The Future of Artillery in 21st Century Warfare

P. K. Chakravorty

Abstract

The article visualises the future of Artillery in the 21st century. It brings out the requirement of Artillery in the nine conflicts till date in the 21st Century. It is observed that Artillery is required to perform three primary tasks: First, Surveillance and Target Acquisition; second, engagement of targets; and third, post-strike damage assessment. The future battle space would be non-linear with the need for simultaneous engagement in the close, intermediate and depth areas. Based on these aspects, one arrives at the future profile of Artillery and the equipment needed for the task. This results in the type of regiments and their equipment in the Indian context. The Surveillance and Target Acquisition (SATA) Regiments, Gun Regiments, Mortar Regiments, Rocket Regiments and BrahMos supersonic Cruise Missile Regiments would compose the future set up of Artillery. In view of this, the paper will discuss, ammunition, the weapon of the Artillery; and the aspects of Precision Guided Munitions, Loitering Munitions as also the Long Range ammunition being developed by BAE System and Lockheed Martin.

Introduction

Does Artillery have a place in the conflicts which have occurred in the 21st century? One-fifth of the 21st century has elapsed and despite the end of the

Major General **P. K. Chakravorty** (Retd) is Senior Fellow (Veteran) at Centre for Land Warfare Studies.

Cold War, military conflicts have continued. Political theorist like Francis Fukuyama who called it the 'end of history'—a triumph of capitalist, and liberal Western democracy over other forms of political ideologies. It was anticipated that the world would be moving towards collective prosperity and peace. The attacks on 11 September 2001, commonly referred to as the 9/11 attacks, profoundly challenged the theory. However, it is pertinent to note that open conventional warfare between nation-states became increasingly rare in the years subsequent to the Cold War. This has been replaced by terrorism, ethnic conflict, civil wars, hybrid warfare and special operations accounted for a large portion of non-state, intrastate and interstate conflicts.[1] In this context, the future of Artillery will be based on the role the Arm is likely to play in conflicts of this century.

The conflicts of the 21st century which have occurred so far will provide inputs on the use of Artillery. These are elucidated below:

- *Second Congo War (1998-2003):* This conflict began in the last years of the 20th century. The conflict occurred due to the Rwandan genocide and the ethnic strife between Hutu and Tutsi tribes. The Eastern part of the Democratic Republic of Congo became a deeply contested battlefield between Armies of nine countries. Though many of these countries have artillery weapons, the contests were primarily confined to Small Arms.
- *Syrian Civil War:* The genesis of the Civil War lay in the forces trying to topple Syrian President Bashar al-Assad. He responded to protests with a combination of political concessions and escalating violence against his own people. This led to a civil war which spread into neighbouring Iraq and led to the creation of the armed group, the Islamic State of Iraq and Syria (ISIS). The rebel groups occupied a large amount of territory and the Syrian Government was left with a small portion of the country. Accordingly, Assad dropped crude barrel bombs, used chemical weapons on territory occupied by the rebels. Kurdish militias advanced from the Kurdish autonomous region in

Northern Iraq. The United States (US) conducted air strikes against ISIS forces which were located in Syria and Iraq. Russia joined the conflict in 2015 in support of President Assad. This reversed the tide of the War. Iran also started supporting Assad. The war saw intense use of fire power which was delivered from the Air, with Artillery and drones Artillery having their place in battle.

- *Darfur Conflict:* The beginning of 2003 witnessed rebels taking up arms against the Sudanese President, igniting long-standing tensions in Darfur region of Western Sudan. The conflict erupted into what the US Government later described as the first genocide of the 21st century. It is estimated that 300,000 people were killed and mainly by chemical weapons. The Sudanese Army has Artillery which is of Russian origin and the same was possibly used to fire smoke shells and other varieties containing chemicals. To note, Artillery is an extremely effective delivery system for chemical and biological warfare.
- *Iraq War:* Operation Iraqi Freedom was launched by the United States along with a coalition of the willing to dislodge President Saddam Hussein on 20 March 2003. Artillery was used immensely by both sides and it led to increasing use of Precision Guided Munitions. Subsequent operations against ISIS involved limited use of artillery as ISIS had a few weapons and used them sparingly.
- *Conflict in Afghanistan:* The conflict began post-September 2001 against the Taliban who were overthrown in December 2001. Ever since terrorist operations continue in Afghanistan. Artillery in combination with Unmanned Combat Aerial Vehicles (UCAVs) and other aerial fire power means have been sporadically used in the country. The focus has been on usage of fewer guns and with greater accuracy.
- *Conflict against Boko Haram:* A group is an Islamic group which came into prominence in 2009. The goal is to impose Islamic law in Nigeria. From 2010, Boko Haram attacked numerous police stations

