

The Mineless Battlespace: Shaping the Future Battlefield without Conventional Landmines

**A Monograph
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Abstract

THE MINELESS BATTLESPACE: SHAPING THE FUTURE BATTLEFIELD WITHOUT CONVENTIONAL LANDMINES. By MAJ Michael J. Price, USA, 76 pages.

This monograph examines the ability of the United States Army to shape the battlefield without the use of conventional landmines. The United States must determine alternatives to conducting warfare without the use of landmines. The humanitarian crisis landmines create calls for this and current and future technologies make it possible. Weapons that cannot discriminate between combatant and non-combatant will lose their legitimacy in the future battlespace. This study traces the evolution of landmines and their purposes. It then reviews current American, British, and Canadian counter-mobility doctrine in order to establish a foundation to build upon. With this solid foundation of the past and present, the study then progresses to address how the United States can shape the future battlespace. This study offers alternatives to conventional landmines through technology, doctrine, and training.

Through their evolution, landmines have become an effective force enabler in the conduct of land warfare, but in recent times their usefulness has diminished. Situational and scatterable landmines have increased importance in the changing environment.

The evolution of the humanitarian crisis from their use supports a complete ban on the use of conventional landmines. The costs associated with landmine use are mind numbing. Medical and rehabilitation costs alone exceed \$750 million. The effects of wars long past continue to plague ravished nations. With current de-mining efforts, the estimate by the Vietnam Veterans of America Foundation (VVAFA) to remove the existing landmines exceeds forty years. Based on this, the evidence supports a total ban on the use of conventional landmines, both anti-personnel and anti-tank.

Reviewing modern doctrine reveals that countermobility operations are very similar amongst the United States, Great Britain, and Canada. The other common thread is offensive action and maintenance of the initiative. The biggest difference between these three nations is chiefly a difference in the American doctrine since it does not discuss the impacts of the Ottawa Treaty. Both Great Britain and Canada have addressed the treaty's impacts by including coordination with host nation agreements into obstacle integration. The United States does not address this factor in countermobility doctrine.

The changing security environment also presents the potential necessity to shape the battlefield without conventional landmines. The Ottawa Treaty restricts the use of anti-personnel landmines and any nations have become signatories to it. The United States Army may have to employ the objective force in a nation or with a nation that is a signatory. Should that be the case, the force will be compelled to abide the articles of the Ottawa treaty and therefore be required to replicate that capability with existing systems/doctrine or develop them.

This study concludes by offering recommendations to shaping the battlefield without conventional landmines. In many respects the United States Army currently shapes the battlefield without the use of landmines. Doctrine provides the means to shape enemy formations. Deception combined with long range fires, including air interdiction; shape the battlefield for the decisive operations. Increased technologies mainly in the intelligence arena allow precision deep fires to destroy enemy forces prior to ground contact. Non-lethal alternatives also exist to replace the function of landmines. Electromagnetic pulse weapons could revolutionize ground warfare and leave the battlefield safe to traverse following the conflict. The recommendations outlined in this paper are based on emerging doctrine and provide for humanitarian friendly alternatives to landmines. Future battlefields can become truly mineless.

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INTRODUCTION

From off in the distance the local villagers hear an explosion. Mothers, instantly concerned, flock to the fields to see whether it was their child this time. At the site of the explosion, a child lies groaning and bleeding, clutching what remains of his leg. His fate is uncertain because of the lack of medical facilities, adequate transportation, or safe routes. The child was minding his own business, helping the family work the fields, when he disturbed a landmine. The explosive in the landmine was enough to tear the majority of his lower leg off and send the little boy flying through the air. He landed in a contorted heap where he awaits medical attention.

Scenes like this occur all too often in many nations around the world, including Afghanistan, Cambodia, Angola, Croatia, Bosnia-Herzegovina, and Mozambique to name a few.¹ Former battlefields remain littered with millions of landmines. According to the Vietnam Veterans of America Foundation (VVAf), as of 1995 one hundred million landmines lay buried in sixty-four countries.² These landmines, both anti-personnel and anti-tank, continue to take innocent, non-combatant lives and cost the inhabitants of the infested nations millions of dollars in medical and rehabilitation expenses. The VVAf estimates this cost to exceed \$750 million.

Medical costs are just the tip of the iceberg, when measuring the financial impacts of landmines. Landmines prevent the use of thousands of acres of land needed to grow crops and build infrastructure. Lost agricultural productivity is planted in mine infested fields. This loss is estimated to approach two billion dollars per year, which in itself is not revealing.³ The truth in numbers is in the request for humanitarian assistance. In 1993 the VVAf reports that sixteen

¹ International Campaign to Ban Landmines, *The Landmine Monitor: Toward a Mine-Free World*, (2001) [WWW document]. URL www.icbl.org/lm accessed 10 January, 2002.

² Shawn Roberts and Jody Williams, *After the Guns Fall Silent: The Enduring Legacy of Landmines*, Washington D.C.: The Vietnam Veterans of America Foundation, 1995, 3.

³ This value is based on the average cereal grain productivity per acre using 2001 U.S dollars. The average is then multiplied by the estimated number of acres of mined cropland in the world as given by the VVAf. The productivity values are given by Federal Agriculture Organization which monitors productivity by nation. www.fao.org accessed 12 December, 2001.

nations requested two and a half billion dollars in aid, thirteen of which had severe landmine problems⁴. While nations remain covered with landmines, fields remain untillable, crops ungrown, the need for humanitarian assistance continues to be a strain on the world.

De-mining operations add additional costs to wars past. In 1999, it cost an estimated \$300 to \$1000 to remove one landmine⁵. If no other landmines were sown the cost would approach upwards of ten billion dollars to remove every landmine throughout the globe. Landmine infected nations do not have the adequate and necessary funds to eradicate this problem. Other nations must undertake this cost in the form of humanitarian assistance. Last year donor nations contributed over \$224 million for humanitarian mine action operations⁶. Simple math based on funding requirements shows that it will take over forty years to remove every landmine, if no other landmine was laid. Other estimates indicate that de-mining the existing landmines will take nearly 1000 years.⁷

The financial and medical impacts linked directly to landmines led seventy nations to come together in 1997 in Ottawa to outline measures to end this humanitarian crisis. The result was the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction – the “Ottawa Treaty” (full text contained in Appendix A). As of 12 December 2001, 122 nations have accepted the terms and have ratified the Ottawa Treaty and 142 other nations have signed it (see Appendix B). By signing the treaty, those nations agreed to its terms. Nations, including the United States and China, have not ratified nor signed the treaty, claiming national security reasons. Many of the severely mine infected nations including Afghanistan, Iraq, Libya, Somalia, and Vietnam have not signed the treaty, mainly

⁴ Shawn Roberts and Jody Williams, *After the Guns Fall Silent: The Enduring Legacy of Landmines*, page 6.

⁵ Ibid, page 283

⁶ Major Findings from LM Report 2001, www.iclb.org/lm, accessed 13 December, 2001

⁷ *New Internationalist*, <http://www.newint.org>, accessed 31 January, 2002. This figure is calculated based on removing 100,000 mines per year.

because of the economic impacts of signing⁸. The treaty outlines time limits to accomplish the removal of existing landmines, which has a tremendous price tag associated with it. As discussed earlier, de-mining operations are expensive and currently under funded to meet the timelines outlined in the Ottawa Treaty.

The United States claims the main reason for not signing the treaty is its continual defense on the Korean peninsula. Defense officials argue that anti-personnel landmines are critical for South Korea and the United States to defend itself from attacking armies from the north. Former President William J. Clinton pledged that the United States would sign the treaty by 2006 if suitable alternatives are fielded to replace anti-personnel landmines by that time.⁹

The treaty is a comprehensive ban on the development, production, stockpiling, transfer, and use of anti-personnel mines for any purpose. It also prescribes the destruction and removal of existing anti-personnel mines within a specified period. This treaty significantly changes or will change the way many nations conduct warfare. Coalition warfare exacerbates this. Coalitions involving the United States will conduct future warfare. Problems will emanate if all coalition partners have signed the treaty. As an example, French commanders are not allowed to accept any rules of engagement that involve the use of anti-personnel mines, nor are they allowed to conduct a relief in place with any unit that emplaced anti-personnel landmines, until they are removed. France also does not allow anti-personnel landmines to travel over its territory.¹⁰ This has strategic and operational implications for the United States in terms of planning and executing future operations when NATO partners are involved.

The “Ottawa Treaty” applies only to non-self destructing anti-personnel landmines. The treaty defines anti-personnel landmines as a mine designed to be exploded by the presence,

⁸ Shawn Roberts and Jody Williams, *After the Guns Fall Silent: The Enduring Legacy of Landmines*, 8.

⁹ “Clinton Urges Bush to sign Ottawa Convention”, *Arms Control Today*, Washington, Mar 2001

¹⁰ Collective article, Les Consequences De La Convention D’Ottawa, *Objectif Doctrine number 21*(Paris, Commandement de la Doctrine et de l’Enseignement militaire Superieur) January 2001, 47-55.

proximity or contact of a person and that will incapacitate, injure or kill one or more persons¹¹. Anti-tank landmines differ only in their intended purpose and the amount of pressure required to detonate the landmine. While anti-personnel landmines aim to maim or kill personnel, anti-tank landmines aim to disable vehicles. When coupled with anti-handling devices, anti-tank landmines perform just as an anti-personnel landmine. Anti-tank landmines affect the same land as anti-personnel landmines and cause just as much damage. Worse, they prevent the use of roads and thereby restrict the transportation of goods.

The humanitarian crisis outlined above remains, even in light of the Ottawa Treaty. The United Nations estimates that almost two million landmines were sown in 1993.¹² Additionally the Landmine Monitor 2001 Report shows that anti-personnel landmines are in wide spread use around the world, even by signatories of the Ottawa Treaty.¹³ With the Ottawa convention proceedings setting precedence, it is not unreasonable to expect the international community to take the next step and ban all conventional landmines. Similar arguments used to rally nations to adopt the Ottawa Treaty could be applied to further restrict or ban the use of all conventional landmines.

This study examines if the United States Army can shape the future battlespace without the use of conventional or “dumb” landmines. The United States must begin now to determine alternatives to conducting warfare without the use of landmines. With the increases in technology on the battlefield and in space, the United States can use more discretion in the types of weapons it uses. Weapons that cannot discriminate between combatant and non-combatant will lose their legitimacy in the future battlespace. This study traces the evolution of landmines and their

¹¹ Convention on the Prohibition of the use, stockpiling, production and transfer of antipersonnel mines and on their destruction.,<http://www.icbl.org/treaty/treatyenglish.htm>, accessed 13 December 2001. Entire text contained in Appendix A.

¹² Shawn Roberts and Jody Williams, *After the Guns Fall Silent: The Enduring Legacy of Landmines*, page 33.

¹³ Landmine Monitor 2001 Report, www.icbl.org/lm, accessed 31 January, 2002. The major findings in this reports indicates that anti-personnel landmine use is confirmed in: Russia, Afghanistan, Angola, Sri Lanka, Burma, Uzbekistan, Columbia, Namibia, Macedonia, Tajikistan, Kyrgyzstan, Eritrea, Uganda, DR Congo, Israel, Nepal, Philippines, Senegal, and Somalia. This includes both state and non-state actors.

purposes. It then reviews current American, British, and Canadian counter-mobility doctrine in order to establish a foundation to build upon. With this solid foundation of the past and present, the study then progresses to address how the United States can shape the future battlespace. This study offers alternatives to conventional landmines through technology, doctrine, and training.

CHAPTER ONE

THE EVOLUTION OF LANDMINES AND THEIR ROLE

The Early Years

Landmines began as crude devices used to slow or stop an advancing enemy. Mike Croll in his book, *The History of Landmines*, traces early landmine warfare to 54 B.C. and attributes it to Julius Caesar. Caesar, Croll explains, conducted a defense against a numerically superior force (70,000 versus 80,000) around the town of Alesia in Gaul.¹⁴ In front of defensive breastworks, Caesar constructed an assortment of obstacles that allowed a smaller force to defend and defeat a larger attacking army. The obstacles included abatis, and buried sharpened sticks and metal hooks. Caesar's innovative form of a defensive front gained him the advantage and after a short time, earned him a victory over the Gallic army.

There were no significant developments to landmines until the advent of gunpowder. By the thirteenth century, the Chinese began incorporating this new development into warfare. Gunpowder was used to propel objects at the enemy. The Chinese also used this new age weapon in an early form of a landmine. They buried objects and then used attractive poles or flags set in the ground. When one of the poles or flags was pulled out it set off an explosive charge and propelled the buried objects.¹⁵ This is the earliest instance of a victim operated explosive trap.

Europeans further developed this concept. Experimentation with early landmines began as early as the sixteenth century in Sicily and southern Italy.¹⁶ An ancestor to command detonated

¹⁴ Mike Croll, *The History of Landmines*. Barnsley [U.K.]: Leo Cooper, 1998, 1

¹⁵ Ibid, 8.

¹⁶ John U. Nef, *War and Human Progress*, New York: Norton Publishing, 1950, 44.

landmines were merely buried cannons. These crude cannons were a one-time use weapons. They were often unreliable and therefore not incorporated into the defense. The chief problem with them was the lack of time fuse and no dependable way of maintaining dry gun powder. The cannon were detonated by lighting a trail of gunpowder that eventually led to the cannon. Under perfect weather conditions, this technique proved fatal for the advancing army, but perfect weather conditions rarely existed. These devices were termed fougasses and their purpose remains unchanged today. The only difference is the means by which they are detonated.

By the end of the fifteenth century, military engineers combined their mining capabilities and the destructive power of explosives. During a siege they first burrowed their way to the fortification walls. At the end of the mine and the base of the fortification wall, the engineers placed a large explosive charge and breached the wall to allow the attackers into the besieged city.¹⁷ The term “landmine” evolved from this period of siege warfare. *The American Heritage Dictionary* defines mine as “an excavation in the earth from which ore or minerals can be extracted”. Military engineers used the term to describe what they did when they “burrowed” a path to a fortification wall. The term “mine” and “landmine” thus became interchangeable when used to describe any buried, victim operated explosive trap.

The American Civil War

During the American Civil War, the use of landmines and fougasses increased. With improved techniques for detonation, fougasses were floated and detonated against Union ships. The Confederate soldiers responsible for perfecting these, Isaac Brown and Matthew Maury, were also credited with planting the first electrically fired landmine in the summer of 1861 near Columbus, Kentucky.¹⁸ These command detonated landmines consisted of buried iron casings

¹⁷ David C. Baker. “The Great Grandfather of modern Landmines might well be a tunnel under Jericho”, *Military History*, (Leesburg, VA, April 2002), 20.

¹⁸ Mike Croll. *The History of Landmines.*, 11.

with grapeshot artillery shells. Fortunately for the Union, the Confederates abandoned this minefield without detonating it. Union soldiers, based on information from Confederate deserters, later found the mines. This discovery helped the Union Army to begin developing countermine operations.

The Confederates had incentive to establish landmine techniques and to begin experimenting with technology because of the strategic setting. At the strategic level of war, the Confederate States of America waged war from a disadvantage. The Union had a larger industrial base to wage war and had a larger population to draw replacements from. In contrast, the Confederate Army was outnumbered and a means to conserve forces became necessary. Landmines were an attempt to achieve economy of force and strengthen their defenses.

From the beginning of the war Jefferson Davis the Confederate president, distributed the southern industrial power throughout the south in order to preserve it.¹⁹ This caused an equal distribution of military forces in order to defend the distributed industries. By the beginning of 1864, the momentum shifted in the American Civil War to the Union side. The Union had secured the Mississippi valley in the west, and maintained pressure throughout the entire south. The Confederates fought more and more defensive battles in an attempt to preserve their newly formed nation state.²⁰ Where large confederate formations were not available, landmines were an attempt to make up the difference and balance out the force ratios. The Confederate minefields like the one at Columbus, Kentucky, were designed to destroy whole regiments with a small Confederate force.

Confederate military units began experimenting with burying ordnance shells and then command detonating them. The next evolution was victim operated landmines. Victim operated

¹⁹ Thomas Griess, *The American Civil War, The West Point Military History Series*, Wayne, New Jersey, Avery Publishing Group INC., 1987, 191.

²⁰ Some of these battles include: the Wilderness Campaign, the Battles of Spotsylvania, North Anna, Franklin, Atlanta, Cold Harbor, Petersburg, and finally Appomattox Court House. This list is not inclusive of all battles after 1863.

traps had been used before, but with little success. It was not until the American Civil War that technology, thought, and requirement came together. The first use of pressure operated landmines is attributed to Brigadier General Gabriel J. Rains at the Battle of Yorktown. BG Rains defended Yorktown with 2,500 soldiers against General McClellan's 100,000. On 4 May, 1862 a pressure operated landmine claimed its first recorded victim.²¹ As the northern army advanced on the fortified positions at Yorktown, they encountered Rains' minefields delaying them. Fearing the odds, BG Rains evacuated Yorktown and headed for Richmond. In his route of withdrawal he ordered the emplacement of additional pressure landmines. During his pursuit, McClellan became cautious because of the effects of the encountered landmines. In the end, Rains safely reached Richmond.

Discussion, from the moral point of view, on the use of landmines began following this action. Some Confederate soldiers believed their use to be too barbaric and as a result, General Longstreet, Rains' commanding officer, forbade their further use. On the Union side, General McClellan described their use as murderous. By 1864 General Tecumseh Sherman similarly described landmines: "It is not war, but murder".²² In the end though, landmines accounted for roughly one hundred of the 623,000 Americans dead.²³ The death toll seems insignificant relative to the number of deaths, but the lessons learned by their use are demonstrative. The mental aspects alone of this new form of warfare were enough to delay movements. They made advancing armies cautious, caused attrition, covered withdrawals, and more importantly for the Confederates, conserved manpower. Landmines led to a new form of distasteful killing of one's enemy.²⁴

²¹ Mike Croll. *The History of Landmines*. 16.

²² Milton F. Perry, *Infernal Machines: The Story of Confederate Submarine and Mine Warfare*, Baton Rouge, LA, Louisiana State University Press, 1965, 22

²³ E.B. Long, *The Civil War Day by Day, An Almanac 1861 – 1865*, New York: Doubleday and Company INC., 1971, 711.

²⁴ Mike Croll. *The History of Landmines*, 20.

Based on the American experience, landmines emerged elsewhere. The British, having observed how the Americans fought, were engaged in their own conflict in Sudan in the 1880s. While the Americans called the use of landmines a distasteful form of warfare, one British general called them the future of the defense.²⁵ Landmines protected work parties against attacks by natives and were effective in the defense of fortifications.

