



# Future Artillery India

## Enhancing Precision and Accuracy

There is no doubt that the maturing of Disruptive Technologies and the onset of AI, Machine learning and IOT will impact the future Battlefield Landscape. Cyber, Hybrid warfare and Non-contact Warfare are already being witnessed in different parts of the world. Application of IOT to weapon platforms – resulting in technological innovations like Swarm Drones are peeping on the horizon, but that may be a bit far in the future for us in India.

What has impacted our battlespace is the impact of technology in the space of ISR resulting in enhanced battlefield transparency. Induction of Long Range Vectors, Force Multipliers, improved munitions with enhanced accuracy, lethality, and the maturing of Precision Weapons are impacting the nature of warfare.

One of the most important developments in the history of 20th Century warfare has been the emergence of the precision weapons - the weapon which can be aimed and directed against a single target, relying on external guidance or its own guidance system. Launched from aircraft, ships, submarines, and land vehicles, or even by individual soldiers on the ground, the precision weapon exemplifies the principle of the low-cost threat that forces a high-cost and complicated defence. Modern precision weapons combine the attributes of accuracy, range, striking power, and portability, and it is that combination that makes it a powerful force multiplier in today's military scene.

### Focus Day Discussion (29 Nov)



A number of issues were raised and questions asked during the three hour long animated discussions and presentations on the 29th. Lt Gen Arun Sahni, PVSM, UYSM, SM, VSM (Retd), former GOC-in-C chaired the session. Mr Ranjan Banerjee, Chief Scientist, CRL BEL spoke about C4ISR and AI and its relevance in the three defence services. BEL has done a



remarkable amount of work in this field and remains committed to improving upon the communications to increase battlefield transparency.

George Koilpillai, Chief Engineer, Honeywell India presented the TALIN- a state of the art navigational device which can be fitted on a number of platforms for accurate navigation and positioning. Accurate positioning and navigation, incidentally, is the first step towards precision and accuracy. Honeywell is making TALIN in India in cooperation with TATA Power SED and the system offers a number of applications for Artillery guns and other platforms.

Interactive panel discussion on C4ISR and related aspects threw up a number questions and issues which are:-

#### Questions

- Do we need dumb ammunition with enhanced accuracy
- If so then the desired scaling
- What doctrinal shifts need to be undertaken e.g. with precision targeting?
- Identification of areas that need to be looked at for exploiting the technologies of AI and machine learning - say targeting
- What are the immediate modulations/innovations that need to be done to ensure that the Shakti eqpt can be upgraded in the interim to function as an effective C2 system till the operationalization of the CIDSS ?

#### Points raised by the speakers/discussion

- There is a need for the user to share data for the AI to be functional.
- Need for interoperability of various subsystems of the CIDSS.
- Priority requirement of a common series of maps and GIS system on the various automated systems. A reliable and common communication linkage for all the services.
- Use of Legacy equipment in the short term for seamless real time links for effective C2 and TA.
- Setting up a 24/7 joint organisation at theatre level for data interpretation and analysis of data received from various sources/sensors.
- Synergise R&D innovations achieved by different PSUs and private industry. Need for scalability & commercialization of innovations
- User/GoI support for startups in the defence sector a necessity. Support indigenous effort of 'High Altitude Pseudo Satellite' and 'Swarming Ammunitions'
- ADB is a good initiative supporting the industry
- Utilise technologies like TALIN to improve upon accuracy and precision.

## OPENING & KEYNOTE SESSION (30 Nov)

*Lt Gen Vinod Bhatia, PVSM, AVSM, SM (Retd), Director CENJOWS was in the Chair for the session.*

**Welcome Address.** (including Recap of Focus Day). Lt Gen Vinod Bhatia stated that the aim of the symposium was to get all stake holders to include the Army, academia, industry and DRDO on a common platform to discuss aspects related to Future Artillery with particular reference to precision munitions. The CENJOWS has a role which has 'Force Development' in its purview. It is in this context that he stated that the Artillery is at a take off stage, with the induction of the Vajra K 9 and the ULH in the pipeline and the development of the ATAGs and Dhanush. However, guns alone do not matter and a holistic view must be taken of the support systems and the types of ammunition required. During the Gulf War 2% smart ammunition caused 80% of the destruction.