and civilian targets across Nigeria. 300 schoolgirls were kidnapped in 2014 and the group began to assert more control over territory in North-East Nigeria. The terrorist campaign turned to a full-blown insurgency and troops from Cameroon, Chad, Benin and Niger eventually joined the military response. It is estimated that limited artillery has been used as also drones were operated from Chad against Boko Haram.

- *Civil War in Yemen:* Houthi rebels in Yemen captured the capital Sanaa and a civil war has broken out between Houthi supported by Iran and the rulers supported by Saudi Arabia. Bombings of Houthi has been regular and drones have been used by both sides. The Southern Transitional Council has been fighting the rebels.[2] The countries involved are Saudi Arabia and the United Arab Emirates (UAE) versus Houthi possibly backed by Iran. Possibly artillery has been used in conjunction with bombings.
- *Ukraine Conflict:* The crisis is a struggle between factions who want to align with the European Union and the other with Russia. Russia craftily used the opportunity to occupy Crimean peninsula in 2014.[3] This has been followed by sporadic attacks by rebels duly supported by Russia mainly in regions of Eastern Ukraine. Limited Artillery was possibly used in the conflict.
- *Nagorno-Karabakh Conflict:* The conflict lasted from 27 September to 9 November 2020. Armenia and Azerbaijan used all weapons which form a part of the conventional set up including Artillery. Turkey supported Azerbaijan and equipped them with sensors and drones which were extensively used and made them the decisive victor in the conflict. Drones carried out destruction of armour, air defence systems, guns and paved the way for successful culmination of operations. The implications of the 44 days conflict have spurred a lot of discussions on the character of modern warfare.[4] These cases highlight the changing contours of conflict in the 21st century.

Battlespace for Artillery of 21st Century

As can be observed, Artillery remains an important operational arm for conflicts in the 21st century. Ammunition is the weapon of the artillery. The Gun, Rocket, Missile and Drones are delivery means for this weapon. To this, the other aspect that needs due consideration is the perceived battlespace for the future. Wherein, the Artillery of the 21st century will be dictated by these aspects, which are as follows:

- *Non-Linearity:* It entails that the entire battlespace will be utilised for operations.
- *Speed*: Speed would be the essence of future operations.
- *Homogenisation:* There would be a requirement of complete homogenisation within the battlespace. Homogeneity combined with integration between land assets would be a prerequisite for successful operations. This aspect would entail the need for interoperability as also civil-military cooperation at all levels. Non-military personnel, government and non-governmental agencies will have an impact on modern-day battlespace which will increase with the passage of time.
- *Continuity:* Operations would be 24 hours nonstop and would be facilitated by technology to moderate the adverse effects of terrain and weather.
- *Connectivity:* This would ensure real-time connection of sensor and shooter as also post-strike damage assessment. These are extremely important from the Artillery point of view.
- *Synchronisation:* The close, rear and the depth battles will be fought simultaneously and synchronised to produce a devastating effect. Guns, Rockets, Missiles and Drones would be instrumental in ensuring this synchronisation.
- *Perception management:* In the current century, the management of perception has become extremely important. Artillery has the capability to fire propaganda shells, containing leaflets with imaginative material

to influence the perception of people where it lands. This would be extremely effective particularly in insurgent situations.

- *Deception:* This is extremely important for conflicts in the 21st century. Artillery is an extremely good means which can deceive the enemy by deployment, movement of ammunition, engaging objectives not to be addressed and by radio transmissions with regard to command and control of artillery.[5]

All these aspects become applicable to the future of Artillery in the current century. An analysis of recent conflicts reveal the ever-changing nature of hybrid engagements, the uneasiness of being in a perpetual operational situation without clearly realising when it begins, pauses and continued very much akin to the Harassing Fire of Artillery. In February 2021, at *Divya-Drishti*, an international seminar organised by Centre for Land Warfare Studies on the theme "Multi-Domain Operations",[6] the domains were mainly identified to be: land, sea (surface and sub surface), air, space, cyber and electro magnetic spectrum (some panellists also included cognitive domain to the list). In all these domains, the tasks of Artillery stand out, which pertain to—Surveillance, Intelligence, Engagement of Targets and Post Strike Damage Assessment.