The Great War

The advent of the “tank” during The Great War brought about another evolution in landmines. Mechanized warfare added a new lethality to the battlefield. Rolling masses of steel powered by a combustion engine protected the infantry soldier. Tanks were also weapon’s platforms that brought fire and maneuver together in one package. Mechanized warfare was developed to overcome the stalemate induced by trench warfare. Small arms fires were ineffective in stopping or even slowing the tank. The tank’s first tactical success came at the Battle of Cambrai in November 1917. The British used three hundred tanks in mass to advance to the German trench line. The Allies gained as much as eight kilometers in some areas of the line. They had also captured four thousand prisoners.²⁶ Although the ground gained was lost in subsequent days, the tank had earned its place in history.

The Battle of Cambrai was the third battle in World War I to use tanks. The first two were ineffective because the British had not yet developed adequate doctrine and they were mechanically unreliable.²⁷ These problems were overcome and tank warfare became a means to end the stalemate brought on by trench warfare. The Germans in response developed weapon systems to destroy the tanks before they could break the German defense. First they attempted to disable the tanks with a single grenade. After that failed, the Germans began experimenting

²⁵ Ibid, 20.

²⁶ Robert W. Martin. The Great Experiment at Cambrai, 1917. Tactical and Technological Innovations. <http://militaryhistory.about.com/library/weekly/aa080601a.htm> accessed 15 February 2002.

²⁷ William R. Griffiths, *The Great War, The West Point Military History Series*, Wayne, New Jersey, Avery Publishing Group INC., 1986, 72.

similar to the way early anti-personnel mines were developed. They buried artillery shells and placed a board over the fuse to form a pressure plate. These mines often proved inefficient and time consuming to construct. The first mass produced anti-tank landmine evolved soon after the battle of Cambrai. It consisted of eight pounds of guncotton contained in a small wooded box. On top of it rested a spring retained bar that when depressed under the weight of a tank, caused the mine to function.²⁸ The use of these mines was haphazard at first. They were initially emplaced on roads and approaches and were often ineffective, mainly because the landmines were never encountered. The next evolution consisted of long lines of barricades interlaced with anti-tank landmines. This led to a standard minefield with two rows of anti-tank mines offset by a picket. Once the tank ran over the picket, the landmine would explode and blow a hole in the soft belly of the crude armor of the tank.

The British responded by developing counter-mine measures. In early 1919 the Mechanical Field Company, Royal Engineers devised rollers that would detonate early anti-tank pressure fuzed landmines.²⁹ The British also began making their own version of the anti-tank landmine. It too was a wooden box with explosives. The only difference was that instead of a spring retained mechanism for a fuse, it had a hinged plate mechanism that acted as a pressure plate fuse.

The Interwar Developments

Landmines and tanks never proved decisive in the conduct of World War I, but the seed was planted. If mechanized warfare was the future for land combat, then anti-tank weapons would have to be developed. World War I was billed as the “war to end all wars”. The Versailles Treaty placed stringent constraints on Germany and its ability to rebuild its army to wage further war. This next section discusses developments during the interwar wars. Specifically it looks at how the modern armies mechanized. The use of the tank during World War I, displayed a capability

²⁸ Mike Croll. *The History of Landmines*, 28.

²⁹ *Ibid*, 31.

useful for future warfare. Tank or mechanized warfare would breed the necessity for anti-tank warfare.

France focused on rebuilding its nation and protecting its resources. The French formulated a defensive strategy to achieve this and to gain time and space should the Germans attack again. They believed, like Carl Von Clausewitz, that the defense would be the stronger form of warfare. Clausewitz says, “The defensive form of warfare is intrinsically stronger than the offense.”³⁰ It is much easier to hold ground and ward off an attacker, than it is to try to take it. Mechanization complicates the defender’s problem. With mechanization and the speed and amount of firepower that can be brought to bear, the defense becomes less strong. Unless unmolested, the attacker’s greater mobility allows him to maneuver to a point of attack of his choosing. The defender must adopt mechanization to increase his maneuverability or a counter to disrupt or prevent the advantages offered by the mechanization.

France was in a peculiar position following the Great War. The leadership understood the need for full mobilization in the event of another war in Europe. The challenge for French mobilization was that the majority of its natural resources are in a region within twenty five miles of Belgium, which is not easily defended. This region combined with the Lorraine is responsible for seventy five percent of French coal production³¹. Along with the majority of natural resources and industry, the bulk of the French people also lived in these regions. The maintenance of these lands was paramount to French existence. Full mobilization required these resources and defense of them would take a large standing military, which was neither favorable nor economically sound. French leaders settled on constructing the Maginot Line. The Maginot Line consisted of a series of concrete fortifications designed to resist any German attack. The Maginot Line defenses were deemed to be impenetrable by its designers. Anti-tank and personnel landmines reinforced

³⁰ Carl Von Clausewitz. *On War*. Edited and Translated by Michael Howard and Peter Paret. Princeton, New Jersey: University Press, 1976, 358.

³¹ Robert A. Doughty, *The Seeds of Disaster, The Development of French Army Doctrine 1919 – 1939*. Hamden Connecticut, Archon Press, 1985, 42.

barricades to the front of the casements and fortresses.³² They relied on a mobile reserve to react anywhere along the line to beat back an attack and allow the remainder of the French army to mobilize.

The British, while not having these constraints placed upon them, still did not entirely embrace mechanization. Like France economics dictated much of the interwar developments, or lack thereof. Landmines were addressed in the 1924 writing of “Anti-tank Mines in Mobile Warfare” by Captain R.H. Dewing. In this article Dewing summarized that landmines have value beyond their destructive power, their physical value. Landmines, Dewing illustrates, have a moral value. This is the effect gained by tank drivers becoming nervous because of the belief that they are driving through a minefield and they may hit one at any moment.³³ By 1928 Great Britain developed a new and improved anti-tank landmine which addressed Dewing’s warnings. Anti-tank warfare experimentation began in the 1930s. In 1935 Great Britain began mass production of the Mark I anti-tank landmine. Exercises in that same year revealed that anti-tanks mines were minimally effective against stopping tank attacks. They also showed that it would take massive numbers of anti-tank mines and be placed in a mathematically defined manner in order to stop a tank attack.³⁴ Even with this, Great Britain did not mass-produce landmines until the outbreak of World War II. In its retreat across Europe, the British army failed to use anti-tank landmines to slow the German advance.

The United States had similar problems with mechanization and with landmine development. Economics and politics played a crucial role in the organization of the armed forces following World War I. The Americans did not believe they would be involved in another conflict similar to The Great War. They also believed that the next war would come across the

³² Vivian Rowe, *The Great Wall of France, The Triumph of the Maginot Line*, London, Putnam, 1959, 62.

³³ Mike Croll. *The History of Landmines*, 34. Mike Croll refers to Captain R.H. Dewing’s article “Anti-tank Mines in Mobile Warfare” from *Royal Engineers Journal*, March 1924, page 15.

³⁴ *ibid*, 35.

Pacific Ocean against Japan. A war with Japan would require a far different army than the one that fought on the European continent. The fatal blow against American innovative thought on mechanization was the National Defense Act of 1920. This act defined tanks as infantry weapons and armored cars as cavalry weapons.³⁵ Defined this way, it meant that tanks and armored cars were subordinate in thought and deed to the infantry and cavalry respectively. The effect of this measure in the act was to hinder provocative thought on the use of mechanization in future warfare. It meant that infantry remained the decisive arm in military thought.

There were attempts to modernize and mobilize the army. First, General Douglas MacArthur, chief of staff from 1930 to 1935, attempted to spread mechanization throughout the army. To overcome the restrictions of the National Defense Act of 1920, “combat cars” were bought, instead of “tanks”.³⁶ This allowed some limited experiments with mechanized forces. In 1935 General Malin Craig became the Army Chief of Staff and emphasized a smaller more mobile division. The result was the triangular division which consisted of echelons of threes (three platoons to a company; three companies to a battalion...) and pooled the heavy weapons at each echelon. This was the basic division structure that entered World War II. It was not until Germany invaded and conquered Poland in 1939 and France in 1940, that the Americans organized armor forces. Still missing from the pre World War II American army was any training, technology, or doctrine relating to landmine warfare.³⁷

Germany approached the interwar years in a different manner. Germany emerged World War I a defeated army and nation. The Allies imposed strict measures to prevent a repeat of The Great War. The Versailles Treaty theoretically prevented Germany from further aggression on the European Continent. Among other things, the treaty limited the German army to 100,000

³⁵ Larry Addington, *The Patterns of War Since the Eighteenth Century*, Bloomington, Indiana University Press, 1994, 180.

³⁶ Jonathan House, *Combat Studies Institute Research Survey No. 2, Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization*, Ft. Leavenworth, KS, U.S. Army Command and General Staff College, 1984, 76.

³⁷ Mike Croll, *The History of Landmines*, 36.

professional soldiers and denied the Germans tanks, poison gas, heavy artillery, air forces, a reserve, fortifications, and even a traditional German Staff.³⁸ These tenets in and of themselves would not be enough to prevent Germany from building the most powerful army in Europe.

The treaty had the opposite affect on the development of the German army and its use. By preventing the construction of fortifications, Germany was able to focus on mobile warfare. By the early 1920s Germany began organizing for war. This organization appeared to be a dis-organization, when in actuality it was a system of registering young men for possible future service.³⁹ By the mid 1920s German military leaders began training for mobile and mechanized warfare. As early as 1928, less than ten years after the signing of the Versailles Treaty, Germany organized and developed doctrine for mobile infantry divisions with towed artillery. By 1929, Major Heinze Gudarian formed the Panzer division⁴⁰ The Panzer division combined speed firepower, maneuverability, and shock. This organizational structure became the building block for World War II and the Blitzkrieg.

The Germans clearly understood the need for anti tank warfare in the development of mechanization. After all, they were the first to defend against a massed armor attack at the Battle of Cambrai in 1918. The Germans found out that tanks were very effective at high speeds because of their shock value. Leading with tanks at high speed also gained the element of surprise. To counter this Germany developed improved anti-tank landmines. Although on the offensive, the anti-tank mines could be critical to defeating an armored counterattack. By the attack on Poland, Germany had two sophisticated anti-tank landmines supported by one anti-personnel landmine. More important than the materiel, was the foresight about their use on the battlefield.⁴¹

³⁸ Larry Addington, *The Patterns of War Since the Eighteenth Century*, 173.

³⁹ James S. Corum, *The Roots of Blitzkrieg*, Lawrence, Kansas, The University Press of Kansas, 1992, 180.

⁴⁰ Ibid, 179.

⁴¹ Mike Croll, *The History of Landmines*, 38.

Anti-tank landmines in the offensive provided flank security against an armored counterattack. In the defense the Germans found that anti-tank mines were effective when laid in a mathematical pattern, much like the British found during their experimentations. The issue then became the relationship between the armored and light forces and which should lead in the attack. If the infantry lead, the element of surprise and shock would be lost because of the lack of speed. If the armored forces lead, they were vulnerable to anti-tank landmines. The compromise became that the engineers led. A small engineer force cleared the anti-tank mines and let the armored forces continue the attack. The disadvantage with this compromise was the anti-personnel landmines which were interspersed with the anti-tank mines. Anti-personnel landmines further delayed the armor force. To compound this, the Germans developed the first anti-handling device. These small devices were simply another fuse screwed to the bottom of an anti-tank landmine, which detonated once the landmine was moved. This slowed the engineers work even more since every landmine encountered was treated like an anti-personnel landmine. During the interwar years Germany fully embraced mechanization including landmine warfare.

World War II

World War II was the first instance of the massive use of landmines. After departing the European continent, and after the Battle of Dunkirk, the British began focusing on the defense of the island. They installed minefields on the beaches hoping that denying the beach to a German attack would gain the defensive forces time and space to react. British units were not adequately trained to employ massive minefields. As a result, poor laying and recording techniques caused a number of British casualties. In the course of the defense of Britain, the British employed over 350,000 landmines.⁴²

The British also found that landmines could shape land warfare on the African continent. Northern Africa was an ideal setting for large armored forces and likewise, landmines. The

⁴² Ibid, 53.

campaign was a series of offensives and counter offensives between the Allies and the Axis. The British attacked first and encountered numerous minefields. The British did not have clearance techniques and in return the attack was delayed. The overall effect of the minefields was that the Italians were able to delay long enough for Afrika Korps to reinforce and stall the British offense. This demonstrated the usefulness of landmines. It also revealed a shortcoming to the British that of countermine operations.⁴³

The British responded. First they withdrew and left a trail of their own landmines. This revealed their own shortfall in their quantity of landmines. They even used captured German and Italian anti-tank landmines to cover their withdrawal. They overcame this by opening factories in Egypt to construct anti-tank landmines. Local labor helped build thousands of landmines for use in the African theater. The other shortcoming was that they merely just laid landmines. They were not covered by direct fire and as a result the German tank crews could simply dismount and clear a path for themselves.⁴⁴

The German attack at El Alamein in July 1942 and the British's use of landmines proved decisive. By this time the British had employed hundreds of thousands of landmines in their defensive. The key aspect of their use was that it forced Rommel to attack in a manner not of his choosing. Although many of the minefields were not covered with fire, they caused German forces to disperse and attack piecemeal. This reveals again the usefulness of landmines. Given time to emplace them, they can cause the attacking army to become attrited, dispersed, and disrupted. The use of landmines, in this instance, overcame the speed and shock of the German armored forces.

Peter Senge defines a learning organization as one "that is continually expanding its capacity to create its future."⁴⁵ A learning organization changes its course based on its recent past.

⁴³ Anthony Farrar-Hockley, *The War in the Desert*, London, Faber and Faber, 1969, 91.

⁴⁴ Richard Collier, *The War in the Desert*, Alexandria, Virginia, Time Life Books, Inc, 1977, 84.

⁴⁵ Peter Senge, *The Fifth Discipline, The Art and Practice of the Learning Organization*, Currency Doubleday, New York, 1990, 14.

It improves itself based on its experiences. The British were a learning organization. Based on their experiences with landmines during their first attack, they established a mine school. At this school they taught minefield recording, breaching techniques, mine awareness, and the experimentation of new ideas. The lessons from this school were invaluable. First and foremost the school developed standardized breaching drills. Mine detectors became the tool of choice for locating buried landmines. Drills were taught that improved breaching by an order of three with their use.⁴⁶ The British formulated recording procedures after capturing a German engineer and his minefield documents. Greater than this was the mine awareness that was taught. Counter landmine warfare became a combined arms responsibility.

The school also experimented with technological solutions to breaching. The school developed the “pilot vehicle”, which essentially was a sandbagged vehicle used to find the leading edge of a minefield. It also developed the flail tank. This was the first mechanical breaching device. The tank had a series of spinning chains mounted on a beam on the front. The concept was that the chains would beat the ground and the landmines and cause them to prematurely detonate, having no effect on the tank. The drawback of the flail tank was that it greatly reduced its service life and it was considerably slower than a tank without the device.

The British lessons occurred over time during the war. In contrast, German landmine warfare had been incorporated with their mechanization. After the German advance to the Atlantic, they fought a defensive war against the Allies. In doing so, the Germans employed over thirteen and a half million anti-tank landmines throughout the continents of Europe and Africa.⁴⁷ The Germans mastered landmine warfare. Evidence of this includes the recycling of mines from one front to another. This occurred in 1944 when the Germans defending the island of Guernsey recovered over six thousand landmines for use in Europe. This demonstrates the precision by which the landmines were originally laid. German landmine doctrine required precise recording

⁴⁶ Ibid, 60

⁴⁷ Ibid, 41.

when emplacing minefields. The other aspect of this is the maintenance of those records. Terrain changes over time and fields strewn with landmines are no exception.

Another aspect of German landmine superiority is the amount of technological developments during the war. Landmine warfare requires countermeasures. Countermeasures include: increased armor thickness, detection devices, and clearance techniques. In Germany's case, they overcame each Allied countermeasure with the design of new landmine. The countermeasure for thick armor was more explosives. To prevent enemy clearance of anti-tank mines, the Germans incorporated anti-personnel landmines. They continued to improve these also by developing anti-handling devices. To defeat detection the German designers began using non metallic casings and then in early 1944 German designers produced the TMi 4531 in response to a comment that Adolf Hitler made in December 1943.

The other day I was thinking if it wouldn't be possible to infest the minefields with other mines, as well as anti-personnel mines, to such an extent that even our own men can't pass these minefields, because they explode no matter who steps on them. These mines should be cased in plastic instead of metal.⁴⁸

This was the first minimum metal anti-tank landmine. Its case was made of plastic and its mechanical components were made of wood, glass, or bakelite. This landmine was not detectable by any of the allies until after the war.

Landmines also had a big impact on the Soviet's defense of their country. The number of landmines the Soviets used varies from two hundred million to sixty five million, depending on the source consulted.⁴⁹ This disparity may appear large, but even two hundred million landmines is a significant number of landmines across the Soviet's front. The Soviets copied many of the German mines they encountered as opposed to spending time and research on developing their own. They did, however, develop more advanced landmines which used delay and remotely

⁴⁸ Felix Gilbert, *Hitler Directs His War: the Secret Records of His Daily Military Conferences*, New York, Oxford University Press, 1950, 82.

⁴⁹ C.E.E. Sloan, *Mine Warfare on Land*. Washington D.C.: Brassey's Defence Publishers, 1986, 3.

controlled fuses. The Soviets also used landmines in the offensive. Using guerilla tactics, Soviet partisans interdicted German supply lines and rear areas with landmines.

Soviet minefields played a critical role in the war's largest tank on tank battle. The Battle of Kursk in the summer of 1943 proved fruitless for Hitler and the Germans. In this battle the Soviets sowed half a million anti-tank landmines, averaging 3,200 landmines per kilometer of frontage.⁵⁰ Soviet tactics included reseeding minefields. This complicated the German attack. Once lead elements breached the minefield, Russian Infantrymen would seal the breach with more landmines, causing both numerous breaches and the isolation of lead elements. The minefields around Kursk and Allied advances in Italy caused Hitler to discontinue the offensive in Russia. Anti-tank landmines were decisive at the Battle of Kursk, which ended up being a turning point on the Eastern Front of World War II.

World War II displayed the importance of landmine warfare. Mechanization and mobile warfare created speed and shock and often times overwhelmed immobile forces. The counter to this was the improved landmine. All armies became landmine aware and either developed techniques to counter landmines or became casualties because of them. Anti-tank landmines were responsible for twenty percent of tank losses during World War II.⁵¹ Landmines proved useful as an economy of force measure. The Italians used mines to delay in Africa. The British and the Soviets used landmines to effectively help attrit German advances in Africa and at the battle of Kursk. The damaging affects, along with the psychological impact of the unknown, helped forge landmines as a vital part of ground warfare. Landmines clearly made a difference in the conduct of mechanized warfare during World War II.

