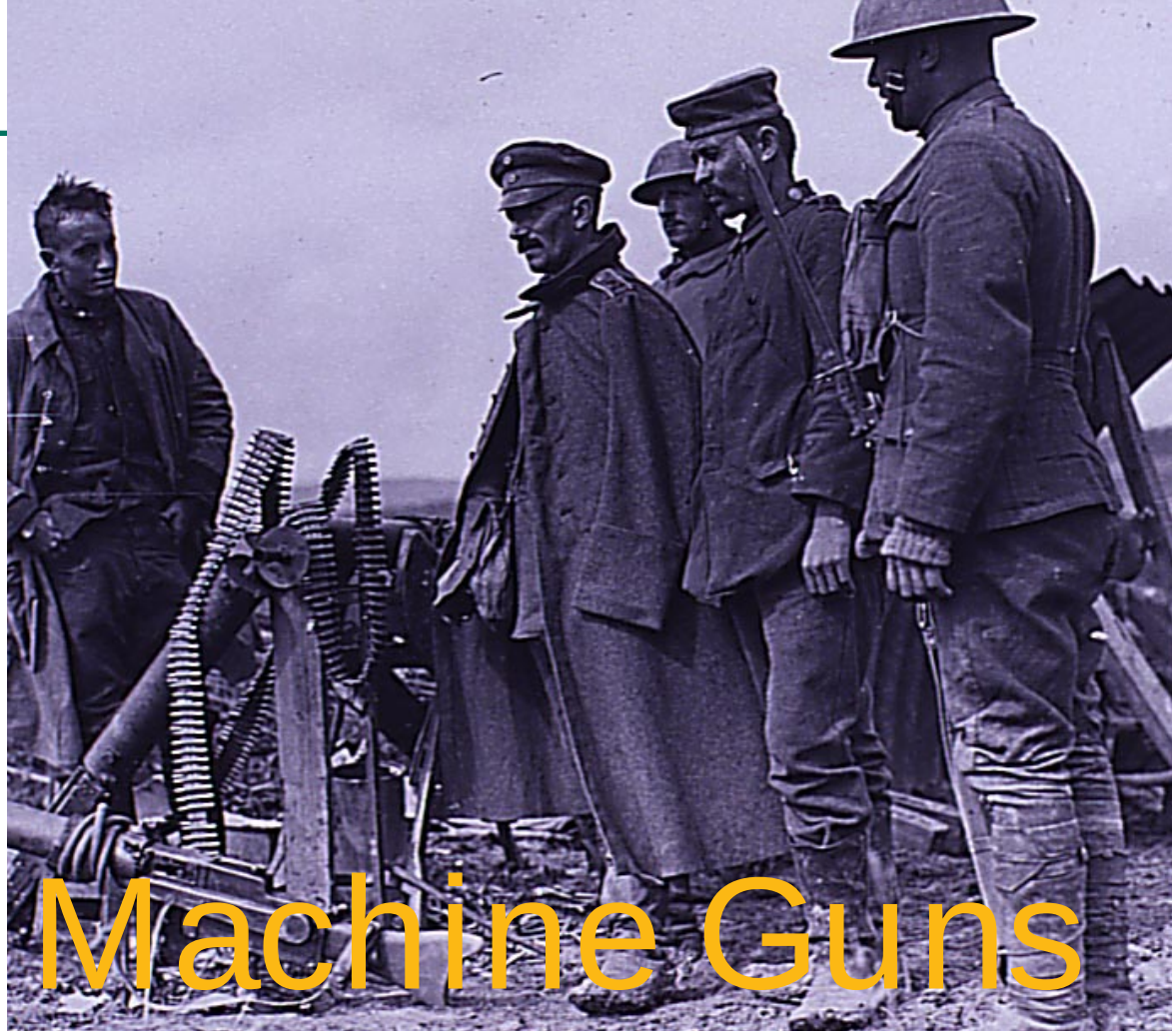

Prisoners with captured machine gun, 1918.

U.S. Army Military History Institute

On Machine Guns and Precision Engagement

By PRICE T. BINGHAM

Although technological developments can lead to immense changes in the conduct of war, it is hard to anticipate what form these changes will take. The machine gun illustrates the tremendous impact of innovative technology on land warfare. Precision engagement could dwarf the influence of that weapon. Examining the introduction of the machine gun will help frame the questions we must address today in making the changes necessary to exploit technology and avoid the catastrophic errors that European armies made when the machine gun was initially fielded.

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Machine guns transformed warfare by vastly increasing infantry firepower. The experience in European colonial wars of the last century strongly suggested that greater firepower made it too costly for massed infantry or horse cavalry to cross a killing zone only a few hundred meters wide. The immense advantage of weapons such as the one produced by Hiram Maxim moved Hilaire Belloc to quip:

> Thank God that we have got
> The Maxim gun and they have not

The lethal firepower of six Maxim guns explains why the British suffered only 48 dead at the Battle of Omdurman in 1898 while the Dervishes lost over 11,000. As Edward Arnold noted, "In most of our wars it has been the dash, the skill, and bravery of our officers and men that

have won the day, but in this case the battle was won by a quiet scientific gentleman living in Kent." Although Sir Edward realized the implications of what had happened, many did not.

Morale Versus Technology

While there was some appreciation that improving the lethality of firepower would demand changes in warfighting, European armies were unable to ask the right questions. Not surprisingly, answers to the wrong questions prevented them from anticipating innovations that new technology provided. The French in particular failed to grasp how improved firepower might affect offensive operations. Not having asked the right questions, they arrived at answers that put too much emphasis on morale versus technology and strengthened the conviction that the offensive spirit of their soldiers would suffice. But the experiences of World War I revealed the limits of the human element when it became clear that "three men and a machine gun" can stop a battalion of heroes.