While looking at issues globally it is important to view the possible conflict scenarios in the Indian context. The perspective could be limited to 15 years. These are as listed below:

- Hybrid conflict and also the possibility of a conventional war with China in a nuclear backdrop.
- Limited or conventional conflict with Pakistan with a nuclear overhang.
- Assistance to Indian Ocean Littoral States.
- Terrorism oriented threats in Kashmir, North East and Hinterland.
- Internal unrest due to growth of religious fundamentalism, socio and political inequalities.

- Terrorist groups acquiring Weapons of Mass Destruction (WMD).
- Refugee pressures impacting security.
- The problem of porous skies and waters.[7]

It is pertinent to note that tasks of Artillery comprising surveillance, intelligence, engagement of targets and post-strike damage assessment enable it to be a participant in all scenarios. The future of Artillery for the current century would be based on all these aspects.

Future Profile

General JFC Fuller had stated that, "Artillery Conquers and Infantry Occupies",[8] Artillery comprises of Surveillance and Targets Acquisition Equipment, Guns, Mortars, Rockets and Missiles. Gathering intelligence through surveillance, weaponry is tasked to destroy/neutralise/suppress the enemy by synergised application of all fire assets at selected points of decision to physically and psychologically degrade enemy's cohesion with the ultimate aim of breaking his will to fight. Artillery can attack operational centres of gravity to pulverise the objective. To undertake this task for the 21st century, the artillery profile would be based on SATA Regiments, Regiments equipped with Guns (based on the role, some would be Self Propelled), Regiments equipped with Mortar, Regiments equipped with Rockets and regiments equipped with missiles. The profile would be based on the terrain and it should be practicable to have equipment which is as far as possible applicable in all operational areas in our country. The profile would be based on SATA Regiments, Gun Regiments, Mortar Regiments, Rocket Regiments and Missile Regiments. It is pertinent to outline the equipment in these categories of Regiments.[9]

Futuristic Equipment in the Artillery Regiments

- *SATA Regiments:* SATA Regiments would be needed in all types of terrain. Surveillance forms a major component for direction of

Artillery fire. The surveillance philosophy of the Indian Army would guide the future sensor profile of the Indian Army. It is obvious that it will focus on the complete battlespace coverage in real-time. SATA Regiment would be the eyes and ears of the Indian Army. The equipment with the SATA Regiment would include the following:

- Image downloading equipment from Low Earth Surveillance Stations. This would enable real-time intelligence from these satellites, which would enable inputs for taking decisions in real-time thereby ensuring instantaneous action against targets deserving punishment.
- *Drones:* The Regiments must be equipped with UCAVs. These would be capable of providing surveillance, reconnaissance and engagement of targets. Based on the requirement of a swarm of mini Unmanned Aerial Vehicles (UAVs) in the current situation it would be prudent to modify the Herons to become UCAV. Further, there is also a need to get an adequate amount of the contracted Guardian UCAV which is of the Predator variety. Frameworks should be made to have these made in India, as the swarm variety capability exists within the country.
- *Battlefield Surveillance Radar:* These would be of three types, Short-range, Medium Range and Long Range. These would help in the detection of vehicles and personnel.
- *Aerostats:* These with radars mounted on them would provide in-depth view of enemy's vehicle and personnel. They would be useful in providing data particularly in the plains and the desert sector. These could be developed indigenously as the Air Force already possess them and are looking for indigenous surveillance equipment.[10]
- *Weapon Locating Radars:* Two Weapon Locating Radars have entered our organisation. The ANTPQ-37 which was procured under the Foreign Military Sales programme from

the United States. Currently, the Artillery is being equipped with the Bharat Electronics, Swathi Weapon Locating Radar. The radar is similar to the ANTPQ-37 and has capability of locating Guns at a range from 2 to 30 km, Rockets at a range of 4-40 km, Mortars ranging from 2 to 20 km. The initial order was for 32 and in August 2020 orders were placed for six radars.[11] The radars are not suitable for High Altitude and there is a need for developing a radar which can track Artillery shells in steep mountainous terrain. The Arthur Weapon Locating Radar manufactured by Saab Sweden has been exported to 12 countries.[12] Saab has been assisting India and it would be prudent to develop radar for High Altitude with their assistance. It is pertinent to note that four radars have been exported to Armenia by Bharat Electronics.