The Korean War

The rugged mountainous terrain in Korea provided an excellent proving ground for the use of landmines. Anti-tank mines canalized armored formations in the twisted mountain passes.

⁵⁰ Ivan Parotkin, *The Battle of Kursk*, Moscow, Progress Publishers, 1974, 220.

⁵¹ C.E.C. Sloan, *Mine Warfare on Land*, 2.

Landmines were effective for ambushes. Once the lead vehicle hit a landmine, anti-tank fire could destroy the trail vehicle. This would immobilize the vehicles in between and leave them as sitting targets. Extensive use of anti-personnel mines by defending infantry helped disrupt onrushing forces.

Still landmine doctrine and training shortcomings from the United Nation forces plagued the theater. Unmarked, unrecorded, minefields continued to cause friendly United Nation casualties. In one instance, an Australian unit suffered over fifty casualties when it found itself in a Canadian protective minefield.⁵²

The North Koreans relied on Soviet and Chinese style mines. Many of them were made of wood which inhibited their detection by mine detectors. The American non-metallic mine detector, the AN/PRS1, performed miserably because of false alarms. It was a crude sonar that detected soil density differentials. The problem was it detected rocks and dirt clods. Roads, where landmines were typical sowed, are incidentally made of rocks and dirt clods.

The Korean War solidified the lessons of World War II regarding landmines. Landmines aided the defender. They helped disrupt enemy attacks and aided in the economy of forces. When tied to the existing terrain, minefields shaped the battlefield, causing the attacking force to engage where the defender wanted. Landmines became more and more part of land warfare. Soldiers from all sides learned the affects of landmines. Anti-personnel landmine warfare paved the way for next American-Asian conflict.

The biggest contribution to the evolution of landmines during the Korean War was the importance and reliance on anti-personnel landmines in restrictive terrain.⁵³ Where tanks cannot maneuver, light infantry can. Following the war the United States developed two new anti-personnel landmines, the M14 “toe popper” and the M18 Claymore. These landmines arguably

⁵² Robert J. O’Neil, *Australia in the Korean War, 1950-1953*, Australian Government Publishing Service, 1985, 253.

⁵³ Thomas E. Griess, *The Arab-Israeli Wars, The Chinese Civil War and the Korean War, Military History Series*, Wayne, New Jersey, Avery Publishing Group INC., 1987, 115.

play an integral part in the Korean defense today. In 1965, the United States laid a massive minefield on the 38th parallel in defense of Southern Korea. These landmines remain emplaced in 2002.

Following the Korean experience, the United States continued to research and develop additional landmines fearing the Soviet Union and the spread of communism. Fearing an attack in Europe, the United States developed the M21 full width, anti-tank landmine. The M21 had a tilt rod that when tilted beyond a certain number of degrees would detonate the fuse, thereby exploding the main charge. This charge would propel a projectile through the skin of the tank and either bounce around on the inside or pass through the tank creating an over pressure. Either way the occupants in the tank would be disabled. The tiltrod ensures that this mine would disable the crew inside the tank whether the vehicle ran it directly over or not. The importance of this mine was that it also reduced the number of mines required because of its full track width characteristic. This and the aforementioned anti-personnel landmines continue to part of the United States' conventional landmine inventory.

The Vietnam War

The Vietnam War pitted a different type of enemy against the United States. Although the conflict was very similar in context to the Korean War, that of a fight against communism, the experiences were far different. The North Vietnamese executed a conventional type war, while the Viet Cong aided them by fighting a guerrilla type war. The guerrilla tactics caused the Americans the greatest challenge.

The object of guerrilla warfare is to use a much smaller force to disrupt a larger force. One of its principles is to protect the small mobile force by organizing in small bands, striking deep and quickly, then moving.⁵⁴ The Confederate and Union Armies used guerrilla tactics during the American Civil War to attack logistical lines in a similar manner that Napoleon did. The

⁵⁴ Mao Tse-Tung, *On Guerrilla Warfare*, New York, Frederick A. Praeger, Inc, 1961, 42.

Soviets used similar tactics with landmines on the Eastern Front to interdict German supply routes. Guerrilla warfare aims to disrupt and wrestle the initiative away from the enemy.

The Viet Cong mastered these techniques to the point that they were able to paralyze the Americans. Key to this paralysis was their use of landmines. Like the Soviets did in World War II, the Viet Cong routinely interdicted roads and footpaths making untenable. The Viet Cong mined the routes and then targeted the convoys trapped in the minefield. The constrictive nature of the terrain made this a very effective tactic by which a much smaller mobile force could halt a much larger force.⁵⁵

Route clearance techniques, some still used today, were born during this conflict. The Americans would clear a route, then that night the Viet Cong would re-mine it. These tactics created an environment where the convoys would not move on until the routes were mine free. Engineers conducted route clearance daily on the same routes and daily they would find landmines on it.⁵⁶ American clearance techniques included rollers, plows, explosive detecting dogs, electronic detectors, and prods. Plows were slow and made the road impassable. Rollers also were too slow and limited in use. Dogs were unreliable and often detonated anti-personnel mines. Metal fragments thrown onto the roads even defeated mine detectors. Since the electronic mine detectors detected metal, this proved these detectors useless. The most reliable method of detection became the hand prod. This also was the slowest, which made the engineers more vulnerable. Landmines ended up costing the Americans seventy percent of armor vehicle losses throughout the war.⁵⁷

Defensively, the Viet Cong began using anti-helicopter landmines in response to American air mobile tactics. The landmine detonated due to the down pressure caused by the

⁵⁵ Richard A. Hunt and Richard H. Shultz, Jr. *Lessons from an Unconventional War, Reassuring U.S. Strategies for Future Conflicts*, New York, Pergamon Press, 1982, 24.

⁵⁶ Conversation with Mr. Uli, a Vietnam War veteran, who conducted these route clearance missions in Vietnam for nearly one year, Engineer Officer Basic Course, Ft Belvoir, Virginia, August 1989.

⁵⁷ C.E.E. Sloan, *Mine Warfare on Land*, 5.

rotor blades. The Americans countered these mines with fuel-air explosives, which were capable of creating a landing zone in thick jungle. The Americans also attempted to counter with their own offensive landmine use. They developed air delivered fragmentation landmines. These mines were ineffective and often times captured by the enemy and used against the Americans later. The air delivered landmines also made an area unsafe for a number of days which hampered offensive action by the Americans.

The Viet Cong's method of offensive mining changed the paradigm for the use of landmines. The Viet Cong used mines offensively to inflict casualties in unit's rear areas and to seize the initiative. They made the Americans expend resources both in soldiers and time: soldiers to clear routes, and time in developing countermeasures. The Vietnam War showed that mines were also offensive weapons when used to interdict roads and trails. Landmines countered superior technology and manpower.

Post Vietnam

The wars and conflicts since Vietnam have seen varying degrees on the usefulness of landmines. Landmines had the most impact during the Israeli-Arab War of 1973. Egypt surprisingly quickly penetrated through Israeli defenses. Once through they met superior Israeli armor forces which pushed the Arab army back into minefield they had breached. This is representative of the hammer and anvil technique in reducing an enemy. United States Army Field Manual 3-90 describes this technique as a type of encirclement which uses a stationary blocking force (the anvil) while an encircling unit forces the enemy into the anvil then through combined action destroys the enemy.⁵⁸ In the Arab-Israeli case, the anvil was the original minefields that the Egyptians breached. The Israeli armored forces (the hammer) encircled then destroyed the Egyptian force.⁵⁹

⁵⁸ FM 3-90, *Tactics*. Washington DC: Department of the Army, 2001, D-6.

⁵⁹ Chaim Herzog, *The Arab-Israeli Wars: War and Peace in the Middle East*, New York, Random House, 1982, 273.

This engagement ended up being a spring board for innovation and an evaluation of tactical doctrine. Nations in the North Atlantic Treaty Organization (NATO) saw the Yom Kippur war as a model for the Warsaw Pact versus NATO conflict that could occur. The American answer was to develop scatterable landmines. The concept was to block an enemy's retreat with scatterable mines before the enemy could escape. The United States developed scatterable mines delivered by fixed and rotary wing aircraft and artillery systems. This new family of scatterable landmines became known as FASCAM. The luxury of FASCAM is its ability to react to a changing tactical situation. This reduces logistics and effort in emplacing needless minefields. FASCAM also increases the offensive use of landmines.

The Americans first employed FASCAM in the Gulf War. Iraq invaded and conquered Kuwait in August 1991 and then built a formidable defense. To protect their new territory the Iraqis employed two million landmines replicating the defense of El Alemain from World War II. The defense included a fire/tank ditch then 150 – 200 meters of mines in the first belt, and then the system repeated itself. Platoon and company size forces covered the first belt, while brigade size counterattack forces covered the second belt.⁶⁰ After a significant air campaign that demoralized the Iraqi defense, the American led coalition easily breached this defense. To prevent Iraqi withdrawal the Americans employed 1,314 Gator munitions.⁶¹ Field artillery systems (ADAM and RAAM) were also carried into the theater, but were not employed. The biggest lesson learned from the use of scatterable mines was their reliability. All of the scatterable systems used in the Persian Gulf had self-destruct capability and overall their performance was dismal, accumulating a ten percent failure rate.

Conclusion

Landmines began as simple traps designed to thwart an attacker. The advent of gun powder changed the complexion of warfare and its use in landmines. Early traps adapted existing

⁶⁰ *Conduct of the Persian Gulf War*, Washington, D.C., Department of Defense, 1992, 251.

⁶¹ Mike Croll, *The History of Landmines*, 121.

fragmentation artillery munitions that could be command detonated. In this form, landmines were purely used in the defense. In the American Civil War, landmines provided for an economy of force for the Confederates and created a mental uneasiness for advancing Union armies. In World War I landmines stopped allied tanks, minimizing their shock effect. The interwar years saw a move to mechanize the armies. Mechanization provided firepower with maneuver coupled with shock. Germany initially used landmines to protect their flanks from counter attack. Both the Allies and the Axis quickly saw that landmines could greatly benefit the defender. As a result over one hundred million landmines were used throughout the war to delay, disrupt, and destroy opposing forces. Landmines emerged from World War II as an integral part of the defense.

Vietnam showed that anti-tank landmines were also useful in the offense, accounting for seventy percent of the armored vehicle losses. The Yom Kippur war echoed this when initially the Israeli defensive minefields failed and then they quickly turned into an offensive weapon as a backstop for an encirclement.

In the last large scale conflict, the Persian Gulf War, landmines lost some of their usefulness. The Iraqi minefields were easily breached due to the extreme lack of over watching fires. The American's use of landmines came in the form of self-destructing scatterable mines that did not perform as expected. Since the end of the war, seventy coalition soldiers and 1,700 civilians died due to landmines that were suppose to have self-destructed.⁶²

This short review of the evolution of landmines shows how and why landmines became an integral part of land warfare and how technology changed landmines functionality. In the defense, landmines shape the battlefield. They break up attacking enemy formations and delay their advance. Minefields can canalize the attacker, forcing him into places he does not want to be. This allows the defender to gain the initiative by engaging where and when he wants. In the offense landmines can provide the anvil for the hammer to crush the enemy upon and provide

⁶² Ibid, 122.

flank protection. Landmines can also help interdict logistical lines. Through their evolution, landmines have become an effective force enabler in the conduct of land warfare, but in recent times their usefulness has diminished. Situational and scatterable landmines have increased importance in the changing environment. Recent conflicts with western interventions saw diminished use of conventional landmines (Desert Storm, Somalia, Bosnia, and Kosovo, for example). This points for the need to shape the battlefield without conventional landmines.

CHAPTER TWO SUPPORT FOR THE BAN

Landmines are an indiscriminate weapon of land warfare. Anyone can actuate the explosive device, thereby becoming the victim. While designed for use against enemy soldiers and equipment, both friendly forces and civilians on the battlefield can just as easily become victims of the landmine's explosiveness. This notion of the indiscriminate use of force is the subject of this next section. Conventional landmines should be internationally banned based on the discussion of the law of land warfare, current conventions on conventional weapons, and the Ottawa process.

The Law of War

The U.S Army abides by the law of land warfare as outlined by FM 27-10, *The Law of Land Warfare*, (July 1956 with change 1 dated July 1985). This field manual lists and outlines some of the international treaties and conventions applicable to how nations conduct warfare. The last update to this manual occurred in 1985. The major conventions that the United States is party to include the Hague convention number III, IV, V, IX, and X written 18 October 1907; the Geneva conventions of 27 July 1929; and the Geneva Convention relative to the Protection of Civilians in time of war dated 12 August 1949.⁶³

⁶³ Full text of the Geneva and Hague Conventions relative to the Protection of Civilian dated 12 August 1949 and 18 October 1907 are found at <http://www.asociety.com/geneva1.html> and <http://www.icrc.org/ihl.nsf> respectively.

These conventions discuss the conduct of land warfare. They attempt to legalize different aspects of warfare on the basis of international law. In respect to landmines, many of the articles could apply. Part (e), article 23 of Hague Convention No. IV of 18 October 1907, Respecting the Laws and Customs of War on Land, says “It is especially forbidden to employ arms, projectiles, or material calculated to cause unnecessary suffering.” One can argue that the use of landmines, especially anti-personnel and anti-tank with anti-handling devices, falls under this article. Anti personnel landmines specifically aim at maiming their victim. Many nations specifically designed landmines to maim in order to have a greater numerical impact on the battlefield. This greater numerical impact manifested itself by taxing the medical system and the requirement for immediate buddy assisted aid. One landmine could injure one soldier and require two others for evacuation. Anti-tank landmines with anti-handling devices create the same effect.

The issue becomes what exactly is unnecessary suffering. FM 27-10 does not define it nor does the Hague Convention IV dated 1907. It does interpret the above article and specifically excludes landmines from causing unnecessary suffering.⁶⁴ FM 27-10 equates unnecessary suffering to the suffering caused by exploding bullets, barbed headed lances, or glass filled projectiles. Using this as a basis to compare weapons’ effects, many modern weapon systems create similar injuries and should fall within this class. Exploding bullets create shrapnel in order to increase the degree of injury incurred by them. Shrapnel rips through flesh causing increased loss of blood and risk of striking critical organs including arteries. Landmines accomplish the same effect. The explosive charge sends shrapnel flying in all directions increasing the risk to whoever caused it to detonate. Landmines clearly create similar injuries when compared to those outlined in FM 27-10.

Another aspect of the law of land warfare deals with warfare and its impact on civilians. The conventions treat civilians as protected persons. The Geneva Convention defines protected

⁶⁴ FM 27-10, *The Law of Land Warfare*, Washington D.C., Department of the Army, 1976, 18.

persons as “those who, at a given moment and in any manner whatsoever, find themselves, in case of a conflict or occupation, in the hands of a party to the conflict or occupying power of which they are not nationals.”⁶⁵ Protected persons are non-combatants. As such, members of the armed forces may not target them in the course of prosecuting warfare. Article 27 of the Geneva Convention goes on to say that “protected persons... shall be protected especially against all acts of violence or threats thereof.” One could argue that the use of landmines directly violates this article of the Geneva Convention chiefly because it fails to delineate between protected persons and combatants. Victim operated landmines main or kill the victim, whether they are combatants or “protected persons” as defined by the Geneva Convention.

The battlefield of previous wars and undoubtedly of future wars contains civilians. The United States Army trains leaders to address civilians on the battlefield at all of the training centers. Civilians and combatants share the modern battlefield. Landmines do not discriminate between friend or foe, nor do they distinguish between combatants and non-combatants. Evidence shows that combatant nations rarely recover landmines in a timely manner.⁶⁶ Some nations fail to recover them at all, which is the reason for the current humanitarian crisis. The use of landmines fails to provide protection against all acts of violence or threat of violence to protected persons. Actually, landmine use creates the threat of violence to protected persons. Landmines restrict movement of goods and supplies on established routes, exacerbating the threat of violence.

Nations typically interpret the law of land warfare to meet their national strategy. Modern warfare necessitates a re-evaluation of the applicability of the existing conventions aimed at mitigating the violence and savagery of war. The purpose of the law of war outlined in FM 27-10 is chiefly to protect combatants and non-combatants from unnecessary suffering.⁶⁷ The authors of the Ottawa Convention saw that the use of anti-personnel landmines in warfare contradicted the

⁶⁵ Ibid, 98.

⁶⁶ The evidence supporting this comment lies in the reported one hundred million landmines still scattered throughout the world see note 2.

⁶⁷ Ibid, 3.

articles prescribed in the Geneva and Hague conventions. As a result, 264 nations have either ratified or signed a treaty that prohibits the use, stockpiling, production and transfer of anti-personnel mines and on their destruction. This was the first step in re-evaluating current law of war and the conventions thereof. Modern landmines equipped with integral anti-handling devices equally contradict the articles of the Geneva and Hague conventions and should be included in the language of the ban. The inclusion of anti-handling devices and of unexploded ordnance could be the next step in re-evaluating the law of war and their conventions.

Certain Conventional Weapons Convention

The United Nations General Assembly periodically establishes conventions to prohibit or restrict certain aspects of the instruments of warfare. These have come to be known as Certain Conventional Weapons Conventions (CCW). The CCW established in 1980 prohibits the use of non detectable fragments and incendiary weapons against civilians, and prohibited the indiscriminate use of booby traps and landmines and greatly restricts the use of remotely deliverable landmines.⁶⁸ This convention and its protocols is the first formal ban on any weapons since the 1899 Hague Convention, which banned dum dum bullets.⁶⁹ Support for this convention was not widespread, and non governmental organizations including the International Crescent Red Cross (ICRC), the Religious Society of Friends, the Coalition for Peace and Reconciliation, Handicap International, and Mines Advisory Group began campaigning for additional conventions.⁷⁰

⁶⁸ Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which may be Deemed to be Excessively Injurious or to have Indiscriminate Effects and Protocols, 1980. Protocol II (Protocol on Prohibitions or Restrictions on the Use of Mines, Booby Traps, and other Devices) to this convention relates to the use of landmines. It also defines “mine” as any munition placed under, on or near the ground or other surface area and designed to be detonated or exploded by the presence, proximity, or contact of a person or vehicle.

⁶⁹ Don Hubert, *The Landmine Ban: A Case Study in Humanitarian Advocacy*, Providence, Rhode Island, The Thomas J. Watson Jr. Institute for International Studies, 2000, 5.

⁷⁰ Ibid, xi.

The Convention amended Protocol II (Protocol on Prohibitions or Restrictions on the Use of Mines, Booby Traps, and other Devices) in 1996. The amended protocol further placed restrictions on the use of landmines. It extended the restrictions to internal conflicts, established reliability standards for remotely delivered landmines, and prohibited non-detectable fragments in anti-personnel landmines. The United States is a signatory to both the 1980 CCW and the amended Protocol II.

