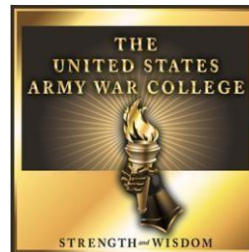


Terrain Shaping in the Twenty-First Century

by

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Abstract

The purpose of this study is to show how the United States' national policy and directives with regards to landmines creates friction points that inhibit the joint forces' ability to shape and control terrain. This paper describes the current U.S. landmine national policy, the future strategic threat environment, the current U.S. terrain shaping capability, and the impact on the joint land force's ability to shape terrain. This paper argues that the current strategic environment, with the recent rise of potential near peer competitors, requires reengagement with our allies and development of a new foundational obstacle system. This paper also provides recommendations that will enhance the United States' ability to shape and dominate terrain to support expeditionary maneuver and joint combined operations.

Terrain Shaping in the Twenty-First Century

The challenges of today's operational environment are exacerbated by the recent U.S. ban on persistent landmines. This creates a greater reliance on nonpersistent scatterable mines.

—ATP 3-90.8¹

Since the American Civil War, the United States has employed mines to deny its enemies freedom of movement and maneuver or to deny them the use of specific terrain to support mission accomplishment by friendly forces. With today's increasing global instability and budgetary constraints, the United States must continually reassess its foreign policy and how it deals with threats to its security. The U.S. military doctrine and capabilities must be designed to support its foreign policy, otherwise the United States will not be able to successfully meet its policy ends.

To win in war, United States forces must shape and control physical terrain. The purpose of this study is to show how the United States' national policy and directives with regards to landmines impacts the joint forces' ability to shape and control terrain. This paper describes the evolution of the current U.S. landmine national policy, the future strategic environment, and the current U.S. terrain shaping capability. This paper will then examine points of friction between the U.S. landmine policy, the future strategic environment, and the U.S. terrain shaping capability. Finally, this paper will provide recommendations to mitigate any friction identified to enhance the United States' ability to shape and dominate terrain to support expeditionary maneuver and joint combined operations.

Evolution of U.S. Landmine Policy

In 1980, the "Convention on Certain Conventional Weapons"² took place in Geneva, Switzerland under the guidance of the United Nations. This Convention built

upon established rules in war that included: “(1) the requirement that a distinction be made at all times between civilians and combatants; and (2) the prohibition of the use of weapons which inflict excessive injury or suffering on combatants or render death inevitable.”³ “The Convention contained three protocols prohibiting the use of weapons that employ fragments not detectable in the human body by X-ray; regulating the use of landmines, booby-traps and similar devices; and limiting the use of incendiary weapons.”⁴

In 1996, the second protocol dealing with landmines was amended to contain fourteen different Articles. Multiple Articles in this amendment help to provide background into the evolution of U.S. landmine policy. The first is Article Three which places restrictions on the use of landmines. One of the restrictions is the use of mines or booby-traps against civilians.⁵ Article Four prohibits the use of undetectable anti-personnel mines and Article Five directs that anti-personnel mines that are not remotely delivered to be emplaced in a monitored and fenced area and then removed once the conflict has ended.⁶ Article Six only allows the emplacement of remotely-delivered mines if they have the capability to self-destruct or self-neutralize.⁷ Article Eight prohibits the transfer of any mine in violation of the second protocol.⁸ Finally, Article Fourteen requires all signatories to comply with this protocol with violators subject to penal sanctions.⁹ Of note, the United States has signed and supports this particular convention.

