

# Proceedings of Seminar on “FUTURE ARTILLERY” 27 & 28 APR 2017

## Opening & Keynote Session

1. **Welcome Address** : Lt Gen Vinod Bhatia, PVSM, AVSM, SM (Retd), Dir CENJOWS. In his Welcome Address at the Inaugural session, Lt Gen Vinod Bhatia, PVSM, AVSM, SM (Retd), Director CENJOWS outlined the intent of the Seminar as being to provide a platform to the services, scientific community and the industry to facilitate better understanding of the way forward to meet future security challenges with Artillery and UAVs as an integral and effective component of our combat power. He emphasized on the innovative & effective employment of Artillery as being amongst the major battle winning factors in the Kargil War during which Indian Armed Forces recaptured the daunting heights. Artillery, Gen Bhatia stressed, remains an effective and all important component of the Army’s war fighting capabilities the world over, specially so in the Indian context, where our forces operate in varied terrain conditions from mountains & high altitude areas to the deserts and plains.
2. On the aspect of Artillery modernization in the Indian Army Gen Bhatia stressed on an urgent and immediate need to refurbish and modernize this all important arm for which Indian Army is seeking 2,820 guns of all types, in addition to large quantities of PGMs for destruction of hard targets, a potent real time recce, surveillance and target acquisition capability, besides ‘state of the art’ Unarmed Aerial Vehicles and Unarmed Combat Aerial Vehicles. He also emphasized that ‘indigenisation’ and ‘Make in India’ as being the bedrock principles on which the modernization of the Indian Armed Forces is based, and highlighted ‘Dhanush’ being a success story and proving to be one of the world’s best guns in its category. ‘Vajra’, which too is an indigenous product is proving to be another success story contributing to the ‘Make in India’ campaign and giving India strategic independence.
3. **Opening Address** : Lt Gen PM Bali, VSM, DG PP. In his opening address, the DG PP highlighted the importance of Artillery as a battle winning factor. He delved on the imperatives of modernizing the Artillery and exhorted the relentless pursuit of objective by the DG Artillery. He alluded to the paradigm shift in research and development by involving the users, academia and the private sector. He expressed satisfaction on the formulation of a long term roadmap to usher modernization with focus on indigenization, to achieve self reliance. He exhorted the efforts of OFB and the private industry in ushering indigenization of Artillery equipment.
4. **Keynote Address**: Lt Gen PK Srivastava, AVSM, VSM, DG Arty. The DG’s keynote address focused on Revolutionizing the Indian Artillery Capability over the next 15-20 Years; the Strategy for Modernization. He deliberated on the envisaged revolution in the Indian Artillery capability covering under the different heads of Equipment and Strategy. The DG elucidated on the current equipment profile, proposed inductions with progress of each case and focused on concerted efforts being made towards indigenization to promote self reliance. He also stressed on the need to introduce change in mindsets, culture and ethos. He also brought out that revolution in Artillery was a long term program, which demands relentless pursuit at all levels, support from industry and academia. It also demands national resolve. For India as an emerging regional and global power, revolutionizing

Artillery ultimately implies indigenization to achieve self reliance and emerge as a global hub for defence production.

5. **Special Address:** Mr NK Sinha, Member OFB. The speaker focused his talk on, Articulating OFB Vision on Weapons and Munitions. He gave an overview of the journey of OFB over decades and major achievements towards achieving self reliance. He highlighted that the OFB understands the aspirations of the Army and all efforts are being made to live up to the required standards. The OFs have embarked on major modernization drive to bring the best and most advanced technologies to the country. Endeavour is being made to convert to commercial organization and compete with the private sector. It is also aimed to create a formidable industrial base in the country through public – private partnership. The efforts of the board are supported by the Govt new policies and procedures legislated through the new DPP, simplified and more transparent procedures. The speaker covered at length the success story of production of indigenous 155 mm Dhanush Gun, with 80 percent indigenous content including 30 percent from private sector partnership.