**Opening Address.** An address on An Overview of the Future of Artillery was delivered by General Deepak Kapoor, PVSM, UYSM, AVSM, SM, VSM (Retd), former COAS. He said that the future of Artillery is linked to the future of land warfare in India. We have 11000 km of disputed land borders with Pakistan and China of which 7000 km is with China and 4000 km is with Pakistan. With the growing nexus between China and Pakistan the threat of a coordinated action by the two of them and therefore a two front war is very much there. In the event of a war, Artillery will play a crucial role. It is after 32 years (post induction of Bofors) that induction of new gun systems is taking place. A happy mix of 39/45/52/ calibres should meet our requirements till 2050.



**Inaugural Address.** Lt Gen V K Ahluwalia, PVSM, AVSM Bar, YSM, VSM (Retd) spoke about Countering Current and Future Threats: Modernising Artillery for Future Operations. He stated that we would have low tech threats from Pakistan and high tech threats from China. We have to be prepared to defeat both and plan for long range vectors. Our organisations which are now based on numbers must shift towards technology based outfits; with due emphasis on aspects related to information warfare and cyber warfare. Absorption of technology is thus imperative.

**Keynote Address.** Lt Gen PK Srivastava, AVSM, VSM,

DG Artillery spoke about Enhancing the Terminal Effect in Battle. He stated that accuracy and terminal effect are very important therefore there is a need for proper target acquisition, which as of now is a weakness. Smart ammunition is the key especially in urban settings.

**Special Address.** Lt Gen PR Shankar, PVSM, AVSM, VSM (Retd), Former DG Artillery spoke on Academia and the Military: Building Blocks for the Future. He is presently with IIT Madras. He went on to explain the immense potential available in IIT Madras to help in the modernisation programmes of the Army. The facilities available should be exploited for working out upgrades, import substitution and tests.

## Session I: Trends and Technologies in 'Precision' and 'Precision Munitions' for Artillery



The session was chaired by Maj Gen Alok Deb SM, VSM (Retd) Dy Director IDSA. He spoke about the renewed interest in precision and guided munitions and resurgence of the US artillery due to conventional conflicts. PGMs offer a huge window of opportunity, but we should explore options for cheaper munitions for our Artillery. The session consisted of 5 speakers, each one an expert in his domain

Lt Gen RS Salaria, Commandant, School of Artillery, Deolali spoke about 'Precision Guided Munitions: Evolution and Concept of Employment in Indian Context. Weaving the thread from evolution of precision munitions in the global context, the General advocated substitution of Mass for Effect in support of PGMs. Calling them Force Multipliers, Gen Salaria recommended that we need to move quickly from dumb munitions to Smart and carry on to the next stage of Brilliant munitions, keeping in sync

with the changing nature of warfare. For the benefit of the audience, he explained operational scenarios and how Artillery helps in shaping the battlefield. He recommended that PGMs be considered as an integral part of weapons and that C4ISR should be developed to exploit the capability. Brig Ajay Sud from the Perspective Planning Directorate spoke of the existing and emerging technologies for precision munitions.

Haley Donoho represented Lockheed Martin and spoke about PGMs and the technologies involved. His presentation included HIMARS, precision guided rockets. Donoho expressed the readiness to bring the technology to India. Sameer Joshi, founder of NewSpace technologies spoke about swarming drones and the difference that the technology will make to the way we wage wars. As we slowly get accustomed to such new concepts, they seem highly credible and given the enthusiasm and sense of commitment, it seems likely that these products will be made in India and be available for deployment sooner than later. K9 Vajra has been in the news as the latest acquisition and L&T represented by Gaurav Tandon made a presentation on the Self-Propelled Gun. It is heartening to see the level of indigenization that the company has already achieved. Capabilities of the gun are impressive and provide a certain boost to the overall fighting capability of the Mechanised Forces.