These conventions and proceedings have set precedents for the international community. Non-governmental organizations (NGO) banded together to further their cause of banning landmines. On the basis of international law as described in The Hague and Geneva Conventions and the CCW protocols, international NGOs and sovereign nations met in Ottawa Canada in 1997 to put an end to the humanitarian crisis plaguing the world. The end result is the Ottawa Treaty.

Arguments for the Ottawa Convention

The chief argument for supporting the Ottawa Convention is that landmines are a direct contravention of the Geneva Convention. This is the basic argument as above, that landmines victimize innocent civilians both during and after the conduct of a conflict.

The other major argument is that the use of landmines creates a humanitarian crisis that greatly outweighs their military necessity. This argument coincides with the above but also addresses the longevity that landmines possess. In 1960 in Mobile, Alabama an excavation uncovered five Rain's fused landmines still intact and still very dangerous.⁷¹ This landmine was emplaced during the Civil War in 1863. This is just one example of the longevity of landmines. Appendix C illustrates another humanitarian risk. This chart shows that in the First Brigade, First Armor Division's sector in Bosnia Peace Keeping forces encountered twelve mine strikes, half of which were anti-tank landmine strikes, during a six month rotation. This report comes from the 1 BCT, 1st Armor Division official After Action Review. Also the major findings from the 2001

⁷¹ Milton F. Perry, *Infernal Machine: the Story of Confederate submarine and Mine Warfare*, Baton Rouge, LA, Louisiana State University Press, 1965, 206.

Landmine Monitor estimate that there were 15,000 to 20,000 new landmine casualties in 2000.⁷²

These examples indicate that there exists a considerable humanitarian crisis and risk to peace keeping forces in war ravished nations.

In terms of the humanitarian crisis three factors favor a total ban. These include post conflict casualties, post war economic debilitation, and post war de-mining costs. According to the Vietnam Veterans of America Foundation (VVAf) as of 1995, one hundred million landmines lay buried in sixty-four countries.⁷³ These landmines, both anti-personnel and anti-tank, continue to take innocent, non-combatant lives and cost the inhabitants of the infected nations millions of dollars in medical and rehabilitation expenses. The VVAf estimates this cost to exceed \$750 million.

This crisis continues to grow as lost productivity in mine infested fields creates a spiraling effect in under developed nations. The value attributed to lost productivity is purely speculative based on markets and future values of goods, but the cost is real. For example the Afghan economy during the nineties lost more than \$26 million per year due to anti-vehicle landmines.⁷⁴ This is just one example of the lasting effects of landmines to economies.

De-mining efforts also continue, but they are slow and costly. Kuwait spent approximately \$700,000,000 to remove the landmines left by the Iraqis after the Gulf War, while reunified Germany spent \$20,000 per mine to remove the mines emplaced by the East German regime to deter defectors.⁷⁵ The United States, among other nations, continues to provide support

⁷² "Major Findings", *The Landmine Monitor Report 2001*, ICBL, <http://www.icbl.org/lm/2001/finding/> accessed 31 January 2002, 1.

⁷³ Shawn Roberts and Jody Williams, *After the Guns Fall Silent: The Enduring Legacy of Landmines*, page 3.

⁷⁴ Thomas Kuchenmeister, "Alternative anti-personnel mines: the Next Generations", London, Landmine Action, <http://landmineaction.org>, accessed 14 March 2002, 7

⁷⁵ Richard Anderson, Christopher A. Lawrence, Dave Bongard, John Kettelle, and Nicholas Krawciw, "The Dupuy Institute's Research Study: Military Consequences of Landmine Restrictions, VVAf Monograph Series Vol 1, Number 2", Maclean, Virginia, Vietnam Veterans of America Foundation, 1996, 13.

for worldwide de-mining operations. In 2000 nations combined to contribute \$224 million to de-mining efforts.⁷⁶

The humanitarian crisis caused by lingering landmines should be enough reason to support a ban on all conventional landmines. The effects of war seem harsh enough on the indigenous population. The adverse conditions that landmines create continue for decades after wars have ended. Warring parties, in general, neglect in restoring war torn nations unless the winning party is active in the restoration. One example of this restoration process is the war of occupation and the Marshall Plan following World War II. Following hostilities the Allies began an enduring commitment to rebuilding a ravished Europe. Part of this commitment included the removal of landmines. Europe embraced peacetime mine clearance as a chance to return to normalcy. At the signing of the peace accords, Europe had nearly one hundred million landmines scattered throughout its land. A coalition of partners removed ninety percent of these within two years.⁷⁷ Allied partners and German prisoners of war helped return Europe to mine free nations. This success story is an anomaly evidenced by the over one hundred million landmines that remain throughout the world.

Summary

The laws of war, Hague and Geneva Conventions, and the Certain Conventional Weapons Convention provide reasons to support the ban on landmines. Landmines do not discriminate between combatants and non-combatants and they create unnecessary suffering. The use of landmines, then, directly violates Article 27 of the Geneva Convention, which states, “protected persons...shall be protected especially against all acts of violence or threats thereof.” The use of landmines fails to achieve this standard.

⁷⁶ International Campaign to Ban Landmines, *The Landmine Monitor: Toward a Mine-Free World*, (2001) [WWW document]. URL www.icbl.org/lm accessed 10 January, 2002.

⁷⁷ Mike Croll, *The History of Landmines*, 94.

The evolution of the humanitarian crisis from their use likewise supports a complete ban on the use of conventional landmines. The costs associated with landmine use is mind numbing. Medical and rehabilitation costs alone exceed \$750 million.⁷⁸ The effects of wars long past continue to plague ravished nations. With current de-mining efforts, the estimate by the VVAF to remove the existing landmines exceeds forty years.⁷⁹ Based on this, the evidence supports a total ban on the use of conventional landmines, both anti-personnel and anti-tank.

CHAPTER THREE

THE MODERN BATTLESPACE ENVIRONMENT

The section describes how the Americans, British, Canadian, and conduct modern warfare. The review of current doctrine shows that landmines provide little value added to the way these armies intend to conduct warfare. Also of significance is that Great Britain and Canada are signatories to the Ottawa Treaty. This impacts the way they will conduct future warfare and how American forces conduct warfare in weapons restricted conflicts.

How the American Army Does It

FM 3-0 is the United States Army's capstone doctrine document. It describes the Army's role in land warfare and then provides an overarching doctrinal direction for the conduct of full spectrum operations.⁸⁰ The fundamental theme in this doctrinal manual is that the Army is the decisive component of land warfare in joint and multinational operations. The United States Army has a charter with the American people to organize, train, equip, and then fight to win the nation's wars and achieve other national objectives. FM 3-0 is the foundation on which winning the nation's war is built. This doctrinal publication is the beginning for the development for the

⁷⁸ Shawn Roberts and Jody Williams, *After the Guns Fall Silent: The Enduring Legacy of Landmines*, page 3.

⁷⁹ *New Internationalist*, <http://www.newint.org>, accessed 31 January, 2002.

⁸⁰ FM 3-0, *Operations*, Washington, DC, Department of the Army, 2001, vii.

tactics, techniques, and procedures for accomplishing the charter between the American people and its Army.

One of the Army's mission essential tasks is to dominate land operations. FM 3-0 describes this task as the Army's ability to "seize the enemy's territory and its resources, destroy his armed forces, and eliminate his means of controlling his population"⁸¹ The Army accomplishes this task through offensive, defensive, stability and support operations. FM 3-0 declares that the offense is the decisive form of war and that the Army defends only long enough to gain sufficient strength to go back on the offense.

This forms the basis for the conduct of army operations. Land operations tend to follow an air campaign that shapes the battlefield for the ground forces. This was the case in Desert Shield/Desert Storm, Kosovo (ground campaign never conducted), and the ongoing actions in Afghanistan against the Taliban and Al Qaida terrorist network in 2002. Once airpower and ground controllers appropriately shape the battlefield, the ground campaign begins on the offensive. Should the ground campaign stall, an operational pause is taken to gain sufficient power and strength to continue the offensive. This operational pause may transition into a defense. In this case defensive operations occur when commanders wish to hold terrain, gain time, erode enemy's resources, or preoccupy the enemy to allow other offensive operations.⁸²

One of the characteristics of the successful defense is preparation. Preparation uses the allowable time to improve the existing battlefield through the combination of natural and man-made obstacles. This also incorporates the integration of fires, both direct and indirect. The strength of any obstacle comes from its ability to be observed and targeted. This leads to another characteristic of the defense: the massing of effects. According to doctrine, defenders mass effects of overwhelming combat power through the integration of the battlefield operating

⁸¹ Ibid, 1-6.

⁸² Ibid, 8-1.

systems at a time and place of their choosing.⁸³ FM 3-90, *Tactics*, further discusses defensive planning considerations. These planning considerations enhance the need for preparation. Preparation requires planning. One of the planning considerations is mobility/countermobility/survivability. The use of landmines falls directly into this defensive planning consideration. Analyzing the terrain, integrating the intelligence products of probable enemy course of action, and the massing of effects have synergistic effects when coupled with the shaping capabilities of landmines. Commanders should plan for the use of obstacles not only for the current fight, but also the future operation, so as to not hinder maneuver.⁸⁴

FM 90-7, *Combined Arms Obstacle Integrations*, describes the integration of landmines into Army operations. It describes obstacles as any obstruction designed or employed to disrupt, turn, fix, and block movement of attacking enemy formations.⁸⁵ Where existing obstacles such as terrain features and man-made structures do not exist, engineer forces create obstacles. Landmines have become an integral part of this function in the creation of the three types of tactical obstacles: directed, situational, and reserve. Directed obstacles are those planned, prepared, and executed during the preparation of the battlefield. These are the most common type of obstacle in a prepared defense. Situational obstacles are planned and possibly prepared, but executed only when the situation meets a set of criterion.⁸⁶ They provide the commander flexibility and are more responsive to a changing environment. Reserve obstacles are on-order obstacles. The commander establishes reserve obstacle groups in order to maintain initiative when the situation dictates. Examples of reserve obstacles are those that close lanes in prepared minefields, or an obstacle executed when a unit delays. Scatterable landmine systems are typically used in the execution of reserve obstacles.

⁸³ Ibid, 8-3.

⁸⁴ FM 3-90, , *Tactics*, Washington, DC, Department of the Army, 2001,8-24.

⁸⁵ FM 90-7, *Combined Arms Obstacle Integration*, Draft, Washington, DC, Department of the Army, 1998, 1-1.

⁸⁶ Ibid, 2-2.

A key component of an effective obstacle is its integration into the maneuver and fire plans. In order for minefields to accomplish their purpose, they must be observed and targeted by direct and indirect fires. Enemy forces easily breach minefields that do not adhere to this principle. A good example of this is Rommel's attack in the North African campaign against the British. The British forces withdrew and threw landmines haphazardly behind them. Since these landmines were not covered by fire, German tank crewmen could get out of their tanks and move the landmines out of their path.⁸⁷ Additionally units routinely learn this lesson at the National Training Center (NTC). As indicated by NTC Final After Action Reports, a continual trend is that units do not integrate direct and indirect fires with obstacles.⁸⁸ Minefields are a force enabler and have a greater effect when incorporated into close combat where they can be integrated with maneuver and fire plans.

The impact of technology is having significant impacts in shaping close combat. Improved technology allows the Army to see more sooner, which allows commanders to better exercise battle command. Seeing more sooner combined with improved indirect fire support systems and precision guided munitions allows the commander to shape the enemy force long before it enters into close combat with friendly forces.⁸⁹ Having this clearer picture of the enemy allows the commander to counterattack the enemy and to seize the initiative. Conventional directed minefields begin to lose their usefulness in this case for a number of reasons. First indirect and deep fires shape the enemy formations prior to them entering the close fight. Secondly, friendly minefields can slow down and disrupt friendly counter-attacking forces, thereby reducing the commander's ability to seize the initiative.

⁸⁷ Anthony Farrar-Hockley, *The War in the Desert*, London, Faber and Faber, 1969, 91.

⁸⁸ CTC Bulletin 98-14 Trend #2, http://call.army.mil/products/ctc_bull/98-14.htm accessed 26 March 2002 and CTC Bulletin 99-10 Trend # 11, http://call.army.mil/products/ctc_bull/99-10.htm accessed 26 March 2002.

⁸⁹ FM 3-0, , *Operations*, 8-18.

The United States Army fights to win its nations wars through decisive operations. FM 3-0 states that the offense is the decisive form of war. Offensive mine warfare is limited in its effects against the enemy and difficult to integrate into maneuver plans. Often times, friendly landmines end up slowing friendly attacks by impeding the movement of follow on forces and creating friendly losses by failure to communicate. This reduces initiative, which contradicts the tone of current Army doctrine.

Mobility, countermobility, and survivability is one of the battlefield operating systems, which commander conduct operations within. A key aspect of countermobility operations is the creation of obstacles with the use of landmines. Modern battlefields contain higher levels of intelligence through the use of increased technological capabilities. Increased intelligence helps the U.S. Army maintain the initiative and Army doctrine reflects this by stressing that the offensive is the decisive form of warfare. The role of conventional landmines thereby becomes less relevant on the modern battlefield for the American ground force.

How the British Army Does It

One of the United State's closest allies is Great Britain. With that in mind, it is important to understand how their Army intends to conduct land warfare. It is also important to understand that Great Britain is a signatory to the Ottawa Treaty and under its articles they intend to conduct land warfare without anti-personnel landmines. This impacts the United States in that during a conflict in which the United States and Great Britain are allied, the United States could be restricted in the weapons it uses. How does Great Britain then intend to execute land warfare without anti-personnel landmines?

Army Doctrine Publication Volume 1, *Operations*, sets the approach to how British forces will fight future conflicts and wars. It interprets *British Military Doctrine*'s security setting into understandable military doctrine for commanders and planners to execute warfare. ADP-1 is

the link between the strategic and tactical levels of warfare. It describes how to fight campaigns and operations within the future security environment.

Fundamental to Great Britain's military defense is the understanding of coalitions. Except for purely national purposes, the British forces are most likely to be part of a coalition or alliance.⁹⁰ The British also recognize that limitations of means are characteristic of future warfare. This emanates from limited warfare with limited strategic objectives. British doctrine acknowledges that political and diplomatic factors may limit the means by which military forces execute warfare. At the writing of ADP-1 the Ottawa treaty had not been proposed nor ratified. Since then, Great Britain has signed this treaty, echoing the characteristic of a limitation of ends to execute warfare.

Much like American doctrine, the British view the offense as the decisive form of warfare. Additionally, maintaining the initiative through the use of operational pauses and cleverly crafting lines of operations, the British commander continually anticipates future operations.⁹¹ This too parallels American doctrinal principles. The British view on the defense is slightly more realistic than the American. ADP-1 acknowledges that strategic and political leaders may impose a defensive strategy. The doctrine explains that the defense does not give up the initiative to the attacker if executed properly.

A key element of the British defense is the battlefield function of protection. Protection encompasses air defense, countermobility, NBC operations, deception, defensive electronic warfare, and OPSEC.⁹² Key to this study is British countermobility operations. Combat forces in conjunction with engineers perform countermobility tasks. Tasks include barriers and demolitions and commanders integrate direct and indirect fires with countermobility tasks into the operational plan. British AAP-6 defines a barrier as "a coordinated series of obstacles designed or employed

⁹⁰ ADP-1, *Operations*, London, Chief of the General Staff, 1994, 17.

⁹¹ *Ibid*, 89.

⁹² *Ibid*, 102.

to canalize, direct, restrict, delay or stop the movements of an opposing force, and to impose additional losses in personnel, time and equipment on the opposing force.” One aspect of British barrier emplacement is that they are sensitive to host nation agreements. In fact Army Field Manual 1, Part 1, Formation Tactics, states that obstacles “must be coordinated with host nation advisors when appropriate and comply with Host Nation Agreements.”⁹³ A quick review of Appendix B, Listing of nations ratifying, signing, or accessing to the articles of the shows that Britain’s commitment to the North Atlantic Treaty Organization, the United Nations, the Conference on Security and Cooperation in Europe (CSCE), the European Community or the Western European Union (WEU) will limit the means by which the British execute land warfare. Many of the nations in these organizations are party to the Ottawa Treaty, thereby imposing specific restrictions in regards to the use of landmines. Again, this reduces the need for landmine use.

The family of man-made obstacles includes field type, peacetime prepared and permanent. Within field type and peacetime prepared are minefields, demolitions, and constructed obstacles. Field type minefields are further broken down into placed and scatterable, compared to the American directed, situational, and reserve. British doctrine places emphasis on scatterable minefields because of their attractive qualities. First, scatterable minefields take less time to emplace. Given that, they are more responsive to changing operations and give the commander additional flexibility in the execution of the operation.⁹⁴

British doctrine writing has not reflected any changes since their signing of the Ottawa Treaty in July 1998. The most recent doctrinal publication which covers obstacles is Military Engineering Volume II, Pamphlet 3, dated 1984. This manual describes the use of landmines in British barrier plans. Anti-personnel landmines protect anti-tank landmines. Army Field Manual

⁹³ AFM-1, *Combined Arms Operations, Part 1, Formation Tactic*, London, Chief of the General Staff, 1995, 5-16.

⁹⁴ *Ibid*, 5-A-2.

1, Part 1, Formation Tactics discusses minefields in barrier plans in terms of anti-tank minefields and anti-personnel barriers. Key to these barrier plans, whether composed of anti-tank or anti-personnel landmines, is their integration into the overall operation and them not hindering offensive action.

Like American doctrine, British doctrine and war fighting stresses the importance of maintaining the initiative and offensive action. Barrier plans reflect this with a greater emphasis on scatterable minefields in obstacle barriers. Offensive action additionally reduces the requirement for the use of barriers and likewise landmines. The British are conscientious of the need to shape the battlefield without anti-personnel landmines. They use anti-personnel barriers as opposed to anti-personnel landmines.

How the Canadian Army Does It

This study examines Canadian doctrine for two main reasons. The first is that Canada hosted the Ottawa Convention that established the Ottawa Treaty. Based on this, one would expect their doctrine to reveal how the land forces intend to shape the battlefield without anti-personnel landmines. Secondly, like the British, Canada is a close ally with the United States and it is important to understand how the Canadian Defense Force intends to conduct land warfare.

Canadian doctrine echoes much of both the British and American models. It characterizes future conflict in a similar manner as the British. The capstone operational manual, B-GL-300-001/FP001, *Conduct of Land Operations-Operational Level Doctrine for the Canadian Army*, states that their doctrine follows closely with its nearest allies.⁹⁵ With that in mind, the Canadian Army uses maneuver warfare as the basis of its ability to defeat enemy forces by shattering their moral and physical cohesion. Physical destruction is not a requirement to achieving this. The key is to destroy the cohesion between the physical and moral planes.

