Night Vision India: 2013
"Seeing Through the Fog of War"

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CLAWS and Indian Military Review (IMR) conducted a joint seminar on Night Vision India: 2013 "Seeing through the Fog of War" on 16-17 Jan 2013 at The Air Force Auditorium, New Delhi. The seminar was conducted in four sessions.

Introduction

The issue of night vision devices (NVDs) is a very timely and relevant issue pertaining to warfare. The ability to detect, identify and engage targets at night would be crucial to Indian Armed Forces as well as Central Armed Police Forces (CAPFs). In historical times, hostilities used to cease at last light precisely because of the lack of ability to continue war fighting by night. The first use of NVDs was in World War II. However, the real revolution in NVDs came about in 1980s and its impact on war outcome was first demonstrated in Gulf War I. The need of the hour is for the public and private sector to step up to the challenge and provide our security forces with the wherewithal to counter the threats both foreign and domestic on a 24/7 basis.

Session I: Combat by Night

Battlefield transparency under all types of conditions will be the hallmark of 21st century military operations. The two wars in Iraq and the ongoing Afghanistan operations have acted as test beds for modern technologies particularly NVDs. The military forces that own the night have a decisive edge vis-a-vis their adversary. The twin obstacles of weather and visibility which play havoc with

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military operations can be overcome to a great extent by the application of NVDs. The possibility of conventional war can't be ruled out in the future and the threat from domestic sources would be pervasive. There will be no front, flanks and rears in such scenarios.

NVDs are force multipliers and are widely used in counter insurgency and border surveillance operations. The legacy systems already in place are heavy and inefficient. Indian Army is in the process of equipping its soldiers with third generation NVDs to match different weapon platforms. To accommodate these new devices and associated technologies there has to be a change in doctrines, organisational structures and training methods. Foliage penetration is the next technology on horizon. There is an urgent need to indigenise the night vision technology and Public-Private Partnership (PPP) will be crucial in this regard.

The operational environment of a future infantry soldier would be to hold ground and capture enemy territory in conventional scenarios and pursue the enemy relentlessly in the sub conventional domain. There is a deficiency in performing the tasks by infantry at night to comparable levels in the day time. Insurgents are petrified of NVDs as their ability to operate at night is highly restricted to actions such as infiltration. The ability of infantry to operate with impunity at night will deny action of freedom to the insurgents. Actions such as area domination and surgical elimination of terrorists can also be aided by night vision capacity with minimal collateral damage. The Army is looking at a mix of passive night sights and thermal imagers (TIs). The unattended ground sensors (UGS) are also limited in their ability as they are not able to differentiate between man and animal at extended ranges.

There is an urgent need to build capacity and enhance training regimes to absorb modern technologies by our security forces. The wherewithal to train on simulators complimented by live exercises on a periodic basis in real operational scenarios is the way forward to produce a world class fighting force. The latest in IR (Infrared) technology includes the forward-looking infrared imaging systems (FLIR) solutions of mainly two types, CAT un-cooled FLIR and Fox cooled FLIR. These products also come with a special feature called Continuous Zoom Lens

(CZL) which helps in stabilising the picture on zooming in and out as well on shaky and mobile platforms. Longer ranges for target acquisition are made possible through wide Field of View (FoV) and CZL technologies.

Currently, the domestic private industry is mainly a subcontractor and ancillary provider of products to the defence forces. India has a great advantage as it can acquire the latest state of art technology for defence modernisation programmes overcoming the progressive upgrade inertia of existing legacy systems in most cases. Impetus needs to be given to process based mass manufacturing and here, the private industry can contribute in a big way.

Session II: Emerging Technologies for Night Vision

Bharat Electronics Limited (BEL) is one of the few indigenous organisations that deal with night vision enablement in India along with DRDO. BEL addresses the entire spectrum of night enablement that includes Image Intensifiers (IIs), uncooled TI and cooled TI. BEL has also integrated sights with LFRs and also developed indigenous Laser Target Designators (LTDs). BEL is manufacturing Belop products that have figure of merit (FOM) of 1600 plus. What is permitted to export to India is 1250 as the maximum FOM. Devices with 1400 figure of merit fitted with non-automated power supply can be exported to India but under induced monitoring. BEL and DRDO are trying to come up a fusion technology by fusing II and TI based NVDs which will enable better night sight.

Various companies in this particular industry are investing a substantial amount of capital in trying to enhance the capability of Photo-Cathode activation from 1000 to 3500. The Ion-Barrier Film and decontamination processing is a very important aspect in enhancing Gen 3 tubes because it affects the signal to noise ratio of the tube. Initially, the influence of Ion-Barrier on the tube was about 30 percent which has been brought down to 15 percent. It is important to note here that the lesser the influence of Ion-Barrier on the tube, the better it is in terms of signal to noise ratio (SNR).