President Clinton published Presidential Decision Directive (PDD)/NSC-48 on June 26, 1996. This directive outlined the U.S. policy on anti-personnel landmines and “was developed in response to the growing threat posed by the indiscriminate use of

anti-personnel landmines.”¹⁰ During this time thousands of people, mainly civilians, were either maimed or killed by anti-personnel landmines and the United States, as the only superpower, took this issue on as the global leader. The key elements of the PDD are the “United States will pursue an international agreement to ban the use, stockpiling, production and transfer of anti-personnel landmines, the United States will continue to use anti-personnel landmines on the Korean Peninsula, the United States will not use and demilitarize all non-self-destructing anti-personnel landmines by the end of 1999, and the United States will continue to use self-destructing/self-deactivating anti-personnel landmines.”¹¹ President Clinton’s ultimate goal was the total elimination of anti-personnel landmines. This directive eventually led to the “Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction.”¹²

In September 1997, “The Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction”¹³, known informally as the Ottawa Treaty or Ottawa Convention, was adopted in Oslo, Norway and later signed by 122 States in Ottawa, Canada. The purpose of the treaty was to “put an end to the suffering and casualties caused by anti-personnel mines that killed or maimed hundreds of people, obstructed economic development and reconstruction, and inhibited the repatriation of refugees and internally displaced persons.”¹⁴ The treaty contains twenty-two Articles. For the scope of this paper only Articles One and Three will be addressed.

Article One describes the general obligations that signatory states must follow. Signatory states “cannot use anti-personnel mines; it prevents them from developing,

producing, acquiring, stockpiling, retaining, or transferring anti-personnel mines; it discourages the assistance to anyone engaging in acts that are prohibited by the treaty; and finally, the treaty requires all the signatories to destroy their current stockpiles of anti-personnel mines in accordance with the provisions of the Convention.”¹⁵ Article Three of the treaty does allow for “the retention or transfer of the smallest amount of anti-personnel mines required for training in mine detection, mine clearance, and mine destruction.”¹⁶ Of note, the United States, Russia, and China are non-signatories to the treaty. The large point of contention for the United States and the Clinton administration was the retention of the capability to use anti-personnel landmines on the Korean Peninsula.

The United States and the Bush administration continued to follow a similar policy as the Clinton administration with regards to landmines. The policy stated “the United States would work toward ending its use of anti-vehicle and anti-personnel landmines that are not designated to self-destruct and self-deactivate within a period of time.”¹⁷ The two key additions for the Bush administration that differed from the Clinton administration was the elimination of the use of non-self-destructing anti-vehicle landmines and the ability to use self-destructing landmines on any battlefield.¹⁸ Like Clinton, the Bush administration continued to support the use of anti-personnel landmines on the Korean Peninsula. However, Bush’s policy did negate two pledges by Clinton “that the United States would end the use of all anti-personnel landmines-smart and dumb-outside of Korea by 2003 and accede to the Ottawa Convention by 2006 if the Pentagon found suitable anti-personnel landmine alternatives by that time.”¹⁹

The Obama administration also executed a review of the U.S. landmine policy after President Obama's election in 2008 and generally followed the same policy as President Bush. The policy stated that the United States would continue to "not use anti-personnel landmines outside the Korean Peninsula; not assist, encourage, or induce anyone outside the Korean Peninsula to engage in activity prohibited by the Ottawa Convention; and undertake to destroy anti-personnel landmine stockpiles not required for the defense of the Republic of Korea."²⁰ The key change to the policy from the Bush administration was "that the United States would not produce or otherwise acquire any anti-personnel munitions that were not compliant with the Ottawa Convention, including to replace such munitions as they expire in the coming years."²¹ The policy also continued the previous guidance to end the use of all non-self-destructing mines.²² As previously stated, the United States is non-signatory to the Ottawa Convention due to the security challenges on the Korean Peninsula. President Obama's policy reiterates, like Bush's policy, that the United States would continue to "pursue material and operational solutions that would be compliant with and ultimately allow the U.S. to accede to the Ottawa Convention while ensuring the U.S. ability to meet its alliance commitments to the Republic of Korea."²³

On December 2, 2016, Secretary of Defense Ash Carter published a memorandum directing the DoD Implementation of U.S. Landmine Policy. This memorandum set forth DoD policy pertaining to landmines consistent with Presidential Policy Directive-37, *U.S. Landmine Policy*. This memorandum directs "DoD components to undertake diligent efforts to pursue material and operational solutions that would be compliant with and ultimately allow the U.S. to accede to the Convention on the

Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction (“Ottawa Convention”), while ensuring the United States’ ability to respond to contingencies on the Korean Peninsula and to meet our alliance commitments to the Republic of Korea.”²⁴

The key elements of the directive state that “DoD components will not develop, produce, or acquire anti-personnel landmines and that DoD components will not export or transfer anti-personnel landmines or anti-personnel landmine technology except for the development of and training in mine detection, mine clearance, or mine destruction techniques.”²⁵ Outside the Korean Peninsula, “DoD is directed to not use anti-personnel landmines, to not assist, encourage, or induce anyone to engage in any activity prohibited to a State Party under the Ottawa Convention; undertake to destroy anti-personnel landmine stockpiles not required for the defense of the Republic of Korea and subsequently not stockpile or retain anti-personnel landmines not required for the defense of the Republic of Korea.”²⁶ Of significance, the policy does allow for a limited number of anti-personnel mines to be retained for training in the areas of “mine detection, mine clearance, mine destruction techniques, and for units with applicable countermobility missions.”²⁷ Similar to the other presidential administration policies, this policy does not prohibit the use or require the destruction of anti-personnel landmines required to defend on the Korean Peninsula.²⁸ With regards to non-self-destruct landmines the policy states that DoD components will not employ any anti-vehicle landmines, or anti-personnel landmines on the Korean Peninsula that do not self-destruct/self-deactivate or are non-detectable.²⁹

Future Strategic Environment

This section of the paper will focus on what the future strategic environment may look like for the United States using concepts described in the Army Operating Concept (AOC). Former Chief of Staff of the Army, General Odierno stated, “The AOC guides future force development by identifying first order capabilities that the Army needs to support U.S. policy objectives.”³⁰ This statement is salient as it describes how the Army must develop capabilities that are compliant with national policy to deal with future threats to the United States and very succinctly captures one of the arguments of this paper.

The enemies the United States will face in the future consist of nation states, non-state actors, insurgent groups, and criminal organizations.³¹ These enemies will take advantage of the advancement in technology to apply against the U.S. “As new military technologies are more easily transferred, potential threats will emulate U.S. military capabilities to counter U.S. power projection and limit U.S. freedom of action.”³²

Planners and intelligence specialists spend a great deal of time describing what the future strategic environment looks like. The AOC uses five characteristics in its description. The first characteristic is the “increased velocity and momentum of human interaction and events.”³³ This characteristic is defined as “the speed at which information diffuses globally through multiple means increases the velocity, momentum, and degree of interaction among people.”³⁴ Information now travels at an unprecedented pace due to advances in technology that now supports the global use of communications tools such as social media and the Internet linking everyone in the world instantly.

The second characteristic is the “potential for overmatch.”³⁵ “Overmatch is the application of capabilities or use of tactics in a way that renders an adversary unable to respond effectively.”³⁶ In the past, the United States has had overmatch in the air, sea, land, cyber, and space domains. This is no longer the case as other state and non-state actors increase their capabilities in the various domains.

The third characteristic is the “proliferation of weapons of mass destruction.”³⁷ In the past couple of years we have seen multiple state actors pursue the development of weapons of mass destruction. North Korea and Iran are two examples of nations pursuing the development of nuclear weapons. As these weapons continue to be developed in unstable nations the potential for global instability increases.

The fourth characteristic is the “spread of advanced cyberspace and counter-space capabilities.”³⁸ Virtually every person on the planet with a computer has the ability to interact and influence in cyberspace, thus making it one of the most important domains if not the most important. Also, the ability to influence actions in space continue to increase as technology continues to advance. This is evidenced by the increase in privately owned and funded ventures into space.

The final characteristic is “demographics and operations among populations in cities and in complex terrain.”³⁹ The past couple of decades has seen the migration of people from rural areas to urban areas to take advantage of job opportunities and the security and services provided by the government. This trend is expected to continue with the development of mega-cities. The complexity of the urban environment increases the difficulty of conducting operations.

