major challenge for BSF. Those involved in R&D should keep user perspective in mind through close liaison and interaction, preferably through their representatives in field locations. BSF desires an integrated border management system to perform the border guarding role efficiently. This system should be flexible to cater for different terrain and weather in which the force operates. To build good quality NVDs in the country, the skill base in both research and production must be enhanced.

22. **Latest Developments in Night Vision in India**. Dr Ajay Kumar, Scientist G, Sahay, IRDE, DRDO delivered a talk on the topic and the following important issues were brought out by the speaker:-

(a) **Thrust Areas of IRDE.**

(i) OPTICS (Design, Fabrication, Thin Film coating, Assembly & Evaluation).

(ii) Day & NI Vision (II based &Thermal) stand alone system.

(iii) Fire Control/ Surveillance Systems (Imagers ,Laser Range Finders and Designators, Ballistic Computers)

(iv) Dual Mode (Day &IIR) seekers and Infrared Search& Track System.

(v) Lasers (Range Finders, Designators, Seekers & Proximity Sensors).

(vi) Servo Control Systems for Line of Sight stabilization.

(vii) Enabling Technology (Image Technology, Ballistic Solution).

(viii) Directed Research (Photonics & Nano Photonics, Integrated Optics, Optical Pattern Recognition, Holography).

(b) **Emerging Requirements**

(i) Improved ranges in various atmospheric conditions.

(ii) Recognition ranges of the order of 40 -50 km.

(iii) Larger FOV and ranges.

(iv) Reduction in size weight and power (SWaP)

(v) Use of multiple bands (MWIR, LWIR , SWIR)

(vi) Data and Image Fusion.

(vii) Use of spectral information for better target discrimination.

23. **Sustainment Challenges in Electro-optics Equipment**. Brig Amit Mukherjee, Comdt 509 Army Base Wksp, said that power supply was the biggest problem for NVDs as designers are not aware of the power conditions in areas in which our troops operate. The major sustenance issues are lack of infrastructure, SMTs/STEs, literature, expertise and spares. There is a need for adequacy of resources, low sustenance cost and obsolescence management of NVDs. Since most equipment stays in service far beyond its expected life hence equipment support suffers towards the end of its life and becomes cost prohibitive. There is a need to build a relationship with the OEM beyond the contract stipulations so that his help can be taken for sustenance till the equipment is in service. In the future there needs to be redundancy in equipment, sustenance cost inclusion as part of contract and enablement of limited forward repairs with remote diagnostics or by small teams adequately kitted for the same.

24. **Questions:-**

Question. How can we know where enemy surveillance equipment is deployed?

Answer. Most electro-optical equipment is passive and works by lasing. DRDO has manufactured an optical target locator which can track the location of the laser.

VALEDICTORY SESSION

25. **Valedictory Address.** Lt Gen PJS Pannu, AVSM, VSM, DCIDS (Doctrine and Training), HQ IDS, said that our adversaries will always try to beat our surveillance through stealth technology hence we must be able to seek better and

destroy better. The OODA loop is now changing to ORDA loop i.e. recognition and acquisition of target assumes greater significance. Battles are cost prohibitive and hence we must invest in the right technology so that we can save costly ammunition by precise targeting. There has to be an even mix of affordability and capability in our procurements. We need multi spectral devices which can engage at longer range, are rugged, light in weight and compatible with existing network. We need 3rd and 4th Gen technology and get an Indian solution for the same, keeping in mind the varied terrain and weather conditions in which the equipment will operate.

26. **Closing Address.** Lt Gen Vinod Bhatia PVSM, AVSM, VSM (Retd), Director CENJOWS pointed out that this seminar is held every year since last three years and the frequency of this seminar highlights the criticality currently the country is facing wrt surveillance equipment. This seminar was lucky to have all stakeholders present including MGO, DG WE, DG OS, maintenance agency representatives, Army, Navy and Air HQ representatives, industry and scientific community. There is convergence of views on most issues among stakeholders but still some difference in perception/understanding persist which would have been ironed out to a great extent during the last two days. Growth of NVDs is still hampered by processes and policies. The Make-II procedure recently announced by the government may be a way forward as it brings about changes like removal of limit of number of companies bidding for a contract, gives vendors a time frame of 12-30 months for development of a product, prevents retraction of RFP once issued, assures company of order with the tender being accepted even if it is a single vendor situation. He concluded by thanking the sponsors of the event.