Session III: Night Air Combat and Support Operations

The saying that "he who owns the night owns the battlefield" holds true in today's conflict scenario. The example of Osama bin Laden's killing was a case in point. Developments in night-fighting capabilities were made during the period 1941-52, i.e. of World War II and the Korean War. 25 per cent of attacks were made at night but could only harass the enemy. The trend continued during the Vietnam War but with certain improvements in terms of the ground-mapping radar. NV

provides great asymmetry but requires intensive training, and is able to utilise a greater part of the spectrum and hybrid synthetic technology.

The main equipment of Army Aviation is helicopters and supporting operations by them are part of the combined arms operations. No infrastructure is required for them and they can be used anywhere. For night operations, systems (sensors) are required for operational actions like take-off, navigation, reaching the area of operation, manoeuvre and engagement of the enemy, coming back and going for another mission. Sensors make the electronic data available to the pilot in the terms he can understand. Other requirements for night operations are systems necessitating flight safety, improved survivability, IR suppressors and jammers. System architecture includes AFCS, TAWS, and FLIR, Human- Machine Interface (HMI), and NV goggles.

Previously, 300-400 metres of sight range was available at night-time by NVDs for mechanised forces. Important issues related to these are the availability and use of cooled technology, gunner and commander sights for tanks, night-enabling IIs and thermal sights. Panoramic sights are required for the commander integrated with the gunner. Imperatives to be addressed are the transfer of technology including software, protocols, and codes and replication of OEM-mandated production protocols. Allied aspects are the operational, training and human resource aspects.

Session IV: Countering the Threat

India with its fifteen thousand kilometers of land borders faces multifarious challenges in border management. The land borders with Pakistan and Bangladesh are guarded by the BSF and this accounts for 45 per cent of the total land borders of the country. These troops need to be equipped with modern NV devices in adequate numbers to enhance capability. Most devices in current use were procured 20-30 years ago and are technologically obsolescent and not user friendly.

Border out posts contribute to the surveillance and domination by virtue of their location in the border areas and physical presence of force personnel. Earlier, the border outposts were 10-15 km apart but, now they are sited closer to cater to increased infiltration. “Naka” is a small body of troops, which is deputed at assigned positions close to the border to keep vigil at night and to take preventive actions with the use of fire arms in self defence. They have no effective NV devices. Though hand held thermal imagers enjoy a good reputation amongst the troops but it is costly equipment with a limited life, inadequate in

number and is also ineffective in foggy weather. Lorros is effective for medium and long-range observation but a single man cannot handle and operate the system. Similarly, BFSR also requires a technical hand to operate. HHTIs also have a prolonged repair cycle which lasts for almost a year as repair facilities are located in the southern part of India.

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All objects emit infrared energy and image identification technique is based on function of temperature. It can sense temperatures ranging from -20 to 2000 degree Celsius, which in turn helps in eliciting IR signatures of military equipment. It gives the thermal image of the object (black and white in nature). Most critical targets display a contrast due to difference in temperature which leads to its detection. Infra-red details are more dynamic in nature and change with the environment and the movement of objects. In the visible spectrum, counter techniques are used to blend with the surroundings and use natural camouflage. In infrared spectrum, procedure is to reduce emissivity and reflectance to hide or distort the signature. For thermal spectrum, techniques used pertain to screening to diminish heat radiation, creation of thermal signatures compatible with the environment and use of liquid nitrogen. It is impossible to cover the entire electromagnetic spectrum because of the economic and functional non-viability. Use of camouflage devices and other measures does not eliminate chances of detection but only reduces it. Present camouflage measures are Synthetic Camouflage and Multi-Spectral Camouflage nets, Infrared Reflector and multi spectral camouflage paints, Low Emissive Coating, Ghillie suits and smoke screens. Future counter techniques include nano-technology, meta-material, e-camouflage and plasma stealth technology.

Breaking the denial regime around NVDs in India, Tata Power has confirmed the readiness of Gen 3 II tubes with FOM: 1700 and are only waiting for an open tender. Tender specifications should be made keeping in mind the time frame; any tenders passed today will lead to the induction of NVDs only in 3 to 4 years. It is imperative to highlight the limitation of Gen 2 NVDs in time to upgrade our systems (Gen 2 NVDs will work for 27 days in a month and 8 months in a year and will not work in the jungles of North East India). Our neighbouring countries have already advanced towards Gen 3 NVDs. Worldwide trend for NV tenders shows that advanced armies have already moved towards Gen 3, FOM: 1600

technology. Therefore, for India, cost should not become a strategic condition, the 30 per cent increase in price of the Gen 3 II tubes will be compensated by its superior capability in starlight/overcast/monsoon conditions over a 15-year product life cycle.

Conclusion

There needs to be a greater degree of involvement of Indian industries in defence production. The fact that we have large borders and the quantity of equipment we require is large indicates that the cost is going to be high but, would provide economies of scale for the industry. However, lack of defence preparedness may cost the nation far more in terms of infiltration from all corners and wreaking havoc in this country. Long lead time taken to repair equipment needs urgent attention. It is only by providing the forces with equipment and training that the operational readiness will be of the highest order.

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