The AOC describes the “harbingers of future conflict as competing powers (e.g., China and Russia), regional powers (e.g., Iran and the Democratic People’s Republic of Korea (DPRK)), transnational terrorist networks (e.g., al Qaida, its affiliates, and transnational criminals), and cyber threats.”⁴⁰

“Though the People’s Republic of China remains committed to stable relationships with neighbors and the U.S. in the near-term, it continues to pursue a long-term, comprehensive military modernization program designed to improve the capacity of its armed forces to fight and win short-duration, high-intensity regional contingencies.”⁴¹ China is constantly trying to expand its influence in its region to solidify its security. China does not want a direct confrontation with the U.S. and keeps its actions and provocations at the level where the U.S. is not forced to respond. However, China is not afraid to create conflict within its region. “Territorial disputes with Japan over the Senkaku/Diaoyu islands; border disputes with India; and increased maritime pressure on the Philippines, Malaysia, Taiwan, and Vietnam are examples of China exerting power through force or threat of force.”⁴²

Another competing power is Russia. “Russian annexation of the Crimean Peninsula and use of conventional and unconventional land forces in Ukraine suggest that Russia is determined to expand its territory and assert its power on the Eurasian landmass.”⁴³ It is unknown what the long-term results of the Russian aggression into the Ukraine will be, but it did show that Russia was willing to use land forces to assert its power and advance its interests. “Without a viable land force capable of opposing the Russian army and its irregular proxies, such adventurism is likely to continue undeterred.”⁴⁴

Regional powers such as Iran and the DPRK are also attempting to gain power and maximize their influence in their respective regions. Iran is continuing its development of nuclear weapons and uses a variety of methods to provide influence in its region. “Iran develops partnerships with disenfranchised populations, religious factions, and criminal elements to create disorder focused on subverting the influence of the U.S. and partner nations.”⁴⁵

The DPRK is a threat to the international order as evidenced by their recent ballistic missile tests and continued development of nuclear weapons. The instability in this part of the world continues to increase as tensions between the United States and the DPRK heighten. The DPRK has a capable conventional army and is continuing to improve their cyber capabilities as seen in the hacking of Sony.

The AOC’s description of the future strategic environment provides context as to what capabilities the United States needs to develop to combat the various threats to global stability. What is clear is that the environment is very complex and volatile and that it will require a multi-capable land force to deal with it.

U.S. Terrain Shaping Capability

Mines have been used for centuries, but the first real extensive use of landmines by the United States took place during the American Civil War. “The Confederate Army, in the face of a much larger force, found it necessary to enhance their defensive front in order to expose the Union troops to as much attrition as possible for as long as possible.”⁴⁶ During this time period the pressure activated landmine was developed.

The emergence of the machine gun during World War I caused the use of landmines to dwindle. However, World War II facilitated major advances in minefield technology. “By 1945, all major military forces considered them an important component

for defense and over a hundred different types were used in combat.”⁴⁷ Through the years, the technology of mines continued to evolve from simple pressure fuses in non-self-destructing mines to sophisticated electronically fused, blast-resistant, self-destructing mines. Today, the bulk of the U.S. mine inventory consists of electronically fused, blast-resistant, self-destructing mines.

“The 1950s through the 1970s saw an increase in countries developing vehicles that could mechanically lay hundreds of mines in minutes.”⁴⁸ In the Korean and Vietnam Wars, the enemy used mines against the United States. Additionally, the mines wounded and killed large amounts of civilians indiscriminately. These incidents caused technological innovations that added anti-handling devices to mines to prevent the enemy from moving and using them and the development of the Family of Scatterable Mines (FASCAM) that have a self-destruct capability.

“A foundational obstacle system refers to that family of anti-personnel and anti-vehicle obstacles that provides the primary means by which the Army achieves its required obstacle effects in nearly any terrain against a wide range of threats.”⁴⁹ “From the time immediately after World War II until January 1, 2011, the U.S. Army relied on a suite of persistent mines-the M14 and M16 anti-personnel mines and the M15, M19, and M21 anti-tank mines-as its foundational obstacle system.”⁵⁰ This capability is no longer compliant with U.S. landmine policy and thus the use of persistent mines is prohibited causing the Army to use its FASCAM arsenal for its terrain shaping capability.