6. **Special Address:** Lt Gen Arun Sahni, PVSM, AVSM, SM (Retd). The theme of special address was Enhancing the Terminal Effect in Battle. The speaker highlighted the symbiotic relationship between evolution of operational thought and technology development, which compels us to focus on enhancing the terminal effect in battle. He highlighted the paradigm shift in war fighting post Cold War Era, in early 1990s, wherein the relevance of conventional wars was significantly reduced. Ever since, the pace of development of conventional weapons has been relegated promoting disruptive technologies in the field of information and cyber wars. He elucidated the phenomenon of air power taking the centre stage in Gulf War- I, displaying pinpoint accuracy and colossal lethality, thus relegating the use of Artillery. However, in the operations in Afghanistan the focus shifted to Co-linear War, CT operations, which have again brought Artillery with precision guided munitions in to focus. Asymmetric Wars demand precision engagements, precluding collateral damage, thus the projectile has become more important than the munitions itself. Budgetary constraints and digital technology has further shifted the focus on terminal effect of munitions. This paradigm shift demands review of our doctrines in terms of requirement of conventional combat ratios in battle. It also raises questions for the decision makers; quantity of smart munitions required, scaling of munitions and ratios of dumb Vs smart munitions. Whilst, it may be prudent to study the western philosophy, we have to make decisions as per geo-strategic imperatives obtaining in our context.

## **Session 2**

Delivering Terminal Effect: Generating an Effective Munitions Capability, Smart and Conventional Munitions

1. **Opening Remarks by the Chairman.** The session was chaired by Lt Gen Arun Sahni, PVSM, AVSM, VSM (Retd). He elucidated on the peculiarities of modern day battlefield and the requirement of smart munitions for the Artillery, which plays a pivotal role in deciding the outcome of battles. He highlighted the importance of enhancing the terminal effect of modern day munitions to achieve greater accuracy as well as higher lethality at much lower cost.

2. **Mr Alok Prasad DDG(W),** Ordnance Factory Board. The speaker gave a brief overview of the activities Ordnance Factories. He brought out that there were 41 factories that have produced over 6000 products and employ approx 90,000 work forces. The range of products includes tents to tanks, chemical to HE, and weapons from 22 to 155 mm caliber. Ordnance factories manufacture the entire ammunition system ie hardware, filling, fuzing etc. In addition, there are 12 ordnance development

centres with over 100 qualified weapon specialists working to transform OFB from a producer to a system developer. He made a detailed presentation on the Dhanush Gun System which has set records as the most tested gun ever at the induction stage- over 4000 rounds have been fired during its trials. Three guns have undergone trials in troop formation and six in battery formation. He stated that the gun beats all contemporary army guns in accuracy and consistency.

3. **Mr Neil Eric**, Nexter Munition. The speaker gave a broad overview of the footprint of the European company in ammunition development. This includes various stages viz advanced studies, development manufacturing, transport, storage, maintenance, employment at op theatre, refurbishment and finally demilitarization of obsolete ammunition. He then highlighted the company's flagship product viz 155 mm BONUS Mk-II arty shell designed for in depth engagement of enemy battle tanks with 2 top attack smart warheads. He also discussed another product of Nexter Munition Company namely the SPADICO fuze system for 155mm ammunition. He described the fuze as being a cost effective means to transform dumb ammunition into one with enhanced capability. The enhanced accuracy that is achieved by the ammunition would reduce the cost of the mission as well as reduce risk of collateral damage by its clearly defined area of saturation during firing. He also discussed new age advanced munitions called MEHNIR, it has a range of 60 km with a 6kg warhead and an accuracy of 10 m with GPS or 1m with a laser sensor. The ammunition was compatible with most 155mm guns.

4. Representative of Honeywell Aerospace India. The speaker discussed Multi Technology Integration for enhanced effect. He afforded an overview of the company's activities in the region. He stated that Honeywell Systems partnership with Tata SED has started production of its flagship product the TALIN Inertial Navigation System. Local manufacturing, assembly, test and depot repairs were being undertaken by the company since 2014.

5. Representative of Solar Systems. The representative of Solar Systems, an indigenous private company, spoke on the topic 'Developing and Producing Artillery Ammunition in India'. He gave an overview of the company's activities and highlighted the large variety of industrial explosives that the company was manufacturing. The company has expanded production centres in Africa and was in the process of setting up similar facilities in Indonesia and Australia. The company was now entering in to the defence explosives space. Its range of products included HMX and its compositions, RDX and related compositions, TNT, propellants (NG and non-NG), new generation explosives, pyrotechnics, and filling and assembly of explosives.