⁹⁵ B-GL-300-001/FP001, *Conduct of Land Operations-Operational Level Doctrine for the Canadian Army*, Ottawa, Ontario, Canadian National Defense, 1998, 27

Canadian doctrine attacks this cohesion in three ways: pre-emption, dislocation, and disruption. Pre-emption seizes an opportunity before the enemy does in order to deny him a desired course of action. This occurs in the offense and in the defense. In American army speak this is seizing the initiative. Dislocation is denying the enemy the ability to bring his force to bear.⁹⁶ Disruption, the least preferred, refers to breaking up the enemy's combat power into confused parts. Disruption focuses on the organization of the enemy and his ability to command and control formations. Fixing and striking forces execute these approaches to attacking physical and moral cohesion

The fixing force physically blocks or holds an enemy formation, while morally it keeps its attention. The fixing force uses firepower and maneuver to physically block or hold the enemy in an effort to deny the enemy freedom of movement. A fixing force uses deception and surprise to morally fix the enemy. In doing so it mentally restricts the enemy's freedom of choice. In combination with the fixing force, the striking force in the physical plane attacks enemy formations in order to gain leverage over an enemy, and in the moral plane, to erode their will to fight. These two dynamic forces interact to overwhelm an enemy and are the basis for Canadian operational doctrine.

Canadian land forces break the battlefield up into combat functions, much like the British. Included in these functions is protection. Protection encompasses those measures the force takes to remain viable and functional by protecting itself from the effects of enemy weapon systems and natural occurrences.⁹⁷ Protection also includes active measures such as countermobility operations.

In the defense, obstacles follow the same fundamentals as those of the British and Americans. They support, not dictate, the maneuver plan; are covered by fire when possible; and

⁹⁶ Ibid, 33.

⁹⁷ Ibid, 42.

obstacles must not hinder the movement of counterattacking forces.⁹⁸ Canadian obstacle terminology also uses the same intent terminology as the American; turn, fix, disrupt, and block. Canadian forces use anti-tank landmines with anti-personnel barriers to achieve these intents. The use of anti-personnel barriers echoes that of the British army. One would expect this based on Canada being a signatory to the Ottawa Treaty. They also fall under the same constraints as the British do in executing countermobility operations in regards to coalition warfare. Canadian forces must into consideration host nation and coalition agreements.

Summary

Reviewing modern doctrine reveals that countermobility operations are very similar among the United States, Great Britain, and Canada. The other common thread is offensive action and maintenance of the initiative. The different nations call it different things, but maintaining the initiative is fundamental to each them. Offensive and defensive operations equally apply to each of the nations, with more emphasis being placed on the offensive form of maneuver. Both the British and the Americans say that the defense is used to gain combat power in order to conduct further offensive operations.

In terms of countermobility, each nation tends to incorporate scatterable or situational minefields/obstacles into their doctrine. Technology and the emphasis on offensive action have helped develop these concepts. Situational obstacles enable the commander greater flexibility in the execution of operations. Greater technology in terms of intelligence, surveillance, and reconnaissance, are giving commanders the ability to look further out, thus enabling the maintenance of the initiative. This in turn reduces the need for conventional minefields, since information and initiative allows the commander to better visualize, describe, and direct offensive action. Even in the event of a defense, conventional landmine usefulness is diminished. Greater

⁹⁸ B-GL-300-002/FP-000, *Land Force Tactical Doctrine*, Ottawa, Ontario, Canadian National Defense, 1997, 4-9.

intelligence allows the greater use of situational obstacles to maximize the maintenance of the initiative.

The biggest difference between these three nations is that American doctrine does not discuss the Ottawa Treaty. Both Great Britain and Canada have addressed its impacts by including coordination with host nation agreements into obstacle integration. U.S. doctrine does not address this factor into obstacle integration. The affect of this is that coalition partners are cognizant of the ever present humanitarian crisis. Also by becoming a signatory to the Ottawa Treaty, Great Britain and Canada are forced to begin thinking about shaping the battlefield without landmines.

CHAPTER FOUR THE FUTURE BATTLESPACE

Predicting the outcome of the future is surely the quickest way to failure. With the breakup of the Union of Soviet Socialist Republics (USSR) in 1989, the world's alliances became uncertain. The bi-polarity of the world dissolved. Prior to the breakup there existed a sense of stability. The United States was on one end of the spectrum, while the Soviet Union occupied the other. The bi-polar world helped provide security for much of the rest of the world's nations. On one hand there were those nations that had similar views to the United States, and on the other, those behind the Soviet model. The remaining nations were buffers in the bi-polar world. The breakup immediately introduced an element of uncertainty in the world.⁹⁹ The nations formally supportive of the USSR, no longer benefited from the security they provided.

This uncertainty translates into proliferation of weapons of mass destruction and effects; regional conflicts within the former borders of the USSR; global economies; rise of new nations; and the lack of stability present under the old paradigm. The breakup of the USSR left the old power regime in Russia while the majority of its nuclear arms spread elsewhere in the

⁹⁹ Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, New York, Touchstone Books, 1996, 21

surrounding nations, chiefly the Ukraine. The failing economy of the USSR was now the failing economy of Russia, Ukraine, Chechnya, etc. One easy way to raise money in a failing state is to sell military arms. Many of the Soviet states did this. The effect of this is now a larger number of countries potentially possessing the technology and means to employ weapons of mass destruction.¹⁰⁰

The breakup of the USSR does not represent all of the threat that the United States may face. Most recently the chief threat is terrorism. Terrorism is the “calculated use of unlawful violence or threat of unlawful violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological.”¹⁰¹ Terrorism typically targets non-combatants, and comes in the form of suicide bombers and bomb carrying airplane hijackers. One problem with terrorism is that many nations never know that it is about to occur. Small bands dispersed widely execute terrorism worldwide. Some terrorists groups are state sponsored. The U.S. State Department lists Iran, Iraq, Syria, Libya, Cuba, North Korea, and Sudan as state sponsors of international terrorism.¹⁰² Terrorism is so widely defined it is difficult to apply elements of national power to defeat it. Success in the struggle against terrorism will require a coalition of nations.¹⁰³ The future battlefield may include terrorist groups conducting terrorist activities.

With the changing world environment, the added uncertainty, and increases in technology, General Shinseki sought to transform the United States Army. The current force had to change to meet the challenges offered by the future battlefield. This transformed army force is known as the Objective Force.

The Objective Force

¹⁰⁰ Ibid, 186.

¹⁰¹ JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, Washington, DC, Department of Defense, 2001, 428.

¹⁰² U.S. State Department, *Patterns of Global Terrorism*, April 2001, <http://www.state.gov/s/ct/rls/pgtrpt/2000/2441.htm>, accessed 28 December 2001.

¹⁰³ Bruce Hoffman, *Inside Terrorism*, New York, Columbia University Press, 1998, 211.

The objective force is the future of the United States Army. It will have to be prepared to fight and win wars for the United States. In October 1999, the Army Chief of Staff unveiled his vision for how the army would meet the challenges faced in the future. General Eric Shinseki's vision includes transformation of the current force into a strategically responsive force that can dominate land warfare across the spectrum of operations.¹⁰⁴

The Army Vision outlines broad capabilities that the future force must possess. They include responsive, deployable, agile, versatile, lethal, survivable, and sustainable. The current force possesses many of these, with the exception of responsiveness. The future force must be able to deploy a war fighting brigade anywhere in the world in ninety six hours, a division in 120 hours, and five divisions in thirty days.¹⁰⁵ The brigade must be able to conduct full spectrum operations once it enters the area of operations.

The ability of a brigade to conduct full spectrum operations ninety six hours after take-off raises questions. Deploying forces must balance combat forces with sustainment. Increasing combat power typically decreases the forces ability to sustain itself, thereby decreasing its ability to conduct operations. TRADOC Pamphlet 525-3-0, *The United States Army Objective Force, Operational and Organizational Concept*, sums it up best: "forces must be able to operate effectively anywhere on the spectrum of conflict without substantial augmentation".¹⁰⁶ Another aspect of the objective force is its ability to transition between categories of missions without loss of momentum, operational focus, or initiative. This echoes FM 3-0's discussion of the maintenance of the initiative.

The objective force operational concept is that these forces will operate in all terrain types, day or night, and combine decisive air and ground operations to defeat enemy forces in detail. The objective force accomplishes this by establishing land dominance, seizing the

¹⁰⁴ The Army Vision, <http://www.army.mil/vision/> accessed 27 December, 2001.

¹⁰⁵ Ibid.

¹⁰⁶ TRADOC Pam 525-3-0, *The United State Army Objective Force, Operational and Organizational Concept, Draft*, Ft. Monroe, VA, U.S. Army Training and Doctrine Command, 2001, 9.

initiative from the enemy, forcing him into the defense, and then finishing decisively.¹⁰⁷ The objective force seizes and maintains the initiative by seeing first, understanding first, acting first, and finally by finishing decisively.

This has implications for the use of landmines. Although it does not totally negate their use, it does greatly limit their usefulness. Conventional “dumb” landmines will only contradict the intent of the Objective Force concepts. When not adequately integrated in the maneuver plan, landmines slow momentum. Friendly maneuver forces routinely incur casualties due to friendly minefields at the NTC because of a lack of integration and communication.¹⁰⁸

Additionally the logistical requirement to achieve any shaping effect is counter productive to offensive action and transitioning smoothly between types of operations. Advanced technologies will enable the objective force to see more sooner which, in turn helps maintain the initiative and offensive action. The objective force conducts force protection operations by maneuvering out of contact and using advanced C4ISR systems to attack before being attacked. This reduces the need for conventional landmines. Situational and reserve obstacles will help maintain the initiative by allowing the commander greater flexibility in shaping the battlefield by placing obstacles only where and when required.

Summary

The Objective Force presents an opportunity to think beyond the use of conventional landmines to shape the battlefield. A force dominated by offensive action and maneuver minimizes the usefulness of landmines. Advanced technologies in intelligence, surveillance, and reconnaissance combined with advanced weapon technologies enable the future combat force to execute land warfare decisively with offensive action on terms favorably to the Objective Force. Landmines become a logistical hindrance and contribute to both losses of momentum and post

¹⁰⁷ Ibid, 25.

¹⁰⁸ Frederick J. Erst, “Obstacle Integration”, NTC Sidewinders’ Newsletter No 99-12, <http://www.call.army.mil>, accessed 4 April 2002.

conflict humanitarian assistance requirements. This supports a need to shape the battlefield with means other than conventional landmines.

The changing security environment also presents the potential necessity to shape the battlefield without conventional landmines. The Ottawa Treaty restricts the use of anti-personnel landmines by any nations that have become signatories to it (see Appendix B). The United States Army may have to employ the objective force in a nation or with a nation that falls into this category. Should that be the case, the force will be compelled to abide by the articles of the Ottawa treaty and therefore be required to replicate the capability to shape the battlefield.

CHAPTER FIVE ANALYSIS/RECOMMENDATIONS

The focus on offensive operations and the impact of advanced technologies is changing landmine warfare and for that matter even the need for landmines at all. More and more reliance on situational and scatterable minefields negates the need for conventional landmines. Better information on the enemy enables commanders to achieve a higher level of battlefield visualization. Better visualization enables higher quality and timelier decision making. This dynamic helps the commander preserve the initiative and remain on the offense, unless strategic or political considerations dictate otherwise. This alone decreases the need of and the reliance on landmines to shape the battlefield. Further, minefield logistical requirements hinder maintenance of the initiative and momentum. The sheer bulk of anti-tank landmines and the quantity required to achieve a desired effect will create an overwhelming logistical requirement for the future objective force.

Couple that with the ever present humanitarian crisis and the strength of the current movements to ban landmines altogether and it is not out of the realm of the possible that ground forces will fight future conflicts without landmines. International groups are lobbying the United Nations to reclassify landmines with anti-handling devices in the same category as anti-personnel

landmines.¹⁰⁹ Should that be the case and supported internationally similar to the Ottawa Treaty, landmines may no longer be viable for shaping the battlefield. It is under that premise that this study offers the following recommendations in terms of doctrine, training, and materiel to shape future battlefields without the use of conventional landmines. Some of these recommendations are not new, but merely reiteration or refocusing of existing efforts.

Doctrine

Doctrine currently exists to shape battlefields without landmines. Shaping operations include those activities that support the decisive operation by effecting enemy capabilities or by influencing enemy decisions.¹¹⁰ The use of landmines accomplished both of these by destroying enemy formations and vehicles and by causing the enemy to either change his course of action or commit resources to breaching operations. The use of fires and information operations will continue to shape battlefields. Also current doctrine exists for the use of demolition obstacles that are just as effective to shaping terrain as conventional landmines.

Military deception is the key information operation that shapes the battlefield. Friendly forces use deception to influence the enemy's decision making process by manipulation, distortion, or falsification.¹¹¹ Deception paints a picture in the enemy's mind that is favorable to friendly forces. While minefields disrupt or turn enemy formations, proper deception operations can accomplish the same. Disrupting the enemy formation attacks the enemy's ability to mass. Disrupted piecemeal attacks favor the defender. Deception operations can break up enemy formations through the use of demonstrations and feints.

For clarity and to illustrate that deception can accomplish similar effects as minefields the types of deception are defined. A demonstration is an attack used to deceive the enemy without gaining contact. Demonstrations use a display of force to present a picture to the enemy. This

¹⁰⁹ Thomas Kuchenmeister, *Alternative anti-personnel mines, The Next Generations*, 16.

¹¹⁰ FM 3-0, *Operations*, 4-23.

¹¹¹ *Ibid*, 11-18.

type of operation aims to gain the enemy's attention while the decisive operation is occurring elsewhere. The demonstration gains the enemy's attention in order to create a force ratio favorable to the friendly force conducting the decisive operation. A feint, on the other hand, is a form of attack that gains contact with the enemy, but does not become decisively engaged. A feint attempts to cause the enemy force to deploy into a different formation, commit the reserve, or shift indirect fire support assets.¹¹² A feint also gains the enemy's attention and causes him to change his intended course of action. Both of these forms of attack help shape the battlefield.

Deception operations require the same amount of planning and preparation as the other operations. Deception operations also require resources. The operational cost of deception is a consideration during planning. Deception must be believable and this requires combat forces. During the Normandy invasion, LTG George S. Patton Jr. commanded a fictitious Army Group in Operation Fortitude. The German's belief that Patton was one of the Allies leading candidates to lead a cross channel invasion, committed the German 15th Army to counter the invasion.¹¹³ LTG Patton was a committed resource. This illustrates the importance of renouncing a deception plan. One of the current Battle Command Training Program trends is that units do not fully integrate information operations, including deception, into plans and operations.¹¹⁴ Units do not resource or even consider information operations as a combat multiplier.

This study recommends that deception take on a larger role in the planning and execution of combat operations. Military deception is a shaping operation in itself. Demonstrations and feints help shape the battlefield for the decisive operation by causing the enemy to alter his intended course of action or by forcing him to make a decision favorable to the friendly force.

FM 90-7, *Combined Arms Obstacle Integration*, also offers another alternative to the use of landmines in shaping the battlefield. The use of special-purpose munitions and demolition

¹¹² FM 3-90, *Tactics*, 5-38.

¹¹³ Martin Blumenson, *Patton, The Man Behind the Legend*, New York, Berkley Book, 1985, 221.

¹¹⁴ Battle Command Training Program Trends 2001, http://bctp.leavenworth.army.mil/2001/Divcorps23Aug01_files/slide0193.htm accessed 30 March 2002.

obstacles shape the battlefield by altering the terrain. In constricted terrain, road craters are just as effective in shaping the battlefield as demolishing bridges. When integrated with the maneuver plan and covered with fire, craters are effective in disrupting enemy formations and logistical trains. Bridging assets are an essential element of maintaining momentum. Causing the enemy to employ temporary or fixed bridging to bridge a crater creates an opportunity for the friendly force to target and destroy him. Pre-chambered road craters were planned extensively for the use in the defense of West Germany during the Cold War.¹¹⁵ These road craters were effectively blocking obstacles along high speed avenues of approach into West Germany. Yet another option is to use off-route demolition techniques instead of attacking the road surface. Major Frank Akins offers a technique to attack the upslope bank to create a road block on improved roads.¹¹⁶ This technique requires less time than an actual road crater and is easily removed with engineer heavy equipment once its purpose is fulfilled.

Fires in conjunction with deception and demolition obstacles can also effectively shape the battlefield. The integration of deep fires and air assets along with information dominance will shape the battlefield by placing fires when and where friendly forces want them.

Training

The implications of shaping the battlefield without landmines is that the existing doctrine regarding deception, fires, scatterable minefields, and demolition obstacle integrations gains that much more importance. To ensure that the force can shape the battlefield, CTCs should restrict the use of landmines. Units should fundamentally change from training with landmines to training to incorporate existing doctrine in regards to deception and fires. As a last resort units must become proficient in scatterable minefield planning and demolition obstacle integration.

¹¹⁵ Author's first duty assignment was with a corps mechanized engineer company responsible for a GDP sector running from Fulda to Osteim. Loading and rigging pre-chambers with 24 pound "cheese charges" was a platoon and company Mission Essential Task and performed quarterly to maintain proficiency.

¹¹⁶ Frank Akins, *Constructing an Obstacle Utilizing Off-Route Demolition Techniques- A Practical Approach*, <http://call.army.mil/products/trngtr/tql-99/roadblk.htm>, accessed 26 March 30, 2002.

Maneuver commanders and planners will learn to identify and incorporate other means to shape the battlefield only when forced to.

In terms of non-lethal technologies, soldiers will need to develop tactics and procedures to incorporate them into the battlefield. Non-lethal weapons are more forgiving and therefore would have a tendency for broader use. Soldiers need to remain disciplined in the use of any weapon, and the use of non-lethal weapons would be no different.

Another aspect of training for the future is the Contemporary Operating Environment. The Contemporary Operating Environment (COE) was developed to challenge the Army in a completely different environment. The COE opposing force is organized unlike any ever seen and provides a cognitive tension between the United States Armed Forces. The COE opposing force breaks the paradigm of the Soviet based threat and attempts to refocus the Army on war fighting across the spectrum of war. FM 7-100, *Opposing Force Doctrinal Framework and Strategy*, published August 2001 is the capstone publication that describes the Contemporary Operating Environment.