Scatterable mines (SCATMINES) and networked munitions are the only systems compliant with current U.S. landmine policy. Scatterable mines are non-persistent mines

with variable self-destruct times that can be employed by air, artillery and ground delivery systems.⁵¹ “SCATMINES offer commanders a means for rapidly responding to changes in the situation and emplacing obstacles in areas beyond friendly lines, in contaminated areas, or in areas where it is physically impossible based on terrain or time-distance limitations.”⁵² Air delivered SCATMINES are dispensed through two types of systems, the Gator and Air Volcano. The Gator is dispensed by a fixed wing aircraft and the Air Volcano is dispensed by a rotary wing aircraft. The artillery delivered SCATMINE is the “Remote Anti-armor Mine (RAAM) and Area Denial Artillery Munition (ADAM).”⁵³ The system used to dispense this particular SCATMINE is the 155-millimeter howitzer and it was “designed to provide a flexible, rapid-response mine capability that can emplace mines directly on top of, in front of, or behind enemy forces.”⁵⁴ The ground delivered systems are the Ground Volcano and the “Modular Pack Mine System (MOPMS).”⁵⁵ This Ground Volcano uses the same dispensing system as the Air Volcano, but it is mounted on a variety of ground based vehicle platforms. “The MOPMS is a hand emplaced, man portable, 162-pound, suitcase-shaped mine dispenser that is used to emplace either tactical or protective obstacles.”⁵⁶ Finally, there is one other system that has been developed that is not part of the Family of Scatterable Mines, but is still policy compliant. It is called the “Spider Networked Munitions System and it is a man-portable, remote-controlled, protection and area-denial munition.”⁵⁷ This system doesn’t leave any residual effects on the battlefield that could harm innocent civilians.

Problem

The majority of the U.S. landmine policy was crafted after the fall of the Soviet Union when the U.S. was the dominant power in the world. The U.S. could afford to accept risk and show leadership to the world with restricting the use of landmines, be it

anti-personnel landmines or persistent mines. However, the strategic environment is now changing with the emergence of the competing powers of Russia and China and the increased instability displayed by the DPRK and Iran. Both Russia and China have shown their willingness to use military force to achieve their national interests. If the U.S. were to conduct a conventional war with a country it is likely to be with China or Russia. Terrain shaping in this type of war could be significant and neither China nor Russia are restricted by any treaty or policy preventing the use of landmines. This would put the U.S. at a significant disadvantage. Additionally, the current U.S. terrain shaping capability doesn't facilitate mission success in a conventional conflict. The U.S. landmine policy and terrain shaping capability are the two major factors that lead to multiple friction points that must be mitigated to ensure collective global security.

Points of Friction

Policy

The current U.S. policy on landmines constrains the land force. The Army and the other components of land power have a limited number of the SCATMINE and networked munitions assets described above. "While scatterable mines make excellent situational obstacles, they were not designed, nor are they optimized, to serve as the Army's foundational obstacle system."⁵⁸ The development of a new foundational obstacle system, that is policy compliant, is required to provide the land force with the capability to shape terrain and be successful in a conventional conflict.

Allies

In today's strategic environment, the U.S. will need allies and partners to win in future wars. The largest coalition is NATO and this alliance is based on agreements between the members. The U.S. landmine policy is of particular concern when it comes

to interoperability with coalition partners. The U.S. and many of the NATO members have divergent thinking with regards to the employment of landmines. The Ottawa Treaty, of which many of U.S. allies are signatories, prohibits the transfer and storage of anti-personnel landmines. Historically, the U.S. has stockpiled various types of equipment and supplies in partnered countries to support forward deployed forces. Currently, the U.S. has destroyed all stockpiles of non-self-destructing anti-personnel landmines except on the Korean Peninsula. Also, the U.S. has discontinued the use of persistent mines and no longer has stockpiles of this type of mine forward deployed as well. If the U.S. goes to war with a near peer competitor in a conventional-type conflict outside of Korea, it will be hindered by its inability to respond without the prepositioned stockpiles. Complicating the situation is the fact that the U.S. could not transit mines or mine emplacement systems that aren't compliant with the Ottawa Treaty through countries that are signatories. Some examples of U.S. allies who could not assist in this regard are Germany, Japan, United Kingdom, and Poland. This could cause a strain on the strategic movement assets required to quickly move assets into theater that are policy compliant.