6. Mr Saurab Kumar, Member (A&E) OFB. The speaker spoke on 'Enhancing the Terminal Effect Through Munitions: Efforts at Indigenization. He gave a detailed presentation on the ATAGS developed and manufactured indigenously. The product he stated was a significant step in DRDO-Industry partnership. For the first time ARDE and Bharat Forge have joined hands to develop competitive products to meet the army's mainstay artillery requirement. The ATAGS has all electric servo operation giving it improved reliability. It also employs charge BMCS ammunition for extended ranges. The gun system had a steer by wire facility for high degree of mobility and ease of operation. In addition, the OFB was improving and enhancing the existing stockpile of ammunition. It has developed 105mm base bleed rounds for the IFG that has enhanced its range by over 20%; its fragmentation and lethality too was enhanced from 883sqm to 1179sqm. OFB has also developed dynamically balanced 130mm HE shells and electronic fuzes for the 155mm guns. The OFB is now developing futuristic ammunition namely Thermo baric Shells for the 81mm mortar and the 105mm

IFG. Other advanced munitions that were being developed include pre-fragmented 120mm mortar bombs and 105mm shells, Pinaka Mk-II, SMERCH and propulsion units for LRSAM and MRSAM.

### **Session 3**

Leveraging Modern Technologies to Enhance Artillery's Effectiveness

1. **Unmanned Aerial Vehicles** : Necessity and Feasibility. Brig Sameer Gupta, DDG 'A' Arty Directorate brought out that the current scenario in India necessitates use of UAVs. He informed the house regarding the characteristics, sub systems, advantages, limitations and role of UAVs. He said that Indian Army needs UAVs of varying ranges which were highly reliable and capable of carrying multiple types of payloads.
2. **Signature Management in Artillery Systems**. Mr Naresh Ummat, MD, Baracuda said that since sensors are getting better, signature management becomes very important as it gives a lot of tactical benefits. He stressed that Indian Army is one of the few armies to still use jute camouflage nets and there is a need to move on to synthetic nets because of the enormous advantages they offer. He showcased some products of his company including the MCS camouflage system.
3. **Robotics and their Contribution to Modern Warfare**. Col Sunil Prem (Retd), CMD, Navyug Infosolutions brought out that we are currently at the start point of the robotics in military systems. Trends like humanoid robots, robots assisting humans, Cyborgisation of soldiers, assistive limbs and super soldiers are at various stages of development/ production. Robots have a great advantage of rapid replication and scalability once developed and this must be exploited. DRDO has already developed Lakshya PTA and Daksh ROV for the Indian Army. Specifically for artillery, robotics can be used for disposal of blanks/misfires, ammunition management, recce and observation, fire control, simulation, etc.
4. New Generation Technologies for Artillery. Mr R Muralidharan, CTO, TATA Power SED, showcased some new generation products of TATA Power SED.
5. Integrated Artillery in Digital Battlespace. Mr Vinay Katyal, GM (MILCOM), BEL brought out that integration of artillery with TAC C3I systems was being done by their company through a three level approach in a phased manner. This approach involves automation of artillery functions as level one, integration with sensor elements as level 2 and finally integration of digital battle space as level 3. With this ACCCS and BSS will be fully integrated with CIDSS.

### **Session 4**

#### **Future Role of Field Artillery**

##### **Panel Discussion**

1. On the second day of the seminar, in session-4, "Future Role of the Field Artillery" was discussed in a panel discussion. The discussion was chaired by Lt Gen Arun Sahni, PVSM, AVSM, VSM (Retd), the former GOC-in-C of the South Western Army Command. The other participants were Col Ajay Singh, an Armed Corps officer, Maj Gen Sanjay Sinha, GoC of an Arty Div and an industry rep, Mr. R Muralidharan, CTO of Tata power SED .

2. Gen Sahni initiated the proceedings by setting the agenda for the discussion. In that, he sought the participants to examine the future role of the field artillery with particular reference to the type of the targets, ammunition and weapon systems to neutralize them and future options and Indigenization of artillery weapons and munitions. He also sought the opinion of the discussants on the impact of digitization and prospective role of the artillery in view of its current capability of engaging the targets from much longer ranges.