Training within the COE is the first step in preparing the U.S. Army to fight and win the nation's wars. The COE offers a training environment which aims to stress the Army in order to prepare it for future land warfare. Its chief agent in doing this is opposing force (OPFOR). This OPFOR typifies no one state, but all adversarial states within a wide range of possible threats. This OPFOR is adaptive to its changing operational and strategic environment. It uses conventional forces to achieve regional political and strategic aims prior to external intervention and then shifts to adaptive strategy and tactics once external forces have intervened.¹¹⁷ The United State Army, in this training environment, is the external force. A key point to this adaptive strategy and tactics is that the OPFOR learns from its successes and failures. It does not fight the same as it did in the past. Therefore "just because the U.S. force knows something about how the

¹¹⁷ FM 7-100, *Opposing Force Doctrinal Framework and Strategy*, Washington, D.C., Department of the Army, 2001, 3-14.

OPFOR has fought in the past does not mean that the OPFOR will always continue to fight that way”.¹¹⁸

The opposing forces the Army faces in training represents a collection of potential scenarios they may face in the future. It echoes of full spectrum operations and current doctrine, FM 3-0, addresses the conduct of operations within this framework. The contemporary operating environment must be fully utilized at all levels of the Army’s training system. With that simulations must not hinder a unit’s ability to prepare for future adversaries in terms of full spectrum operations.¹¹⁹ The Army will continue to meet the challenges on the battlefield however they may come.

Materiel

The biggest changes to shaping the future battlefield may come in advances in technology. Current ongoing studies focusing on alternatives to anti-personnel landmines will have direct impacts on anti-tank landmines. When President Clinton announced that the United States would sign the Ottawa Treaty by 2006 subject to finding alternatives to anti-personnel landmines, the Under Secretary of Defense for Acquisition and Technology began searching for alternatives.¹²⁰

These alternatives revolve around anti-personnel landmines, but many have anti-tank landmine implications. Research focuses on sensors that can detect targets, command and control systems that can decide and direct an engagement, and a knowledge based system that will self destruct or neutralize itself under given circumstances. Landmines with this technology overcome the constraints imposed by the Ottawa Treaty and the Conventions of Certain Weapons. The ability of a munition that can detect a vehicle at an extended range, decide if it is an enemy

¹¹⁸ Ibid, ix.

¹¹⁹ Author’s observation from Battle Command Training Program in December 2001 and February 2002 is that the current simulations are unable to replicate urban combat. This affects how units plan to fight in complex terrain.

¹²⁰ Thomas Kuchenmeister, *Alternative anti-personnel mines, The Next Generations*, 41.

armored vehicle, and direct an attack is a lethal munition that can replace conventional minefields. Add anti-tampering by the use of command detonation and the system is nearly undefeatable. The Defense Advanced Research Projects Agency (DARPA) is currently working on self-healing minefield technology. The basis of the program is to establish an anti-tank minefield that can detect when it has been breached and then reposition a portion of its landmines to seal the breach.¹²¹

Besides advanced landmines, other advanced technology is useful in shaping the future battlefield. Non-lethal munitions gained Department of Defense endorsement following the Gulf War.¹²² The argument of non-lethal fires stems from the conflicts throughout the 1990s where areas of operations contained as many non-combatants as enemy forces. Non-lethal munition research includes calmatives, obscurants, entanglements, malodorants, acoustic weapons, electrical weapon, isotropic radiators, and super adhesives/caustics/lubricants.¹²³ Most of these affect the person and not the machine. In some cases the super adhesives or lubricants affect the machine. The anti-traction concept is airborne delivered, environmentally safe, and temporary. It basically makes a surface ice-like by reducing friction.

Directed energy weapons can also shape the battlefield. Electromagnetic Pulse weapons emit a powerful force that produces a short lived voltage of thousands of volts.¹²⁴ This has the same affect as an electrical surge in a light bulb to all exposed electrical conductors. EMP weapons create irreversible mobility kills and communication disruption on advancing enemy forces, thereby shaping them in a way similar to minefields. EMP weapons can be fitted into standards air force bomb munitions or even on UAVs set to loiter. Acoustic and radio energy weapons can similarly temporarily disable unprotected soldiers. Acoustic and radio energy

¹²¹ *Self Healing Minefield*, <http://DARPA.mil/ato/programs/apla/programinfo.html>, accessed 10 March, 2002.

¹²² Alvin and Heidi Toffler, *War and Anti-War*, Boston, Little, Brown, and Company, 1993, 128.

¹²³ Thomas Kuchenmeister, *Alternative anti-personnel mines, The Next Generations*, 51.

¹²⁴ Carlo Kopp, *The E-Bomb – A Weapon of Electrical Mass Destruction*, http://inforwar.com/MIL_C4I/mil_c4i8/html, accessed 10 March, 2002, 2.

weapons emit frequencies that cause nausea and diarrhetic symptoms by vibrating one's insides.¹²⁵

When the energy weapon is shut off, the symptoms cease. Directed energy weapons have tremendous potential as alternatives for landmines. First they provide an alternative to anti-personnel landmines and secondly the EMF weapons disable vehicle, thereby providing an alternative to anti-tank landmines.

Advanced sensors enable battlefield visualization beyond the current construct of the close fight. With this additional range of our sensors, TRADOC PAM 525-3-0, *The United States Army Objective Force, Operational and Organizational Concept* surmises that enemy formations can be targeted and attacked at extended ranges. This clearly shapes the battlefield for the decisive operation.

CONCLUSION

Landmines proved an effective force enabler throughout the twentieth century. Anti-tank landmines gained their dominance on the battlefield during World War II which led to the development of anti-personnel landmines. Having become so effective against disrupting and even stopping enemy armored formations and ground assaults, landmines of all sorts gained widespread use. Countermine capabilities continually lagged behind and as a result over one hundred million landmines remain employed today, costing thousands of lives a year and billions of dollars to fractured economies in lost productivity, medical costs, and demining costs. Landmines created a humanitarian crisis that led to the signing and ratification of the Ottawa Treaty (Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Antipersonnel Mines and on their Destruction) by 142 and 122 nations respectively.

The United States has the most powerful armed forces in the world and the use of landmines has not proved decisive in achieving that standard. The Gulf War showcased the United States' dominance in the air and on land with shock and maneuver. The offensive nature

¹²⁵ Thomas Kuchenmeister, *Alternative anti-personnel mines, The Next Generation*, 50.

of the conflict negated the use of landmines. Fire and maneuver dominated ground warfare. American forces did not emplace any landmines in Operations in Somalia, Bosnia, and in Kosovo. Army transformation and the Objective Force base operations on offensive action and maintaining the initiative. With advanced technology in intelligence, target acquisition, and fires, conventional landmines may become a weapon of the past.

Having the most powerful Army in the world does not relieve the requirement to be continually better in all areas. In many respects the United States Army currently shapes the battlefield without the use of landmines. Doctrine provides the means to shape enemy formations. Deception combined with long range fires, including air interdiction; shape the battlefield for the decisive operations. Increased technologies mainly in the intelligence arena allow precision deep fires to destroy enemy forces prior to ground contact. The greatest example of this is the on going War on Terrorism in Afghanistan. Ground forces along with advanced technology and real time sensors enable the United States Air Force to engage targets well above the range of any surface to air missiles. Non-lethal alternatives exist to replace the function of landmines. Electromagnetic pulse weapons could revolutionize ground warfare and leave the battlefield safe to traverse following the conflict. The recommendations outlined in this paper based on emerging doctrine provide for humanitarian friendly alternatives to landmines. If accepted, future battlefields could become truly mineless.

APPENDIX A

“Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Antipersonnel Mines and on their Destruction”

Preamble

The States Parties,

Determined to put an end to the suffering and casualties caused by anti-personnel mines, that kill or maim hundreds of people every week, mostly innocent and defenseless civilians and especially children, obstruct economic development and reconstruction, inhibit the repatriation of refugees and internally displaced persons, and have other severe consequences for years after emplacement,

Believing it necessary to do their utmost to contribute in an efficient and coordinated manner to face the challenge of removing anti-personnel mines placed throughout the world, and to assure their destruction,

Wishing to do their utmost in providing assistance for the care and rehabilitation, including the social and economic reintegration of mine victims,

Recognizing that a total ban of anti-personnel mines would also be an important confidence-building measure,

Welcoming the adoption of the Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices, as amended on 3 May 1996, annexed to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, and calling for the early ratification of this Protocol by all States which have not yet done so,

Welcoming also United Nations General Assembly Resolution 51/45 S of 10

December 1996 urging all States to pursue vigorously an effective, legally-binding international agreement to ban the use, stockpiling, production and transfer of anti-personnel landmines,

Welcoming furthermore the measures taken over the past years, both unilaterally and multilaterally, aiming at prohibiting, restricting or suspending the use, stockpiling, production and transfer of anti-personnel mines,

Stressing the role of public conscience in furthering the principles of humanity as evidenced by the call for a total ban of anti-personnel mines and recognizing the efforts to that end undertaken by the International Red Cross and Red Crescent Movement, the International Campaign to Ban Landmines and numerous other non-governmental organizations around the world,

Recalling the Ottawa Declaration of 5 October 1996 and the Brussels Declaration of 27 June 1997 urging the international community to negotiate an international and legally binding agreement prohibiting the use, stockpiling, production and transfer of anti-personnel mines,

Emphasizing the desirability of attracting the adherence of all States to this Convention, and determined to work strenuously towards the promotion of its universalization in all relevant fora including, inter alia, the United Nations, the Conference on Disarmament, regional organizations, and groupings, and review conferences of the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects,

Basing themselves on the principle of international humanitarian law that the right of the parties to an armed conflict to choose methods or means of warfare is not unlimited, on the principle that prohibits the employment in armed conflicts of weapons, projectiles and materials and methods of warfare of a nature to cause superfluous injury or unnecessary suffering and on the principle that a distinction must be made between civilians and combatants,

Have agreed as follows:

Article 1

General obligations

1. Each State Party undertakes never under any circumstances:
 - a. To use anti-personnel mines;
 - b. To develop, produce, otherwise acquire, stockpile, retain or transfer to anyone, directly or indirectly, anti-personnel mines;
 - c. To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention.
2. Each State Party undertakes to destroy or ensure the destruction of all anti-personnel mines in accordance with the provisions of this Convention.

Article 2

Definitions

1. "Anti-personnel mine" means a mine designed to be exploded by the presence, proximity or contact of a person and that will incapacitate, injure or kill one or more persons. Mines designed to be detonated by the presence, proximity or contact of a vehicle as opposed to a person, that are equipped with anti-handling devices, are not considered anti-personnel mines as a result of being so equipped.
2. "Mine" means a munition designed to be placed under, on or near the ground or other surface area and to be exploded by the presence, proximity or contact of a person or a vehicle.
3. "Anti-handling device" means a device intended to protect a mine and which is part of, linked to, attached to or placed under the mine and which activates when an attempt is made to tamper with or otherwise intentionally disturb the mine.
4. "Transfer" involves, in addition to the physical movement of anti-personnel mines into or from national territory, the transfer of title to and control over the mines, but does not involve the transfer of territory containing emplaced anti-personnel mines.
5. "Mined area" means an area which is dangerous due to the presence or suspected presence of mines.

Article 3

Exceptions

1. Notwithstanding the general obligations under Article 1, the retention or transfer of a number of anti-personnel mines for the development of and training in mine detection, mine clearance, or mine destruction techniques is permitted. The amount of such mines shall not exceed the minimum number absolutely necessary for the above-mentioned purposes.
2. The transfer of anti-personnel mines for the purpose of destruction is permitted.

Article 4

Destruction of stockpiled anti-personnel mines

Except as provided for in Article 3, each State Party undertakes to destroy or ensure the destruction of all stockpiled anti-personnel mines it owns or possesses, or that are under its jurisdiction or control, as soon as possible but not later than four years after the entry into force of this Convention for that State Party.

Article 5

Destruction of anti-personnel mines in mined areas

1. Each State Party undertakes to destroy or ensure the destruction of all anti-personnel mines in mined areas under its jurisdiction or control, as soon as possible but not later than ten years after the entry into force of this Convention for that State Party.

092. Each State Party shall make every effort to identify all areas under its jurisdiction or control in which anti-personnel mines are known or suspected to be emplaced and shall ensure as soon as possible that all anti-personnel mines in mined areas under its jurisdiction or control are perimeter-marked, monitored and protected by fencing or other means, to ensure the effective exclusion of civilians, until all anti-personnel mines contained therein have been destroyed. The marking shall at least be to the standards set out in the Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices, as amended on 3 May 1996, annexed to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects.
3. If a State Party believes that it will be unable to destroy or ensure the destruction of all anti-personnel mines referred to in paragraph 1 within that time period, it may submit a request to a Meeting of the States Parties or a Review Conference for an extension of the deadline for completing the destruction of such anti-personnel mines, for a period of up to ten years.
 4. Each request shall contain:
 - a. The duration of the proposed extension;
 - b. A detailed explanation of the reasons for the proposed extension, including:
 - i. The preparation and status of work conducted under national demining programs;
 - ii. The financial and technical means available to the State Party for the destruction of all the anti-personnel mines; and
 - iii. Circumstances which impede the ability of the State Party to destroy all the anti-personnel mines in mined areas;
 - c. The humanitarian, social, economic, and environmental implications of the extension; and
 - d. Any other information relevant to the request for the proposed extension.
 5. The Meeting of the States Parties or the Review Conference shall, taking into consideration the factors contained in paragraph 4, assess the request and decide by a majority of votes of States Parties present and voting whether to grant the request for an extension period.
 6. Such an extension may be renewed upon the submission of a new request in accordance with paragraphs 3, 4 and 5 of this Article. In requesting a further extension period a State Party shall submit relevant additional information on what has been undertaken in the previous extension period pursuant to this Article.

Article 6

International cooperation and assistance

1. In fulfilling its obligations under this Convention each State Party has the right to seek and receive assistance, where feasible, from other States Parties to the extent possible.
2. Each State Party undertakes to facilitate and shall have the right to participate in the fullest possible exchange of equipment, material and scientific and technological information concerning the implementation of this Convention. The States Parties shall not impose undue restrictions on the provision of mine clearance equipment and related technological information for humanitarian purposes.
3. Each State Party in a position to do so shall provide assistance for the care and rehabilitation, and social and economic reintegration, of mine victims and for mine awareness programs. Such assistance may be provided, inter alia, through the United Nations system, international, regional or national organizations or institutions, the International Committee of the Red Cross, national Red Cross and Red Crescent societies

and their International Federation, non-governmental organizations, or on a bilateral basis.

4. Each State Party in a position to do so shall provide assistance for mine clearance and related activities. Such assistance may be provided, inter alia, through the United Nations system, international or regional organizations or institutions, non-governmental organizations or institutions, or on a bilateral basis, or by contributing to the United Nations Voluntary Trust Fund for Assistance in Mine Clearance, or other regional funds that deal with demining.
5. Each State Party in a position to do so shall provide assistance for the destruction of stockpiled anti-personnel mines.
6. Each State Party undertakes to provide information to the database on mine clearance established within the United Nations system, especially information concerning various means and technologies of mine clearance, and lists of experts, expert agencies or national points of contact on mine clearance.
7. States Parties may request the United Nations, regional organizations, other States Parties or other competent intergovernmental or non-governmental fora to assist its authorities in the elaboration of a national demining program to determine, inter alia:
 - a. The extent and scope of the anti-personnel mine problem;
 - b. The financial, technological and human resources that are required for the implementation of the program;
 - c. The estimated number of years necessary to destroy all anti-personnel mines in mined areas under the jurisdiction or control of the concerned State Party;
 - d. Mine awareness activities to reduce the incidence of mine-related injuries or deaths;
 - e. Assistance to mine victims;
 - f. The relationship between the Government of the concerned State Party and the relevant governmental, inter-governmental or non-governmental entities that will work in the implementation of the program.
8. Each State Party giving and receiving assistance under the provisions of this Article shall cooperate with a view to ensuring the full and prompt implementation of agreed assistance programs.

Article 7

Transparency measures

1. Each State Party shall report to the Secretary-General of the United Nations as soon as practicable, and in any event not later than 180 days after the entry into force of this Convention for that State Party on:
 - a. The national implementation measures referred to in Article 9;
 - b. The total of all stockpiled anti-personnel mines owned or possessed by it, or under its jurisdiction or control, to include a breakdown of the type, quantity and, if possible, lot numbers of each type of anti-personnel mine stockpiled;
 - c. To the extent possible, the location of all mined areas that contain, or are suspected to contain, anti-personnel mines under its jurisdiction or control, to include as much detail as possible regarding the type and quantity of each type of anti-personnel mine in each mined area and when they were emplaced;
 - d. The types, quantities and, if possible, lot numbers of all anti-personnel mines retained or transferred for the development of and training in mine detection, mine clearance or mine destruction techniques, or transferred for the purpose of destruction, as well as the institutions authorized by a State Party to retain or transfer anti-personnel mines, in accordance with Article 3;
 - e. The status of programs for the conversion or de-commissioning of anti-personnel

- mine production facilities;
 - f. The status of programs for the destruction of anti-personnel mines in accordance with Articles 4 and 5, including details of the methods which will be used in destruction, the location of all destruction sites and the applicable safety and environmental standards to be observed;
 - g. The types and quantities of all anti-personnel mines destroyed after the entry into force of this Convention for that State Party, to include a breakdown of the quantity of each type of anti-personnel mine destroyed, in accordance with Articles 4 and 5, respectively, along with, if possible, the lot numbers of each type of anti-personnel mine in the case of destruction in accordance with Article 4;
 - h. The technical characteristics of each type of anti-personnel mine produced, to the extent known, and those currently owned or possessed by a State Party, giving, where reasonably possible, such categories of information as may facilitate identification and clearance of anti-personnel mines; at a minimum, this information shall include the dimensions, fusing, explosive content, metallic content, colour photographs and other information which may facilitate mine clearance; and
 - i. The measures taken to provide an immediate and effective warning to the population in relation to all areas identified under paragraph 2 of Article 5.
2. The information provided in accordance with this Article shall be updated by the States Parties annually, covering the last calendar year, and reported to the Secretary-General of the United Nations not later than 30 April of each year.
 3. The Secretary-General of the United Nations shall transmit all such reports received to the States Parties.