Additionally, if the United States did go to war with its NATO partners its ability to bring its FASCAM arsenal would be hindered. U.S. allies that are signatories to the Ottawa Treaty would not fight with any systems that use anti-personnel landmines. Unfortunately, U.S. FASCAM systems (Ground and Air Volcano, ADAM/RAAM, Gator, and MOPMs) all employ anti-personnel landmines. Even though the U.S. systems are compliant with U.S. policy and have a self-destruct capability, they are technically banned under the Ottawa Treaty. The lack of the ability to employ this capability would

put the U.S. at an extreme disadvantage and possibly put a strain on the coalition. “It has been demonstrated through extensive modeling and simulation that a force, in the context of a European contingency, without the capability to use anti-personnel landmines will suffer 35% greater casualties than if they had those systems. In addition, losses of equipment and material would increase by 40%.”⁵⁹

Functionality

The Army’s recent emphasis on preparing for war with a near peer competitor has brought increased focus on its ability to conduct terrain shaping operations. This emphasis has caused a demand for the use of the SCATMINE systems that have not been trained on in the past fifteen years during counterinsurgency operations. These systems were not needed in Iraq and Afghanistan and were not a focus for training for the units that had them in their inventory. A critical challenge now facing these systems is the ability to sustain and maintain the systems. “Some of the sustainment challenges with legacy area-denial systems include system age; battery life and obsolescence; changes in ground and air prime mover platforms; the demand for and availability of repair parts; priority of sustainment funding; unit familiarity with maintaining and operating the systems; and evolving policy guidance and treaty requirements.”⁶⁰

The majority of FASCAM systems, such as the Volcano, are 20-30 years old. The technology in these systems are out of date and require an upgrade. One issue is battery life-span and performance.⁶¹ Just about every system in the Army relies on some type of battery to assist in its functionality and the FASCAM systems are no different. Unfortunately, many of the batteries are reaching or exceeding their design life.⁶² Batteries are not the only concern for failure in advanced munitions. Other

components, such as plastics and electronics, deteriorate over time and need replacement as well.⁶³ Overall, these systems are in need of a major overhaul.

Doctrine

Historically, Engineers were looked upon as the terrain shaping experts and were tasked with the countermobility mission. Engineers conducted this mission using doctrine that directed the use of persistent anti-personnel and anti-vehicle landmines that are now non-compliant with national policy. The unfortunate result of the ever changing strategic environment and the U.S. efforts to provide policy to support the strategic environment has rendered the majority of countermobility doctrine as out of date. “The deployment of landmines has shifted away from the engineer and toward a combined arms team that includes field artillery, combat aviation, and the U.S. Air Force.”⁶⁴ “Army Doctrine Publication 3-09, *Fires*, fails to mention landmines; while Army Doctrine Reference Publication 3-09, *Fires*, fails to list the employment of scatterable mines as a role, core competency, or critical capability of the field artillery.”⁶⁵ Army aviation and the Air Force also have a lack of depth in their doctrine with regards to landmine deployment.⁶⁶ Additionally, ATP 3-90.8, *Combined Arms Countermobility Operations*, lacks sufficient detail to address how to conduct terrain shaping under the current policy constraints.

Recommendations

Policy

Due to the U.S. and international community’s sensitivity toward human suffering and death caused by landmines, it is unlikely that a less restrictive policy will be developed. Therefore, other actions must be taken to mitigate this risk. In the near term, bilateral agreements must be established with allied nations to allow the prepositioning

and transit of U.S. FASCAM assets, current policy compliant systems must be overhauled, and doctrine must be adjusted to comply with the policy. In the long term, new systems must be developed that comply with policy and that are better designed to assist the land force with terrain shaping.