World War I revealed that three men and a machine gun can stop a battalion of heroes

Only after sustaining immense casualties while attempting to cross the killing zones on the battlefield of 1914–18—made possible by developments in firepower such as the machine gun—did armies make dramatic changes in warfighting. By the end of World War II technological changes led to the end of horse cavalry and to the advent of mechanized vehicles for mobility, armored protection, and firepower. The armies of today have further increased their reliance on vehicles not just on the battlefield but across the entire theater. This dependence on vehicles to wage war helps explain how precision engagement technologies can change warfare far more than the machine gun.

Some technologies vital to realizing the potential of precision engagement are found in airborne ground surveillance. In particular, the joint surveillance target attack radar system (JSTARS) has greatly extended the distance at which we can see and target enemy mobile land forces. Its unprecedented performance in the moving target indicator mode makes it possible for this type of surveillance to accurately detect, locate, and track enemy vehicles crossing a vast area in real-time, even in darkness and bad weather.

Surveillance and Targeting

When surveillance and target attack capability is combined with progress in airborne battle management, sensor-to-shooter connectivity, and precision munitions optimized to attack moving vehicles, the military will have an awesome precision engagement capability. Such power would make it possible to destroy vehicles in a killing zone over two hundred kilometers deep, coinciding with the JSTARS field of vision. Recognizing the role vehicles play in modern land warfare as well as the impact weapons like the machine gun had in creating a killing zone only a few hundred meters wide, the role of precision engagement in future land warfare becomes obvious.

When an enemy learns that we can see and precisely target vehicles—as the Iraqis discovered at Al Khafji—it may be increasingly reluctant to attempt movement, not unlike soldiers who are reluctant to move across an unswept minefield. As enemy fear of traveling in vehicles increases, the ability to maneuver operationally or resupply diminishes. Moreover, an enemy will lose much of the mobility, firepower, and armored protection essential to modern land warfare.

Once mechanically paralyzed, an enemy must depend on foot and animal power like preindustrial armies. Yet our forces can take advantage of 21st century technology which gives them dominant maneuver capabilities. Faced with such overwhelming disadvantages, most organized resistance would collapse. Then our combined information, firepower, armored protection, and maneuver dominance should assure victory at relatively little cost. To borrow from Belloc:

> Thank God that we have got
> Precision engagement and they have not

We must learn what changes are needed for our forces to exploit surveillance and precision engagement to deny an enemy use of its vehicles. The development of the machine gun reveals both the importance and difficulty of determining those changes. We learn from that example that changes required by surveillance and precision engagement capabilities will rely on what questions we ask and our thoroughness in answering them.

The Right Questions

We must begin by asking if we have the tools to evaluate the effectiveness of surveillance and precision engagement technologies and to train personnel to use them. Both evaluation and training require the ability to accurately simulate vehicular movement on a massive scale. They also require accurate simulation of how connectivity and battle management affect our ability to rapidly target large numbers of moving vehicles. Simulating the destruction of enemy vehicles is not enough by itself because, like mine warfare, the impact of

Firing TOW missile.

2d Marine Division, Combat Camera (E.J. Young)

Toting anti-armor missile system.

2d Marine Division, Combat Camera (E.J. Young)

precision engagement will be determined by enemy perceptions of the threat and its influence on the behavior of enemy soldiers.

Given the right tools we must ascertain which systems—fighters, bombers, helicopters, or missiles—or combinations of systems can best deliver precision munitions against moving vehicles tracked by JSTARS. Such decisions will require looking at responsiveness, basing availability and vulnerabilities, and delivery cost to include the risk of loss for manned aircraft delivery. Closely related to the issue of which delivery platforms offer what advantages is the question of what types of munitions are best for performing precision engagement against moving vehicles.

Since a primary goal of precision engagement is operational paralysis, it is important to ask how munitions should be optimized to destroy a moving vehicle in the dark or poor visibility. Answering this question requires knowing if achieving the requisite precision depends on being able to exploit signatures created by vehicular movement. (Here we might ask if the anti-radiation missile, which uses radar emissions for terminal guidance, provides a suitable requirements model for a precision munition attack on moving vehicles.) Determining the best option will also require gauging the influence of munition footprints on battle management and connectivity requirements as well as the ability to achieve surprise and intensity to maximize the intimidation of an enemy and minimize friendly exposure.

an objective of precision engagement is operational paralysis—the conditions for dominant maneuver

Understanding how to exploit the advantages of precision engagement makes it essential to ask what changes will be needed in land and air forces. We must determine how a vehicle killing zone with a depth greater than two hundred kilometers is likely to influence close-in battle and thus the air and land forces used to fight it. Given that an objective of precision engagement is creating operational paralysis—that is, the conditions for truly dominant maneuver—we must learn whether inflicting paralysis could make mines and hand-held weapons the principal close-in threat to land forces. This will determine, in turn, the kind of protection vehicles need and whether weapons should be optimized for neutralizing dug-in infantry as opposed to killing tanks.

Precision engagement clearly puts the Armed Forces in a position to exploit truly immense changes in warfighting. It is equally apparent that it will require major adjustments in doctrine and organization as well as weaponry. Fortunately, we are better prepared for a test of professionalism today than when the machine gun was introduced. The proof will come in the questions we ask and our willingness to act on the answers regardless of the resulting changes. **JFQ**