Article 8

Facilitation and clarification of compliance

1. The States Parties agree to consult and cooperate with each other regarding the implementation of the provisions of this Convention, and to work together in a spirit of cooperation to facilitate compliance by States Parties with their obligations under this Convention.
2. If one or more States Parties wish to clarify and seek to resolve questions relating to compliance with the provisions of this Convention by another State Party, it may submit, through the Secretary-General of the United Nations, a Request for Clarification of that matter to that State Party. Such a request shall be accompanied by all appropriate information. Each State Party shall refrain from unfounded Requests for Clarification, care being taken to avoid abuse. A State Party that receives a Request for Clarification shall provide, through the Secretary-General of the United Nations, within 28 days to the requesting State Party all information which would assist in clarifying this matter.
3. If the requesting State Party does not receive a response through the Secretary-General of the United Nations within that time period, or deems the response to the Request for Clarification to be unsatisfactory, it may submit the matter through the Secretary-General of the United Nations to the next Meeting of the States Parties. The Secretary-General of the United Nations shall transmit the submission, accompanied by all appropriate information pertaining to the Request for Clarification, to all States Parties. All such information shall be presented to the requested State Party which shall have the right to respond.
4. Pending the convening of any meeting of the States Parties, any of the States Parties concerned may request the Secretary-General of the United Nations to exercise his or her good offices to facilitate the clarification requested.

5. The requesting State Party may propose through the Secretary-General of the United Nations the convening of a Special Meeting of the States Parties to consider the matter. The Secretary-General of the United Nations shall thereupon communicate this proposal and all information submitted by the States Parties concerned, to all States Parties with a request that they indicate whether they favour a Special Meeting of the States Parties, for the purpose of considering the matter. In the event that within 14 days from the date of such communication, at least one-third of the States Parties favours such a Special Meeting, the Secretary-General of the United Nations shall convene this Special Meeting of the States Parties within a further 14 days. A quorum for this Meeting shall consist of a majority of States Parties.
6. The Meeting of the States Parties or the Special Meeting of the States Parties, as the case may be, shall first determine whether to consider the matter further, taking into account all information submitted by the States Parties concerned. The Meeting of the States Parties or the Special Meeting of the States Parties shall make every effort to reach a decision by consensus. If despite all efforts to that end no agreement has been reached, it shall take this decision by a majority of States Parties present and voting.
7. All States Parties shall cooperate fully with the Meeting of the States Parties or the Special Meeting of the States Parties in the fulfilment of its review of the matter, including any fact-finding missions that are authorized in accordance with paragraph 8.
8. If further clarification is required, the Meeting of the States Parties or the Special Meeting of the States Parties shall authorize a fact-finding mission and decide on its mandate by a majority of States Parties present and voting. At any time the requested State Party may invite a fact-finding mission to its territory. Such a mission shall take place without a decision by a Meeting of the States Parties or a Special Meeting of the States Parties to authorize such a mission. The mission, consisting of up to 9 experts, designated and approved in accordance with paragraphs 9 and 10, may collect additional information on the spot or in other places directly related to the alleged compliance issue under the jurisdiction or control of the requested State Party.
9. The Secretary-General of the United Nations shall prepare and update a list of the names, nationalities and other relevant data of qualified experts provided by States Parties and communicate it to all States Parties. Any expert included on this list shall be regarded as designated for all fact-finding missions unless a State Party declares its non-acceptance in writing. In the event of non-acceptance, the expert shall not participate in fact-finding missions on the territory or any other place under the jurisdiction or control of the objecting State Party, if the non-acceptance was declared prior to the appointment of the expert to such missions.
10. Upon receiving a request from the Meeting of the States Parties or a Special Meeting of the States Parties, the Secretary-General of the United Nations shall, after consultations with the requested State Party, appoint the members of the mission, including its leader. Nationals of States Parties requesting the fact-finding mission or directly affected by it shall not be appointed to the mission. The members of the fact-finding mission shall enjoy privileges and immunities under Article VI of the Convention on the Privileges and Immunities of the United Nations, adopted on 13 February 1946.
11. Upon at least 72 hours notice, the members of the fact-finding mission shall arrive in the territory of the requested State Party at the earliest opportunity. The requested State Party shall take the necessary administrative measures to receive, transport and accommodate the mission, and shall be responsible for ensuring the security of the mission to the maximum extent possible while they are on territory under its control.
12. Without prejudice to the sovereignty of the requested State Party, the fact-finding mission may bring into the territory of the requested State Party the necessary equipment which shall be used exclusively for gathering information on the alleged compliance issue. Prior

- to its arrival, the mission will advise the requested State Party of the equipment that it intends to utilize in the course of its fact-finding mission.
13. The requested State Party shall make all efforts to ensure that the fact-finding mission is given the opportunity to speak with all relevant persons who may be able to provide information related to the alleged compliance issue.
 14. The requested State Party shall grant access for the fact-finding mission to all areas and installations under its control where facts relevant to the compliance issue could be expected to be collected. This shall be subject to any arrangements that the requested State Party considers necessary for:
 - a. The protection of sensitive equipment, information and areas;
 - b. The protection of any constitutional obligations the requested State Party may have with regard to proprietary rights, searches and seizures, or other constitutional rights; or
 - c. The physical protection and safety of the members of the fact-finding mission. In the event that the requested State Party makes such arrangements, it shall make every reasonable effort to demonstrate through alternative means its compliance with this Convention.
 15. The fact-finding mission may remain in the territory of the State Party concerned for no more than 14 days, and at any particular site no more than 7 days, unless otherwise agreed.
 16. All information provided in confidence and not related to the subject matter of the fact-finding mission shall be treated on a confidential basis.
 17. The fact-finding mission shall report, through the Secretary-General of the United Nations, to the Meeting of the States Parties or the Special Meeting of the States Parties the results of its findings.
 18. The Meeting of the States Parties or the Special Meeting of the States Parties shall consider all relevant information, including the report submitted by the fact-finding mission, and may request the requested State Party to take measures to address the compliance issue within a specified period of time. The requested State Party shall report on all measures taken in response to this request.
 19. The Meeting of the States Parties or the Special Meeting of the States Parties may suggest to the States Parties concerned ways and means to further clarify or resolve the matter under consideration, including the initiation of appropriate procedures in conformity with international law. In circumstances where the issue at hand is determined to be due to circumstances beyond the control of the requested State Party, the Meeting of the States Parties or the Special Meeting of the States Parties may recommend appropriate measures, including the use of cooperative measures referred to in Article 6.
 20. The Meeting of the States Parties or the Special Meeting of the States Parties shall make every effort to reach its decisions referred to in paragraphs 18 and 19 by consensus, otherwise by a two-thirds majority of States Parties present and voting.

Article 9

National implementation measures

Each State Party shall take all appropriate legal, administrative and other measures, including the imposition of penal sanctions, to prevent and suppress any activity prohibited to a State Party under this Convention undertaken by persons or on territory under its jurisdiction or control.

Article 10

Settlement of disputes

1. The States Parties shall consult and cooperate with each other to settle any dispute that may arise with regard to the application or the interpretation of this Convention. Each

- State Party may bring any such dispute before the Meeting of the States Parties.
2. The Meeting of the States Parties may contribute to the settlement of the dispute by whatever means it deems appropriate, including offering its good offices, calling upon the States parties to a dispute to start the settlement procedure of their choice and recommending a time-limit for any agreed procedure.
 3. This Article is without prejudice to the provisions of this Convention on facilitation and clarification of compliance.

Article 11

Meetings of the States Parties

1. The States Parties shall meet regularly in order to consider any matter with regard to the application or implementation of this Convention, including:
 - a. The operation and status of this Convention;
 - b. Matters arising from the reports submitted under the provisions of this Convention;
 - c. International cooperation and assistance in accordance with Article 6;
 - d. The development of technologies to clear anti-personnel mines;
 - e. Submissions of States Parties under Article 8; and
 - f. Decisions relating to submissions of States Parties as provided for in Article 5.
2. The First Meeting of the States Parties shall be convened by the Secretary-General of the United Nations within one year after the entry into force of this Convention. The subsequent meetings shall be convened by the Secretary-General of the United Nations annually until the first Review Conference.
3. Under the conditions set out in Article 8, the Secretary-General of the United Nations shall convene a Special Meeting of the States Parties.
4. States not parties to this Convention, as well as the United Nations, other relevant international organizations or institutions, regional organizations, the International Committee of the Red Cross and relevant non-governmental organizations may be invited to attend these meetings as observers in accordance with the agreed Rules of Procedure.

Article 12

Review Conferences

1. A Review Conference shall be convened by the Secretary-General of the United Nations five years after the entry into force of this Convention. Further Review Conferences shall be convened by the Secretary-General of the United Nations if so requested by one or more States Parties, provided that the interval between Review Conferences shall in no case be less than five years. All States Parties to this Convention shall be invited to each Review Conference.
2. The purpose of the Review Conference shall be:
 - a. To review the operation and status of this Convention;
 - b. To consider the need for and the interval between further Meetings of the States Parties referred to in paragraph 2 of Article 11;
 - c. To take decisions on submissions of States Parties as provided for in Article 5; and
 - d. To adopt, if necessary, in its final report conclusions related to the implementation of this Convention.
3. States not parties to this Convention, as well as the United Nations, other relevant international organizations or institutions, regional organizations, the International Committee of the Red Cross and relevant non-governmental organizations may be invited to attend each Review Conference as observers in accordance with the agreed Rules of Procedure.

Article 13

Amendments

1. At any time after the entry into force of this Convention any State Party may propose amendments to this Convention. Any proposal for an amendment shall be communicated to the Depositary, who shall circulate it to all States Parties and shall seek their views on whether an Amendment Conference should be convened to consider the proposal. If a majority of the States Parties notify the Depositary no later than 30 days after its circulation that they support further consideration of the proposal, the Depositary shall convene an Amendment Conference to which all States Parties shall be invited.
2. States not parties to this Convention, as well as the United Nations, other relevant international organizations or institutions, regional organizations, the International Committee of the Red Cross and relevant non-governmental organizations may be invited to attend each Amendment Conference as observers in accordance with the agreed Rules of Procedure.
3. The Amendment Conference shall be held immediately following a Meeting of the States Parties or a Review Conference unless a majority of the States Parties request that it be held earlier.
4. Any amendment to this Convention shall be adopted by a majority of two-thirds of the States Parties present and voting at the Amendment Conference. The Depositary shall communicate any amendment so adopted to the States Parties.
5. An amendment to this Convention shall enter into force for all States Parties to this Convention which have accepted it, upon the deposit with the Depositary of instruments of acceptance by a majority of States Parties. Thereafter it shall enter into force for any remaining State Party on the date of deposit of its instrument of acceptance.

Article 14

Costs

1. The costs of the Meetings of the States Parties, the Special Meetings of the States Parties, the Review Conferences and the Amendment Conferences shall be borne by the States Parties and States not parties to this Convention participating therein, in accordance with the United Nations scale of assessment adjusted appropriately.
2. The costs incurred by the Secretary-General of the United Nations under Articles 7 and 8 and the costs of any fact-finding mission shall be borne by the States Parties in accordance with the United Nations scale of assessment adjusted appropriately.

Article 15

Signature

This Convention, done at Oslo, Norway, on 18 September 1997, shall be open for signature at Ottawa, Canada, by all States from 3 December 1997 until 4 December 1997, and at the United Nations Headquarters in New York from 5 December 1997 until its entry into force.

Article 16

Ratification, acceptance, approval or accession

1. This Convention is subject to ratification, acceptance or approval of the Signatories.
2. It shall be open for accession by any State which has not signed the Convention.
3. The instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary.

Article 17

Entry into force

1. This Convention shall enter into force on the first day of the sixth month after the

month in which the 40th instrument of ratification, acceptance, approval or accession has been deposited.

2. 2. For any State which deposits its instrument of ratification, acceptance, approval or accession after the date of the deposit of the 40th instrument of ratification, acceptance, approval or accession, this Convention shall enter into force on the first day of the sixth month after the date on which that State has deposited its instrument of ratification, acceptance, approval or accession.

Article 18

Provisional application

Any State may at the time of its ratification, acceptance, approval or accession, declare that it will apply provisionally paragraph 1 of Article 1 of this Convention pending its entry into force.

Article 19

Reservations

The Articles of this Convention shall not be subject to reservations.

Article 20

Duration and withdrawal

1. This Convention shall be of unlimited duration.
2. Each State Party shall, in exercising its national sovereignty, have the right to withdraw from this Convention. It shall give notice of such withdrawal to all other States Parties, to the Depositary and to the United Nations Security Council. Such instrument of withdrawal shall include a full explanation of the reasons motivating this withdrawal.
3. Such withdrawal shall only take effect six months after the receipt of the instrument of withdrawal by the Depositary. If, however, on the expiry of that six-month period, the withdrawing State Party is engaged in an armed conflict, the withdrawal shall not take effect before the end of the armed conflict.
4. The withdrawal of a State Party from this Convention shall not in any way affect the duty of States to continue fulfilling the obligations assumed under any relevant rules of international law.

Article 21

Depositary

The Secretary-General of the United Nations is hereby designated as the Depositary of this Convention.

Article 22

Authentic texts

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

APPENDIX B

1997 Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction (1997 Mine Ban Treaty)

Under Article 15, the treaty was open for signature from 3 December 1997 until its entry into force, which was 1 March 1999. On the following list, the first date is signature, the second date is ratification. Now that the treaty has entered into force, states may no longer sign it, rather they may become bound without signature through a one step procedure known as accession. According to Article 16 (2), the treaty is open for accession by any State that has not signed. Accession is indicated below with (a).

As of 10 October 2001 , 142 signatories/accessions and 122 ratifications, accessions (a) or approvals (AA).

Albania 8 Sept 1998; 29 Feb 2000
Algeria 3 Dec 1997; 9 Oct 2001
Andorra 3 Dec 1997; 29 Jun 1998
Angola 4 Dec 1997
Antigua and Barbuda 3 Dec 1997; 3 May 1999
Argentina 4 Dec 1997; 14 Sep 1999
Australia 3 Dec 1997; 14 Jan 1999
Austria 3 Dec 1997; 29 Jun 1998
Bahamas 3 Dec 1997; 31 Jul 1998
Bangladesh 7 May 1998; 6 Sep 2000
Barbados 3 Dec 1997; 26 Jan 1999
Belgium 3 Dec 1997; 4 Sep 1998
Belize 27 Feb 1998; 23 Apr 1998
Benin 3 Dec 1997; 25 Sept 1998
Bolivia 3 Dec 1997; 9 Jun 1998
Bosnia and Herzegovina 3 Dec 1997; 8 Sep 1998
Botswana 3 Dec 1997; 1 Mar 2000
Brazil 3 Dec 1997; 30 Apr 1999
Brunei Darussalam 4 Dec 1997
Bulgaria 3 Dec 1997; 4 Sep 1998
Burkina Faso 3 Dec 1997; 16 Sep 1998
Burundi 3 Dec 1997
Cambodia 3 Dec 1997; 28 July 1999
Cameroon 3 Dec 1997
Canada 3 Dec 1997; 3 Dec 1997
Cape Verde 4 Dec 1997; 14 May 2001
Chad 6 Jul 1998; 6 May 1999
Chile 3 Dec 1997; 10 Sep 2001
Colombia 3 Dec 1997; 6 Sep 2000

Cook Islands 3 Dec 1997

Congo Brazzaville 4 May 2001 (a)
Costa Rica 3 Dec 1997; 17 Mar 1999
Côte d'Ivoire 3 Dec 1997; 30 June 2000
Croatia 4 Dec 1997; 20 May 1998

Cyprus 4 Dec 1997

Czech Republic 3 Dec 1997; 26 Oct. 1999
Denmark 4 Dec 1997; 8 Jun 1998
Djibouti 3 Dec 1997; 18 May 1998
Dominica 3 Dec 1997; 26 March 1999
Dominican Republic 3 Dec 1997; 30 June 2000
Ecuador 4 Dec 1997; 29 Apr 1999
El Salvador 4 Dec 1997; 27 Jan 1999
Equatorial Guinea 16 Sep 1998 (a)
Eritrea 27 Aug 2001 (a)

Ethiopia 3 Dec 1997

Fiji 3 Dec 1997; 10 Jun 1998
France 3 Dec 1997; 23 Jul 1998
Gabon 3 Dec 1997; 8 Sep 2000

Gambia 4 Dec 1997

Germany 3 Dec 1997; 23 Jul 1998
Ghana 4 Dec 1997; 30 June 2000

Greece 3 Dec 1997

Grenada 3 Dec 1997; 19 Aug 1998
Guatemala 3 Dec 1997; 26 March 1999
Guinea 4 Dec 1997; 8 Oct 1998
Guinea-Bissau 3 Dec 1997; 22 May 2001

Guyana 4 Dec 1997

Haiti 3 Dec 1997

Holy See 4 Dec 1997; 17 Feb 1998
Honduras 3 Dec 1997; 24 Sept 1998
Hungary 3 Dec 1997; 6 Apr 1998
Iceland 4 Dec 1997; 5 May 1999

Indonesia 4 Dec 1997

Ireland 3 Dec 1997; 3 Dec 1997
Italy 3 Dec 1997; 23 Apr 1999
Jamaica 3 Dec 1997; 17 Jul 1998
Japan 3 Dec 1997; 30 Sept 1998
Jordan 11 Aug 1998; 13 Nov 1998
Kenya 5 Dec 1997; 23 Jan 2001
Kiribati 7 Sep 2000 (a)

Lesotho 4 Dec 1997; 2 Dec 1998
Liberia 23 December 1999 (a)
Liechtenstein 3 Dec 1997; 5 Oct 1999

Lithuania 26 Feb 1999

Luxembourg 4 Dec 1997; 14 June 1999

Macedonia, FYR 9 Sep 1998 (a)
 Madagascar 4 Dec 1997; 16 Sept. 1999
 Maldives, 1 Oct 1998; 7 Sep 2000
 Malaysia 3 Dec 1997; 22 April 1999
 Malawi 4 Dec 1997; 13 Aug 1998
 Mali 3 Dec 1997; 2 Jun 1998
 Malta 4 Dec 1997; 7 May 2001
Marshall Islands 4 Dec 1997
 Mauritania 3 Dec 1997; 21 July 2000
 Mauritius 3 Dec 1997; 3 Dec 1997
 México 3 Dec 1997; 9 Jun 1998
 Moldova, Republic of 3 Dec 1997; 8 Sep 2000
 Monaco 4 Dec 1997; 17 Nov 1998
 Mozambique 3 Dec 1997; 25 Aug 1998
 Nauru 7 August 2000 (a)
 Namibia 3 Dec 1997; 21 Sep 1998
 Netherlands 3 Dec 1997; 12 April 1999
 New Zealand 3 Dec 1997; 27 Jan 1999
 Nicaragua 4 Dec 1997; 30 Nov 1998
 Niger 4 Dec 1997; 23 March 1999
 Nigeria 27 Sep 2001 (a)
 Niue 3 Dec 1997; 15 Apr 1998
 Norway 3 Dec 1997; 9 Jul 1998
 Panamá 4 Dec 1997; 7 Oct 1998
 Paraguay 3 Dec 1997; 13 Nov 1998
 Perú 3 Dec 1997; 17 Jun 1998
 Philippines 3 Dec 1997; 15 February 2000
Poland 4 Dec 1997
 Portugal 3 Dec 1997; 19 Feb 1999
 Qatar 4 Dec 1997; 13 Oct 1998
 Romania 3 Dec 1997; 30 Nov 2000
 Rwanda 3 Dec 1997; 13 June 2000
 Saint Kitts and Nevis 3 Dec 1997; 2 Dec 1998
 Saint Lucia 3 Dec 1997; 13 April 1999
 Saint Vincent and the Grenadines 3 Dec 1997; 1 Aug 2001
 Samoa 3 Dec 1997; 23 Jul 1998
 San Marino 3 Dec 1997; 18 Mar 1998
São Tomé e Príncipe 30 Apr 1998
 Senegal 3 Dec 1997; 24 Sept 1998
 Seychelles 4 Dec 1997; 2 June 2000
 Sierra Leone 29 Jul 1998; 25 April 2001
 Slovakia 3 Dec 1997; 25 Feb 1999 AA
 Slovenia 3 Dec 1997; 27 Oct 1998
 Solomon Islands 4 Dec 1997; 26 Jan 1999
 South Africa 3 Dec 1997; 26 Jun 1998
 Spain 3 Dec 1997; 19 Jan 1999