3. Following the chairman opening talk, Col Ajay Singh in his short presentation brought in focus the ever increasing the role of Arty from the past to the present times. He narrated instances from the history wherein, Arty had made significant contribution in shaping the final outcome of the battle. He asserted that that emerging technologies such as robotics, artificial intelligence, ISR technology, networking etc. will significantly enhance the capabilities of the arty. Commenting on the need for modernization, he exhorted that development of the Arty should our national mission.

4. The second discussant, Maj Gen. Sanjay Sinha, stressed that while the conventional role of the arty in support role would stay but, we also need to find innovative way to use the fire power. He passionately discussed on the concept of manoeuvre fire for shaping the battle field and reducing the casualties. However, the entire effort should conform to the plan of the theatre commander to achieve his aim.

5. Mr. R Muralidharan from Tata, SED stressed that cycle time to develop a system is very large. Quite often by the time the system is made available by the developer for exploitation, it is already nearing obsolescence. He therefore, stressed, that the question whether the system can be upgraded in situ must be asked. Other attributes of the equipment relate to the equipment safety, cyber security reliability, weight, fire power and ability to operate for longer duration and whether the current developments like Big Data and Internet of Things (IoT) can be put to use for better performance. Important Takeaways of the Seminar

6. The Seminar threw up several takeaways, which need to be pursued by all concerned to expedite modernization of Indian Artillery. These are discussed in the succeeding paras.

7. Gaps in Information Dissemination. During the discussions in the Seminar, several information gaps between the users and higher HQ were highlighted, which need to be bridged. The gaps pertained to the following aspects :-

(a) Provision of Spares & Stores. The users appeared to be ignorant about provision of spares & stores, actions initiated at the highest level to make up the deficiencies. It is important to review the information dissemination system in vogue to keep the users abreast with the latest initiatives.

(b) Employment Philosophy of Artillery. The users appeared to be ignorant about the employment philosophy of Artillery at the formation level. It is imperative that the employment philosophy is disseminated to the users through the formation discussions and courses of instruction.

8. Employment Philosophy of Artillery in the Indian Context. The Indian operational scenario is distinctly different from the Western world. Whilst, it would be prudent to study the employment philosophy of the advanced countries, it is imperative to evolve a pragmatic employment philosophy suited to the Indian environment.

9. **Preponderance of Artillery Resources to Northern Borders.** The Seminar highlighted a major anomaly in allocation of bulk of Artillery resources of Indian Army for defence of Northern and Western borders. It was highlighted that India today faces major threat in the North - Eastern Theatre, which has comparatively very less Artillery resources to counter any misadventure by our adversary. It is imperative to ensure strategic balance in allocation of Artillery resources across all fronts.
10. **Modernization of Artillery.** The long term modernization plan for Artillery is in place, which is often marred by slippages. It is recommended that the plan be reviewed periodically and pursued vigorously by various stakeholders for timely fruition.
11. **Strategic Autonomy.** India is an emerging regional cum global power, confronted with complex security environment obtaining in the region. The challenges include Sino-Pak collusive threat, cross border terrorism and power play in the Indian Ocean Region. To safeguard national interests, it is imperative for India to attain strategic autonomy at the earliest, by achieving self reliance in defence requirements. This must to be a focus area for defence planners and decision makers.
12. **Indigenization of Weapon Systems.** To achieve self reliance, it is imperative the focus of modernization is on indigenization of weapon systems. This demands seamless interaction between R&D, academia, PSUs, civil industry and the users, which must be facilitated at the apex level. This is the key to success towards achieving self reliance.
13. **Focus on Indigenization of Smart Munitions.** The high tech weapon systems employ smart munitions which have prohibitive cost. To economize the cost and achieve self reliance, it is imperative to focus on indigenization of smart munitions for new weapon systems.
14. **Collaborative Approach for Indigenization of Weapon Systems.** India is endowed with a huge network of PSUs, large number of world class technical education institutions and vibrant civil defence industry. India should adopt a collaborative approach, synergizing the efforts of all the stakeholders towards research and development of high tech weapon systems to emerge as a world leader in defence production.
15. **Change in Mindsets.** The modernization entails induction of high tech weapon systems in to the Artillery, over a period of time. The optimal exploitation of modern weapons is often restricted by the ingenuity of the users. Thus, it is imperative to usher change in mind set of Gunners Fraternity to ensure optimal employment of high tech weapon systems.