Allies

In case of contingency operations that would require the rapid deployment of U.S. conventional forces it is imperative to have bilateral agreements in place with allied nations to allow the prepositioning or transiting of U.S. FASCAM systems. These negotiations should begin immediately to allow time to come to an agreement. The U.S. should prioritize which nations to negotiate with first, based off of geographic proximity to a potential U.S. threat and their likelihood to assist. Japan, Germany, and Poland are potential candidates. Once these agreements are negotiated, operational plans must be updated to reflect the capability to store and transfer FASCAM systems at these critical geographic locations.

Functionality

Overhauling the current systems to restore functionality must take place as soon as feasible. The Army has begun taking steps to refurbish the Volcano system. First, “the U.S. Army Armament Research, Development and Engineering Center (ARDEC) began its support by reviewing the various system and subsystem technical data packages to identify modern replacements for the obsolete legacy components.”⁶⁷ ARDEC then passed this information to TACOM who started to refurbish a limited number of systems.⁶⁸ However, budgetary funds must be allocated to complete the refurbishment of all systems to get them fully mission capable until new replacement systems are fielded.

Doctrine

The U.S. networked munitions and FASCAM doctrine must be revised to include a joint combined arms approach and compliance with current national policy. “U.S. forces must plan, emplace, integrate, and control the new family of networked munitions in concert with terrain, other obstacles, observation, and fires in support of joint combined operations to achieve the intended obstacle effects.”⁶⁹ The revised doctrine must add more depth and description as to how the field artillery, combat aviation, and U.S. Air Force can use our current FASCAM systems to employ obstacles that support entry, offensive, defensive, and stability operations to achieve overmatch against the enemies of the United States in the land domain.

New Foundational Obstacle System

To meet the policy requirements of the United States and the requirements of Unified Land Operations will require the development of a new foundational obstacle system that is rapidly emplaceable and policy compliant. The following characteristics must be part of the new system—⁷⁰

- Effective against personnel and vehicles.
- Remotely controlled to minimize risk to friendly forces and noncombatants.
- Rapidly employable to support fast-paced operations.
- Scalable, with options for lethal and nonlethal effects.
- Capable of variable, short to long-term duration and available in sufficient quantity at the right time and place to support the specific unit mission as part of Army operations.

- Versatile enough to work in all terrains and to be delivered at close, middle, and deep ranges.
- Flexible enough to allow combinations of different munitions, devices, triggering mechanisms, and sensors.
- Easily trained, operated and integrated at all echelons of the Army.
- Compliant with U.S. policies, laws, and applicable treaties and conventions and adaptable to future changes in these.
- Affordable.

The U.S. is the only nation attempting to develop new solutions in mine emplacement technology that will not outrage the international community. The U.S. should encourage its international partners, who are signatories to the Ottawa Treaty, to participate in the development of these new systems. It is in the best interest of all parties involved to improve its collective security.

Conclusion

Today's strategic environment is constantly changing with the emergence of new actors that threaten U.S. security. A critical element of U.S. security is its ability to dominate as a land power. Part of the U.S. dominance as a land power is its capability to shape terrain. Due to policy constraints, the U.S. terrain shaping capability is now reliant on FASCAM. The U.S. must continue to revise, refurbish, and upgrade its FASCAM capability if it wants to continue to be dominant on the land. Without it, the U.S. is exposing a weakness that could be exploited by its enemies.

Endnotes

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³⁵ Ibid.

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³⁸ Ibid.

³⁹ Ibid., 12.

⁴⁰ Ibid.

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⁴² Ibid., 12–13.

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⁷⁰ Ibid. The list of ten bullets describing the characteristics of a new foundational obstacle system is quoted and incorporated directly into this paper as it was written by Kelvin Nichols and Paul Kelly in the original source.