Sudan 4 Dec 1997

Suriname 4 Dec 1997

Swaziland 4 Dec 1997; 23 Dec 1998

Sweden 4 Dec 1997; 30 Nov 1998

Switzerland 3 Dec 1997; 24 Mar 1998

Tajikistan 12 October 1999 (a)

Tanzania 3 Dec 1997; 13 Nov 2000

Thailand 3 Dec 1997; 27 Nov 1998

Togo 4 Dec 1997; 9 Mar 2000

Trinidad and Tobago 4 Dec 1997; 27 Apr 1998

Tunisia 4 Dec 1997; 9 July 1999

Turkmenistan 3 Dec 1997; 19 Jan 1998

Uganda 3 Dec 1997; 25 Feb 1999

Ukraine 24 Feb 1999

United Kingdom 3 Dec 1997; 31 Jul 1998

United Republic of Tanzania 3 Dec 1997; 13 Nov 2000

Uruguay 3 Dec 1997; 7 June 2001

Vanuatu 4 Dec 1997

Venezuela 3 Dec 1997; 14 Apr 1999

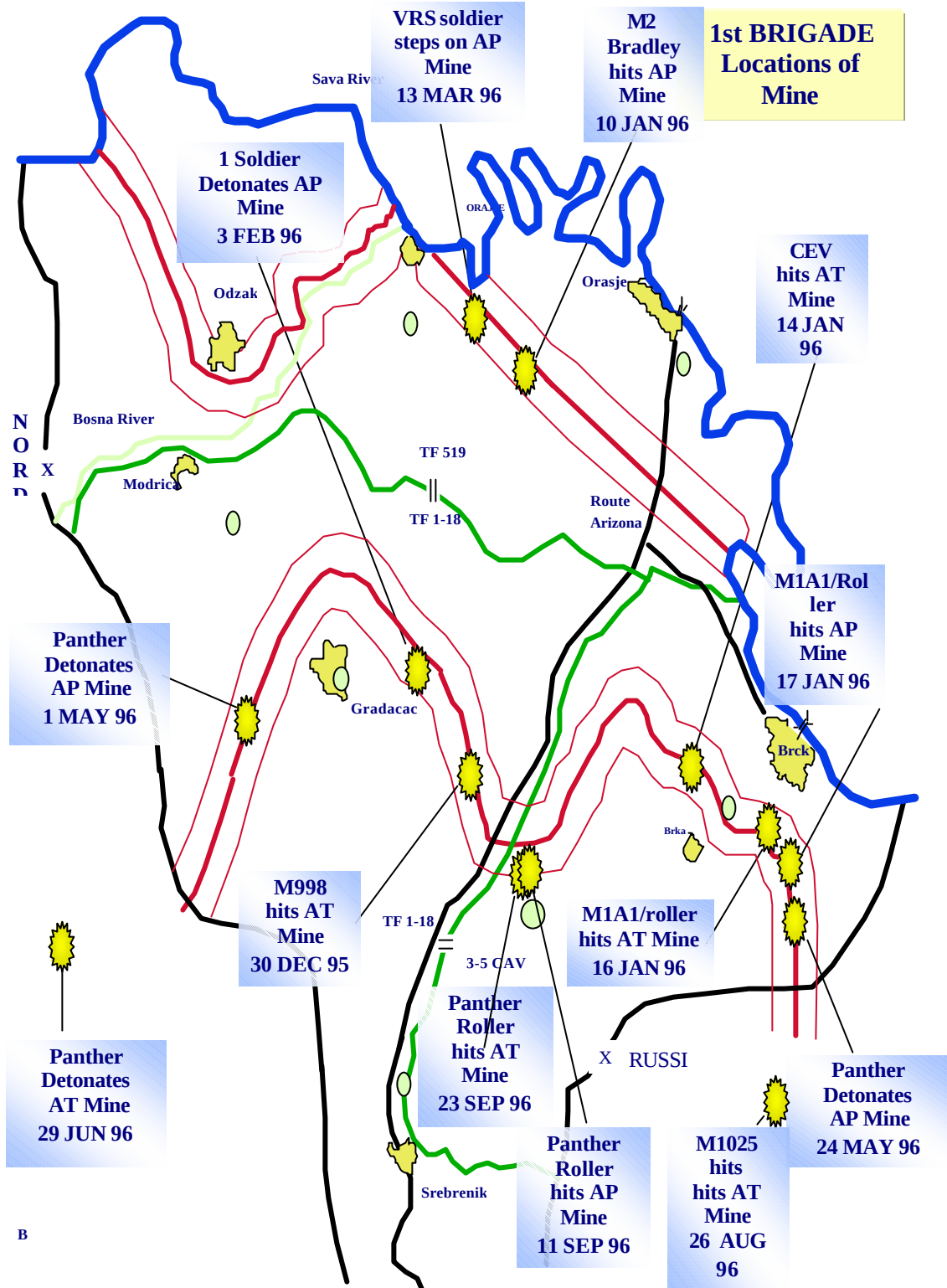
Yemen 4 Dec 1997; 1 Sep 1998

Zambia 12 Dec 1997; 23 Feb 2001

Zimbabwe 3 Dec 1997; 18 Jun 1998

APPENDIX C

1st BDE, 1st Armored Division Sector Minestrikes



BIBLIOGRAPHY

Books

- Addington, Larry, *The Patterns of War Since the Eighteenth Century*, Bloomington, Indiana University Press, 1994.
- Bellamy, Christopher. *The Future of Land Warfare*. New York: St. Martin's Press, 1987.
- Berube, Margery S. Director of Editorial Operations. *The Second College Edition, The American Heritage Dictionary*. Boston, Massachusetts: Houghton Mifflin Company, 19829.
- Bloch, Ivan S. Jean de. *The Future of War*. Boston: The World Peace Foundation, 1914.
- Blumenson, Martin. *Patton, The Man Behind the Legend*, New York, Berkley Book, 1985.
- Cahill, Kevin M. *Clearing the Fields: Solutions to the Global Land Mines Crisis*, New York: Basic Books, 1995.
- Clancy, Tom with Frederick M. Franks, *Into the Storm, A Study in Command*. New York: G.P. Putman's Sons, 1997.
- Clausewitz, Carl von. *On War*. Edited and Translated by Michael Howard and Peter Paret. Princeton, New Jersey: University Press, 1976
- Collier, Richard, *The War in the Desert*, Alexandria, Virginia, Time Life Books, Inc, 1977.
- Corum, Jame S., *The Roots of Blitzkrieg*, Lawrence, Kansas, The University Press of Kansas, 1992.
- Croll, Mike. *The History of Landmines*. Barnsley [U.K.]: Leo Cooper, 1998
- Doughty, Robert A., *The Seeds of Disaster, The Development of French Army Doctrine 1919 – 1939*. Hamden Connecticut, Archon Press, 1985.
- Farrar-Hockley, Anthony, *The War in the Desert*, London, Faber and Faber, 1969.
- Fitton, Robert A. *Leadership: Quotations From The Military Tradition*. Boulder: Westview Press, 1990.
- Goldblat, Jozef. *Agreements for Arms Control: A Critical Survey*, London: Taylor and Francis LTD., and Cambridge, MA: Oelgenschlager, Gunn &Hain, INC., 1982.
- Gorman, Paul F. *The Secret of Future Victories*. Fort Leavenworth, KS: US Army Command and General Staff College Press, 1994.
- Griess, Thomas, *The American Civil War*, The West Point Military History Series, Wayne, New Jersey, Avery Publishing Group INC., 1987

- Griess, Thomas E., *The Arab-Israeli Wars, The Chinese Civil War and the Korean War, Military History Series*, Wayne, New Jersey, Avery Publishing Group INC., 1987
- Hartle, Anthony E. *Moral Issues in Military Decision Making*. Kansas: University of Kansas Press, 1989.
- Herzog, Chaim, *The Arab-Israeli Wars: War and Peace in the Middle East*, New York, Random House, 1982.
- Hoffman, Bruce. *Inside Terrorism*. New York, Columbia University Press, 1998.
- Hunt, Richard A. and Richard H. Shultz, Jr. *Lessons from an Unconventional War, Reassuring U.S. Strategies for Future Conflicts*. New York, Pergamon Press, 1982.
- Huntington, Samuel P. *The Clash of Civilizations and the Remaking of World Order*. New York, Touchstone Books, 1996.
- International Committee of the Red Cross. *Anti-Personnel Landmines: Friend or Foe? A study of the military use of and effectiveness of anti-personnel landmines*. Geneva: ICRC Publications, 1996.
- Klein, Gary. *Sources of Power*. Massachusetts Institute of Technology, 1998.
- Marlatt, Greta E. and Michael L. Huygen. *Land Mines and Demining in the 20th Century* Monterey, California: Dudley Know Library, Naval Postgraduate School, 1998.
- McGrath, Rae. *Landmines and Unexploded Ordnance: A Resource Book*. Sterling, VA: Pluto Press, 2000.
- Nef, John, U., *War and Human Progress*, New York: Norton Publishing, 1950
- O'Neil, Robert J. *Australia in the Korean War, 1950-1953*, Australian Government Publishing Service, 1985.
- Parotkin, M., *The Battle of Kursk*, Moscow, Progress Publishers, 1974.
- Patton, George S. Jr. *War as I knew It*. Boston: Houghton Mifflin Co., 1947.
- Roberts, Shawn and Jody Williams. *After the Guns Fall Silent: the Enduring Legacy of Landmines*. Washington D.C.: The Vietnam Veterans of America Foundation, 1995.
- Rosen, Stephen P. *Winning the Next War*. New York: Cornell University Press, 1991.
- Scales, Robert H. *Future Warfare Anthology*. Pennsylvania: United States Army War College, 1999.
- Schneider, James J. *The Structure of Strategic Revolution*. Novato, CA: The Presidio Press, 1994.
- Simpkin, Richard E. *Race to the Swift: Thoughts on Twenty-First Century Warfare*. London: Brassey's Defense Publishers, 1985.

- Sloan, C.E.E. *Mine Warfare on Land*. Washington D.C.: Brassey's Defence Publishers, 1986.
- Spiller, Roger J. *Combined Arms in Battle Since 1939*. Fort Leavenworth, KS: US Army Command and General Staff College Press, 1992.
- Toffler, Alvin and Heidi, *War and Anti-War*, Boston, Little, Brown, and Company, 1993.
- Triandafilov, Vladimir K. *The Nature of the Operations of Modern Armies*. Great Britain: Frank Cass & Co. LTD., 1994.
- Tse-Tung, Mao, *On guerrilla Warfare*, New York, Frederick A. Praeger, Inc, 1961.
- Turabian, Kate L. *A Manual for Writers of Term Papers, Theses, and Dissertations*. 6th ed. Chicago: University of Chicago Press, 1996.
- Van Crevald, Martin L. *Command In War*. Massachusetts: Harvard University, 1985.
- Winslow, Philip C. *Sowing the Dragon's Teeth: Land Mines and the Global Legacy*. Boston, Massachusetts: Beacon Press, 1997

Articles and Periodicals

- Akins, Frank, *Constructing an Obstacle Utilizing Off-Route Demolition Techniques- A Practical Approach*, <http://call.army.mil/products/trngtr/tql-99/roadblk.htm>, accessed 26 March 30, 2002
- Baker, David C. "The Great Grandfather of modern Landmines might well be a tunnel under Jericho", *Military History*, (Leesburg, VA, April 2002).
- Burkhalter, Holly. "Phantom Pain: Banning Landmines." *World Policy Journal* (New York, Summer, 1997): 34.
- Erst, Frederick J., "Obstacle Integration", NTC Sidewinders' Newsletter No 99-12, <http://www.call.army.mil>, accessed 4 April 2002
- Erwin, Sandra I. "U.S. Antitank Weapons Could Replace Landmines, study says". *National Defense*. (September 1999).
- Gilbert, Felix, *Hitler Directs His War: the Secret Records of His Daily Military Conferences*, New York, Oxford University Press, 1950
- Hewish, Mark and Rubert Pengelley. "In search of a successor to the anti-personnel landmine". *Jane's International Defense Review*. (March 1998).
- Kopp, Carlo, *The E-Bomb – A Weapon of Electrical Mass Destruction*, http://inforwar.com/MIL_C4I/mil_c4i8.html, accessed 10 March, 2002.

- Kuchenmeister, Thomas, *Alternative anti-personnel mines, The Next Generations*, London, Landmine Action, 2001.
- Jefferson, Paul A. S. "A Political Minefield." *The Wall Street Journal* (15 October, 1997)
- Leighow, John K. "Route Clearance Operations". *The Engineer Magazine*. (August 1995)
- Leklem, Erik J. "U.S. Pledges to Sign APL ban; Lists conditions to be met first". *Arms Control Today*. (May 1998).
- Lokey, Joe. "DCSA and James Madison University team up against Landmines" *Disarm Journal of International Security Assistance Management*". Spring 2000.
- Muller, Robert O. "The Land Mine Scourge – How Much Longer?". *Christian Science Monitor*. (February 8, 1996).
- O'Donoghue, Terry, "Standardized Lane and Bypass Marking", NTC Sidewinders' Newsletter No 99-12, <http://www.call.army.mil>, accessed 4 April 2002
- Schneider, James J. "The Theory of the Empty Battlefield," *Journal of the Royal United Services Institute (RUSI) for Defence Studies*, (September, 1987): 37-44.
- Schneider, James J. "What if We Fight Tonight: Advanced Military Education for the XXIst Century." *Association of Advanced Operational Studies NET Call 2*, (Fall-Winter 1994-95): 3-9.
- Shenon, Philip. "U.S.-Land Mines Killed Many Americans, Report Says". *New York Times*. (July 29, 1997).
- Stohl, Rachel. "Landmines remain the issue in Korea". *Defense monitor*. Vol 29 no 5. (Jun 2000).
- Stroup, Theodore G. Jr. "The Ongoing Army Transformation, " *Army* 50 (July 2000): 7-10.
- Trainor, Bernard E. "Land Mines Saved My Life". *New York Times*. (March 28, 1996).
- Troxell, John F. "The Landmine Debate". *Parameters*. Autumn 2000.
- Troxell, John F. "Landmines: Why the Korea exception should be the rule". *Parameters* (Spring 2000).

Government Documents

- _____. ADP-1, *Operations*, London, Chief of the General Staff, 1994.
- _____. AFM-1, *Combined Arms Operations, Part 1, Formation Tactic*, London, Chief of the General Staff, 1995,
- _____. B-GL-300-001/FP001, *Conduct of Land Operations-Operational Level Doctrine for the Canadian Army*, Ottawa, Ontario, Canadian National Defense, 1998

- _____. B-GL-300-002/FP-000, *Land Force Tactical Doctrine*, Ottawa, Ontario, Canadian National Defense, 1997,
- _____. FM 3-0, *Operations*. Washington DC: Department of the Army, 2001.
- _____. FM 7-100, *Opposing Force Doctrinal Framework and Strategy*, Washington, D.C., Department of the Army, 2001.
- _____. FM 27-10, *The Law of Land Warfare*, Washington D.C., Department of the Army, 1976.
- _____. FM 71-3, *The Armored and Mechanized Infantry Brigade*. Washington DC: Department of the Army, 1996.
- _____. FM 90-7, *Combined Arms Obstacle Integration*. Washington DC: Department of the Army, 1994.
- _____. FM 90-13-1, *Combined Arms Breaching Operations*. Washington DC: Department of the Army, 1994.
- _____. FM 101-5-1, *Operational Terms and Graphics*. Washington DC: Department of the Army, 1997.
- _____. JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, Washington, DC, Department of Defense, 2001.
- _____. ST 3-100.40, *Tactics*. Ft. Leavenworth, KS: USA Command and General Staff College, 2001.
- _____. TRADOC PAM 525-3-0, *The United States Army Objective Force, Operational and Organizational Concept*. Fort Monroe, VA: U.S. Army Training and Doctrine Command, November 2001.
- Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which may be Deemed to be Excessively Injurious or to have Indiscriminate Effects and Protocols, 1980
- US Department of Defense. Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*. Washington DC: Government Printing Office, 1994.
- US Department of State. *Hidden Killers: The Global Landmine Crisis*, Washington DC: Government Printing Office, 1995.
- US General Accounting Office. GAO/T-NSIAD-99-92, "Military Readiness: Full Training Benefits from Army's Combat Training Centers Are Not Being Realized." Washington DC: Government Printing Office, 1999.

Monographs, Reports, Theses, and Unpublished Works

- Anderson, Richard, Christopher A. Lawrence, Dave Bongard, John Kettelle, and Nicholas Krawciw, "The Dupuy Institute's Research Study: Military Consequences of Landmine Restrictions, VVAF Monograph Series Vol 1, Number 2", Maclean, Virginia, Vietnam Veterans of America Foundation, 1996.
- House, Jonathan, Combat Studies Institute Research Survey No. 2, *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization*, Ft. Leavenworth, KS, U.S. Army Command and General Staff College, 1984.
- Hubert, Don, *The Landmine Ban: A Case Study in Humanitarian Advocacy*, Providence, Rhode Island, The Thomas J. Watson Jr. Institute for International Studies, 2000.
- Funk, David E. "A Mine is Terrible Thing to Waste: The Operational Implications of Banning Anti-Personnel Landmines". Monograph, Fort Leavenworth, Kansas: School of Advanced Military Studies, Second Term, AY 97-98.
- Swain, Richard M. *Selected Papers of General William E. Depuy* Combat Studies Institute, US Army Command and General Staff College, 1994.