- *Sound Ranging System:* This is a passive system of locating artillery shells. Despite efforts, no system met the qualitative requirements of the Indian Army. No Original Equipment Manufacturer could meet the terms and therefore there is a need for us to try and develop the system for the plains.
- *Long Range Reconnaissance and Observation System (LORROS):* The device has been in use in the Indian Army for almost two decades. There is a requirement of developing a better system with a greater range and a more powerful image.

- *Gun Regiments:* The Gun Regiments of the Future Artillery would be based on the 155 mm Gun. It has varying barrel lengths which could be 39 calibres, 45 calibres and 52 calibres. All these could be grouped in varieties as listed below. In addition, there would be a few Regiments, holding Field equipment till they are replaced by the 155 mm Regiments equipped with the 105 mm Light Field Gun:

- *155 mm (52 calibre) Towed Regiment:* These would replace the existing Field regiments and would be equipped with Israeli ATHOS manufactured by Elbit Systems and the indigenously designed Advanced Towed Artillery Gun System (ATAGS). These Guns would be ranging 48 km at Mean Sea level. They would be inducted possibly by the end of 2021 or early 2022.
- *155 mm (45 calibre) Dhanush:* These are manufactured by the Ordnance Factory Board (OFB) and would constitute a fair number with a range of 38 km. A regiment is already inducted and there are a fair number in the pipeline.
- *155 mm (45 calibre) Soltam:* These are manufactured by OFB and constitute a range of about 38 km. They have been inducted and are operational.
- *155 mm (52 calibre) Self Propelled K-9 Vajra:* This is a tracked Self Propelled Gun with a range of 48 km. These would be employed in desert terrain with mechanised forces.
- *155 mm (45 calibre) Sharang Gun:* This is similar to the Soltam except the barrel is manufactured by OFB. The first regiment will be inducted this year and would upgrade the existing 130 mm Regiments to 155 mm.
- *155 mm (39 calibre) Ultra-Light Howitzer:* This Gun has been inducted and has a range of 30 km. The Gun is extremely light and can be lifted by a Chinook Helicopter.
- *155 mm (52 calibre) Mounted Gun:* The process for acquisition of this system was revalidated in 2018[13] and should have crossed the Request for Proposal stage. However, progress on the subject is not known. The Gun is mounted on a wheeled vehicle and is an important equipment as it would provide mobility since no towing is involved. This would be ideal for movement as the turning radius would be reduced.

- *155 mm (39 calibre) Bofors Gun:* The current Gun is in service for the last three and half decades. The Gun has a range of 30 km. To extend its life by another 15 years the equipment needs an upgrade particularly with regard to its Auxiliary Propulsion Unit its carriage and Sighting System. This is within the capability of OFB and the Army Design Bureau.
- *Other Equipment:* While the Guns are getting inducted we will have to continue with the existing 105 mm Light Field Gun and 130 mm Medium Regiments.

- *Mortar Regiments:* The Indian Army has been continuing with the 120 mm Brandt Mortar which has stood us in good stead for more than five decades. There is a requirement of a modern Mortar with a greater range possibly around 12 km and where required mounted on an Armoured Personnel Carrier. This weapon will be needed due to its ability to engage reverse slopes accurately and its importance will remain in the 21st century.
- *Rocket Regiments:* Rockets are capable of producing shock action which makes them relevant for conflicts in the current century. Broadly, there are three types of Rocket regiments which would be useful as enumerated below:
  - *Upgraded GRAD BM 21 Rocket Regiments:* The System has got a new lease after the latest up-gradation. The Ural vehicle has been replaced by Ashok Leyland and we have new Extended Range ammunition which ranges up to 40 km which is double the existing range. This ammunition is categorised as 122 mm 9 M521 Rocket.[14]
  - *Smerch Regiments:* These units are equipped with BM 30 Smerch (Tornado) which is a heavy multiple Rocket Launcher. It has a maximum range of 90 km and has been used by Syrian military

forces against rebels during the civil war in 2014. It was also used by Russia backed militants to deliver explosive and cluster munitions against Ukrainian military positions and in the War in Donbass. The Russian Ground Forces used the BM-30 in Syria during the Russian intervention in Syria.[15] During the 2020 Nagorno-Karabakh conflict Armenia and Azerbaijan both targeted each other with Smerch Rockets.[16] The weapon in its current form is suitable for plains. Using a smaller variant would see the equipment reach the mountains with a reduced number of tubes. This could be done indigenously with assistance from Russia.