## Session II: Indigenisation and Development of Precision Munitions



Post lunch session was on indigenization of precision munitions and weapons. Lt Gen Anil Ahuja, former DCIDS steered the session. He quoted extensively from his personal experiences while establishing the need for PGMs and their indigenization. Former DG Artillery, Lt Gen PR Shankar, expressed his views on the need for a fair mix of PGMs and dumb munitions. He was emphatic on indigenization – costs drop significantly once you have a local competitor and thus the argument for indigenization. IIT Chennai, where he is a part of the faculty, is ready to be a partner in developing precision technologies.



*Attentive audience at the seminar*

Bharat Forge – Elbit JV, represented by Col Amarjit, spoke of their indigenous efforts in developing armaments and munitions in the country. Bharat Forge's ATAGS gun has been in the news for a while now for its exceptional capabilities and successful trials till date. Amarjit made a clear case for Make in India by Bharat Forge.

## ▶ TAKEAWAYS

**The Future.** Improvements in the future should relate to precision, lethality and increased ranges. We must go in for autonomous gun systems which can detect, engage targets and carry out a post-strike damage assessment. Situational awareness assumes increasing importance and therefore there is a need for ISR systems which are interoperable with other such systems. Target acquisition is a weakness in the Indian Army as we do not have good target acquisition systems. Hence, there is a need to go in for appropriate GIS systems. Modernisation of ammunition must remain a high priority with focus on indigenisation.

**Precision Munitions.** Smart ammunition is the key to the future as they will play the role of Force Multipliers. However, we cannot do away with conventional ammunition altogether due the prohibitive cost of smart ammunition and the advantages, like dispersion (cover large areas) that conventional ammunition offers. Other factors that need to be borne in mind/ worked out about precision munitions are: -

- There has to be sensor/ shooter mating- we cannot have

incompatible ammunition and guidance systems.

- In our case the scaling of precision ammunition must be done keeping the different types of terrain in mind.
- Guidance systems must also be based on varying terrain types.
- Storage and maintenance of precision ammunition needs to be given due thought.
- A considered scale of 20% precision and balance conventional is considered appropriate.
- Use of precision ammunition will not offset the need for boots on the ground.

**Precision Kits.** Considering the prohibitive cost of fully smart ammunition we could go in for kits and fuzes which can be used as 'add ons' to conventional ammunition to make it semi smart. Ideally the cost of such additions should be less than INR 20,000/- per piece.

**Swarm Drones.** The use of drones for military purposes has been in vogue for many years but the new concept of using swarms of hundreds of drones is the new military weapon. With each drone connected to a central computer, they can be used for ISR or even dropping explosives. With advancements in AI

Maj Gen Ashwini Channan of Army Design Bureau (ADG PP) wound up the discussion by listing out initiatives, their rationale and the achievements of the nascent organization. He also utilized the opportunity to exhort all present to contribute towards the cause and add to the efforts of the Design Bureau which is a major forward step towards indigenization, particularly for the MSMEs.

**Valedictory Address.** This was preceded by brief QAs which were answered very sportingly by the DG Artillery. In his Valedictory Remarks the Director General reiterated his views on precision and accuracy and why it needs to be indigenized and made more affordable. In doing so the DG weaved the thread to announce the theme for the next symposium to 'Making the Artillery More Cost Effective'.

these will pose an even more serious threat. The cost of bringing them down with expensive AD weapons will also be prohibitive on the enemy.

**Enhance Technological Threshold.** There is a need to enhance the technological threshold of our officers and men. PLA has sent 2500 officers since 2007 to foreign universities, specialising in imparting technical education. We could engage with IITs to commence a M Tech programme in Defence Technology and Procurement, for our officers.

**Industry.** The present and the near future offer a tremendous opportunity to the Indian industry to contribute to the Make in India effort in the defence sphere, especially in the case of Artillery, which is on the cusp of transformation through induction of new gun systems and looking for improved ammunition types. It is incumbent on the Army to hand hold the Industry so that both are on the same page and the efforts bear fruit.

**Army Design Bureau.** Though the organization is in a nascent stage it has already started proving its worth as it provides a single point of contact within the Army for the industry, academia and agencies like the DRDO etc. It will also greatly help boost the indigenization efforts. [SA](#)