- *Pinaka Regiments:* Pinaka Multiple Rocket Launcher System has been developed by DRDO and manufactured by Tata Power and L&T. The system has a maximum range of 40 km for Mark-I and 75 km for Mk-II and has 12 barrels on each launcher. A salvo can be fired in 44 seconds.[17] Currently, there are seven Regiments. Six additional Pinaka regiments have been contracted and these will be operationalised along the Northern and Eastern Borders. The induction is planned to be completed by 2024.[18] There is a need to complete the development of the incendiary shell of Pinaka which will pay rich dividends in operations.

- *BrahMos Regiments:* BrahMos is a Super Sonic Cruise Missile currently has a range of 290 km but has been successfully tested for 400 km. A hypersonic version of the missile which flies at five times the speed of sound is also being developed. Sources indicate that the aim is to test an 800 km BrahMos missile within a year. Further sources also report that the range is ultimately to be enhanced to 1500 km.[19]
- *Other Futuristic Guns:* Broadly two equipment need to be noted. The Rail Gun a prototype of which was made by DRDO in November 2017. An electromagnetic Gun which needs electrical power to fire a shell at extremely high velocity. There is no requirement of Charges as the same

is caused by electromagnetic induction. The initial test comprised a 12 mm square bore electromagnetic device. Currently, the aim is to fire a one-kilogram projectile at a velocity of more than 2000 metres per second using a capacitor bank of 10 joules. The development of the next Gun would be 30 mm square and would enable engagements at high speeds.[20] The other equipment is the use of a laser as a weapon. This would need high power and be suitable against the line of sight targets.

Ammunition Aspects

Ammunition is the weapon of the Artillery. A Precision Guided Munition (PGM) is a missile, bomb or artillery shell equipped with a terminal guidance system. It contains electrical equipment that guides it in the final phase before impact. PGMs are the most important development of the 20th century. They saw their initial usage during the Vietnam War when the Thanh Hoa Bridge was knocked down by the bombers using Laser Guided Bombs from the US Air Force. The percentages of PGMs used in various conflicts are (a) Vietnam 0.2 per cent, (b) First Gulf War 8 per cent, (c) Op Allied Force 35 per cent, and (d) Second Gulf War, Afghanistan and Libya 56 per cent.

The US has taken a decision that 50 per cent of all its ammunition holdings would be PGMs. This would overall optimise ammunition holdings and improve destruction of pinpoint targets. This has been vindicated by the success of PGMs which has increased from 90 per cent during the First Gulf War to the current rate of 95 per cent. The weapons could be in the form of a PGM which has a Global Positioning System with Inertial Navigation System in loop or an inexpensive system which could have a Precision Guidance Kit which has an inertial guidance kit fitted on the nose of the shell and produces an accuracy of less than 30 metres. The PGMs like Excalibur has an accuracy of 5 metres and missiles like the Hell fire and other Unmanned Combat Aerial Vehicles have pinpoint accuracy.

The other weapon is the Loitering Missile which is capable of loitering over the target and engaging with pinpoint accuracy. It is reported that Israel has Delilah and other variants. The other Companies who manufacture this variant are MBDA of Europe and Lockheed Martin of the United States. This is certainly a force multiplier for any Army in the World, particularly in a Counter Insurgency environment. PGMs and the Loitering missile must be acquired on priority and later the technology could be shared and these could be Made in India. This must be obtained by the fast track procedure using a co-development model. At least 10 per cent of the Indian Army's ammunition must be PGMs. Where required propaganda shells may be used for distribution of leaflets.

The 155 mm Long Range Land Attack projectile being developed by Lockheed Martin and BAE system for the US Navy ranging more than 100 km must be developed to achieve higher ranges for our Gun Systems.[21] The other aspect would be the use of Directed Energy as ammunition which is being undertaken by DRDO. Issues will fructify in a few years from now.[22]

Conclusion

Artillery as an arm will remain a potent Arm for the 21st century. It would need to modernise and improve its ability to provide intelligence, engagement of targets and post-strike damage assessment. It has its role in the Hybrid scenario of the current method of fighting and remains a dominant arm of the Indian Army.

Notes

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